

Common Threads: Methods, Themes, and Contributors  
that Developed Historic Information Design from the 18th and 19th Centuries

by

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## ABSTRACT

Presently, Information Design is on an upward trajectory, as it is being implemented on various platforms, from professional presentations to social media posts. The need for strong, understandable visual content has driven individuals with varying backgrounds to adopt the methods from the field. However, whether novice or trained professional designers, a vast number appear to pillage the random works they come across and apply the visuals without considering the historic lessons that are within each visualization.

When designers discuss the history of Information Design, many cannot agree on much. Of the books that are in circulation, a majority highlight specific people, places, designs, and/or time periods. A few identify common themes but fall short of emphasizing threads that connect people and methods. In actuality, the history of Information Design is severely limited. Designers fail to notice the benefits of understanding the complexity of problems encountered by practitioners in the 18th and 19th centuries. Many in the field deny themselves the opportunity to recognize the inventiveness, successes, and failures of the predecessors. Lost are the lessons, skills, and insight taught by the progenitors.

This research aims to highlight connections from the past to rediscover their value in the present, while also calling attention to contributors who were previously overlooked or undervalued. Through the exploration of methods and themes, as well as a look at responses collected from modern designers, a reconstruction of historic developments will allow the discipline to untangle its complex past in order to set goals for the future.

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# CHAPTER 1

## INTRODUCTION

### OVERVIEW

For centuries, humans have been documenting their lives. The methods used to record information have taken many forms. With advancements in technology, humans have transitioned their methods for recording the information that chronicles their very existence. Society has welcomed the ability to shape knowledge beyond two-dimensional and into multi-dimensional representations, both physical and digital. Information, it seems, has become an entity that manifests its form to continuously adapt no matter the time or purpose.

Qualitative data, such as maps, revealed new lands while quantitative data, such as census recordings, revealed population and economic growth. Information's very existence relies on human input and the ability to reconcile it into formats for successful viewer consumption. In the present day, humans generate information at lightning-fast rates. The expectation is to have it at our fingertips to absorb and dispose of in a matter of seconds. In order to share information with efficiency, visual methods have been applied and are used to clarify the complexity that comes with data. While designers may feel that this information revolution is relatively new, the truth is, information designers from prior centuries tackled this issue with deep thought and care. Specific methods were created to enhance content and to present a felicitous visual display.

Despite Information Design's effectiveness for exhibiting content, a detailed record of the contributors and the applied methods for this field faded. A sizable absence of storytelling exists in today's world. Just now, are design researchers exploring the lineage of Information Design. Samples of historic works can be found peppered

throughout time, but documentation connecting the field from past to present is limited. Most of the historic documentation concentrates on a handful of European contributors. Additionally, designers tend to fixate on the same historic visualizations. With the resurgence of information design underway in the 21st century, it is necessary to unearth the missing pieces. Without a thorough understanding of its origins, designers are at a disadvantage in fully grasping the importance of Information Design and the ability to connect it to modern visualizations.

### STATEMENT OF PROBLEM

Information Design changed the way graphic designers visually communicated content, whether qualitative or quantitative. Its marginalized history limits its impact and hampers its effectiveness in the 21st century. By exploring the development of Information Design, when it was thriving from the 18th and 19th centuries, we can affirm the impact early practitioners had in the construction of this field. Additionally, we can explore their methods and reason(s) for developing visual systems, as they aim to transmit information effectively.

### JUSTIFICATION

Modern information designers have a fragmented record of their field's history due to limited sources, sparse details, skewed opinions, and inadequate education. By offering an overview of the 18th and 19<sup>th</sup> centuries, it is believed that content, which was deficient, will now reveal a more integrated representation of the field. Furthermore, those of us who currently teach or practice information design, whether we be novice or long-standing admirers, will have the opportunity to validate its presence and push to ensure its future.

This research aims to communicate details that unmask connections between contributors and visual themes that are omitted or scarcely addressed in current books — which tend to focus primarily on how methods are translated or applied digitally for today’s world. Furthermore, this research will bring lesser-known contributors to light rather than focus on a handful of “celebrity” (or well-known) designers from this time period. Modern designers will be introduced to early practitioners, their contributions, methods, and patterns that reveal how historic ties linger in today’s world. Specifically, forbearers will be shared to unveil associations between them and their works. In doing so, weakened connections will be enhanced and the conjecture found online can be curbed to separate opinions from facts. With the abundance of information design blogs and social media posts, it is not hard to find content that is incorrectly labeled or narratives that are clearly misinformed about the origins of the work presented. There is also an on-going disagreement about what constitutes information design which opens the door for arguments between factions and a shunning of visualizations that do not align with commentators’ views or opinions.

### LIMITATIONS

The focus of this research will remain in the 18th and 19th centuries, as this is when the field began to flourish. Any references to visualizations from periods before or after these dates may be mentioned to establish historic context, highlight growth, or address patterns/trends but will not be elaborately discussed beyond that purpose. Historic biographies will not be supplied for each contributor mentioned, as information may be difficult to find on the lesser-known individuals and that may create unwanted emphasis on those who are already established. The collected works will come from an assortment of fields/occupations and will focus on a variety of visualizations. Due to

limited funds and travel restrictions (tied to COVID-19), work from other countries will be minimal. It can take years to uncover new visualizations and, with a specified deadline for completing this written study, only the historic visualizations that were accessible at the time of this research will be discussed. For the purposes of this paper, two terms will be used to describe works and content produced by historic contributors. The term “visualization” will be interchangeable with similar words used to express the designed qualitative and/or quantitative examples. It is not meant to reference digital content, which is the modern application of the word. Additionally, the term “data” will be applied to describe the collected content or information found within qualitative and/or quantitative visualizations.

## CONCLUSION

By preparing a historic overview of information design, those in the academic and professional realms will be able to further their understanding of the field, challenge assumptions, overcome bias interpretations, and identify patterns that they may not have seen before. Additionally, this examination will strengthen the lineage of historic information design and solidify its purpose, all while demonstrating its importance in graphic design and its application throughout the world.

## CHAPTER 2

### LITERATURE REVIEW

#### INTRODUCTION

Information Design, also referred to as Information Graphics, is said to begin with the 17<sup>th</sup> century work of René Descartes. His development of the Cartesian coordinates is what allowed for the creation of the Cartesian grid. William Playfair, an 18<sup>th</sup> century polymath, is credited with using the Cartesian coordinates to convert data into graphic content (Meggs, 2016). Throughout the centuries, numerous contributors, both men and women, demonstrated how qualitative and quantitative information could be transformed into visualizations. Their designs were well-planned, meticulously produced visuals that told rich stories using simple shapes, colors, text, and layers of content (Meirelles, 2013). Despite knowing this about our information design predecessors, a spotty historic record of contributors has been perpetuated.

Authors who discuss the genesis of Information Design often assign credit to a handful of men and overlook contributors who predated, coexist, or follow said men. Additionally, the “origins” of Information Design vary greatly. The inception, for some, dates to ancient civilizations, not the 17<sup>th</sup> century, while others believe it's more of a modern construct. No matter where authors fall on this spectrum of creation, the resurgence of Information Design gained traction due to the works of modern practitioners, educators, and enthusiasts, such as Edward Tufte. A statistician and professor, Tufte is considered one of the reigning specialists responsible for its revival. Tufte relies on historical works, from the 16<sup>th</sup> and 17<sup>th</sup> centuries, to demonstrate his modern viewpoints for creating information design (Tufte, 1990).

Currently, the discipline is in a state of flux, as there is an abundance of designs being produced. However, there does not appear to be a solid understanding of what constitutes Information Design. Professionals, educators, and students, in some ways, appear to be left to their own devices as they aim to define the methods used for the works they produce. We have reached a pinnacle point in the field of Information Design. Driven by consumer demand, audiences expect information to be accessible, understandable, and readily available. Individuals are inundated with information (Coates and Ellison, 2014). Thanks to technology and the speed in which we demand access to data – not just on a local scale, but on a global scale – information consumption is on the rise and doesn't show signs of slowing. This may explain why Information Design is surging in usage and popularity; however, it raises questions regarding how equipped we are to manage and make sense of this "information overload" (Tominski, C., Aigner, W., Miksch, S., Schumann, H., 2017). Perhaps historic information design can teach designers how to harness data to develop clarity.

As Information Design increases in the 21st century, the field will require an in-depth review of its history in order to understand how the present was shaped by the past. As suggested by Jacobson (2000), "this may include the creation of a reliable lexicon and theory." Additionally, methods for analyzing Information Design are necessary to distinguish their purpose from one another (Dousay, 2012). We need to know how data was handled in the past to propel how we use it presently. Historic works "...can serve as fruitful sources of inspiration for visualization designers today" (Tominski, C., Aigner, W., Miksch, S., Schumann, H., 2017).

As conduits of information, modern designers should not be satisfied with the inadequate representation of the field's heritage. In order to comprehend its influence and ability to impact the way people decipher data, we need to acknowledge that the



discipline evolved over time — it is not a modern construct that developed a few decades ago. Understanding information design’s history means current and future designers will know why this field developed, who played a role in shaping the field, identify what methods were practiced, and how that impacts the future profession as well as academia.

### WHAT IS INFORMATION DESIGN?

Unlike other specialties in graphic design, Information Design has an additional challenge. Its origins were developed as a result of individuals, from varying backgrounds, contributing their discoveries to a collective field. Therefore, if one tries to provide the definition of Information Design, without a doubt, one will receive a variety of replies. This is demonstrated by Coates and Ellison (2014) who found that, “Many people define it differently. Some feel that it is simply the visualization of data; others see it as the communication of any message in any form.” As discovered by researcher Maria José Herrera, similarities in how information design is defined exist. Her research found patterns, or repetition of words, that allow for a general definition to be constructed. Based on her exploration, Herrera (2013), states “Information Design is the art of organizing, selecting, optimizing and transforming complex data into easier, useful, and effective information with the intention to satisfy user needs and objectives according to a context.” While this definition aims to encompass all forms found within the field, slight deviations may be present due to the specialties that correspond to the contributors. As more is revealed about the field’s past, the definition may shift to be more inclusive and to accurately represent all parties who developed this discipline.

## PURPOSE

Information design allowed creators to produce work that either complemented written works, to tell a larger story, or to break away from written form altogether. Visuals provided a new way to transmit or chronicle a narrative. According to Friendly (2006), many of the earliest visual works intertwine with various fields of study. He attributes this to the rise in innovations, statistical thinking, and advancement in the reproduction and recording of data.

### **The Power of Visualizations**

At a time when written words were still the primary method for sharing content, visualizations were introduced to expose people to the world at micro and macro levels. They would see visuals about the cities they lived in as well as data from places across the globe. It permitted expanding industries to move information and products quickly. Historic information design tapped into the “most universal characteristics of human activity” by using imagery to present ideas (Funkhouser, 1937). Documenting these developments required new methods to be applied. The progenitors of Information Design took it upon themselves to invent visual systems that broke away from traditional formats. In fact, most contributors were self-driven to conduct exploratory developments. Society was not necessarily seeking visualizations such as charts and diagrams. If anything, maps were the most accepted form of information design, followed by timelines. No matter, the forbearers persevered to change how people absorbed, understood, and interacted with information. They appreciated what others did not — the power of visualizations.

Our progenitors realized that information was consumed by the viewer’s eyes. Therefore, they devised systems for translating information visually. They were challenging the status quo by breaking away from tradition and disputing what their

peers considered to be appropriate practice. Their driving thought being that people would translate what they saw much faster if represented visually rather than requiring the viewer to read it — assuming the viewer was literate. Furthermore, by translating information into a visual format, it would be possible for people to see patterns, make comparisons, identify potential issues/outcomes faster than if they read the content. Davis (2017) found that there were two approaches to 18<sup>th</sup> century timelines. Creators would either provide viewers with visual elements that would explicitly inform them what to believe or they would apply visual elements in a way that would allow the viewer to discover the story. Davis (2017) also disclosed that historic contributors were convinced that information was more impactful if it was presented on a single display, as it would allow for a “single gaze” and the information would be collected with ease.

With the development of historic information design, contributors creatively visualized problems. This new approach allowed viewers the opportunity to decipher details otherwise lost in text or table formats. Visual narratives provided layers of content and allowed individuals from diverse backgrounds to engage with topics about the world they lived in.

### **In Their Own Words**

Historically, we know that numerous contributors documented their reasoning for developing visuals in lieu of relying exclusively on text to record information. Jacques Barbeau-Dubourg, according to Davis (2017), believed “events so strike the sense, organize themselves so effortlessly in the memory, and are imprinted there so strongly, that we learn almost automatically, hardly needing to think what we do.” This belief is proof that Barbeau-Dubourg recognized the power of visuals. Instead of relying on reading to retain content, he knew viewers could capture the visuals and store that information for future use.

Joseph Priestley shared a similar approach to that of Barbeau-Dubourg. Both men appreciated orderliness and methodical visual structures. Through the research of Davis (2017), we find that Priestley believes foremost that space is an element that carries as much meaning as the other visual and textual content on the page. Specifically, Priestley felt visualizations provided a sense of satisfaction to viewers. He believed audiences were given ample layers of context to evaluate and could internalize what they saw versus what they read in a book.

Despite having different approaches and methods for developing information design, Emma Willard also argued that visualizations attracted attention and allowed for improved retention of content. Davis (2017) uncovered a quote where she said, "...and when the eye is the medium, the picture will by frequent inspection, be formed within, and forever remain, wrought into the living texture of the mind."

Ian Spence and Howard Wainer (2017) found that William Playfair, who is credited with producing some of the most well-known visual methods, strongly believed that visuals delivered more details to viewers than content found in ledgers or other written forms. Playfair's discoveries allowed for the development of a "universal language". Spence and Wainer (2017) revealed, "Playfair believed that graphs would be a powerful aid to memory; intuitively, he appreciated that visual memory was more robust than memory for words or numbers."

Mirroring Playfair's thoughts was Florence Nightingale. According to Cotgreave (2016), she stated, "Diagrams are of great utility for illustrating certain quantities of vital statistics by conveying ideas on the subject through the eye, which cannot be so readily grasped when contained in the figures." Nightingale's ability to transform statistical data into user-friendly visuals caught the attention of the reigning monarch. A Royal Commission was established by Nightingale, with the help of Queen Victoria, to examine

the health of soldiers. Her visualizations, in collaboration with other contributors, allowed Nightingale and her team to identify preventable deaths and diseases (*Florence Nightingale, 2009*).

Alexander von Humboldt, whose work often depicted narratives related to nature, understood that visuals had the ability to convey a powerful story — as he would layer illustrations with text and charts. Wulf (2016) states, “One of Humboldt’s greatest achievements was to make science accessible and popular. He did so by using a simple and non-scientific language as well as through infographics. Everybody learned from him: farmers and craftsmen, schoolboys and teachers, artists and musicians, scientists and politicians.”

Understanding the purpose of historic information design, as explained by the progenitors, further exemplifies how visualizations are accessible, powerful, and universal. They allow viewers to use their innate skills to interpret and better understand the world they live in.

## PUBLICATIONS ABOUT HISTORIC INFORMATION DESIGN

Modern information designers wholeheartedly understand the power of visualizations — numerous books have been written about the subject. Yet, until recently, few books address historic information design. Many modern publications, when discussing the field’s history, tend to begin their stories in the 20<sup>th</sup> century despite evidence of works dating back to the 16<sup>th</sup> century. Those early visualizations are treated as one-offs or outliers in the overall creation of the field. Funkhouser (1937) found that “Writers, past and present, on graphic methods have interspersed their work with occasional historical notes,” but he laments that an exhaustive historiography highlighting the background and activities of the field is missing. In fact, examples of

visualizations that predate or follow well-known works are rarely addressed in modern textbooks. A handful of contemporary authors acknowledge this as a problem. Within recent years, new publications have emerged. Some focus on the field itself while others aim to bring attention to a specific timeframe or method. The problem that continues to remain is the lack of inclusivity. Works from lesser-known contributors are overlooked, women tend to be ignored, and countries outside Europe, specifically beyond the United Kingdom, do not receive as much, if any, recognition. Establishing a thorough and accurate representation of information design's history is what remains elusive.

Authors Edward Tufte, Sandra Rendgen, Michael Friendly, Paul Kahn, Isabel Meirelles, and Rune Pettersson, to name a few, have shared samples of historic information design in their writings. All refer to early European works; however, some more than others, address visualizations from other countries and early civilizations. Friendly (2006), acknowledges that disparities exist which have prevented a thorough historic resource from being developed. He states, "... practitioners in these fields today tend to be highly specialized, and unaware of related developments in areas outside their domain, much less their history." David Sless (1997) believes that Information Design has "gone through a series of transitions that have been marked by discontinuities, some of which have been quite radical." This implies that the incomplete documentation of the field's history is due to fragmentation in our chronology.

In addition to the aforementioned authors, an abundance of books exploring information design are presently published. Quite a few have been popularized by practitioners and enthusiasts. Many authors provide insight into the theory, approach, and application of information design. Each has a specialty that affords them the opportunity to expand on the topic, whether it be for print or digital mediums. Their books, like many others, tend to focus on present-day information design. The concern is

that most of these popularized texts do not address the historic contributions that led to their current applications. While a few may make mention of a contributor, it is either done so in passing or in such a concise manner that the opportunity to enlighten their readers about the centuries old method being implemented gets overlooked. Our progenitors, whose work is being modernized, deserve acknowledgment for their contributions.

Perhaps this is why we have struggled, in the present, to make connections to our past. It is because current authors are not shining a spotlight on our history to provide a direct link to the here and now. Frequently, published works focus on the “how to” of information design. Authors thoroughly explain how to create, implement, and improve visualizations. Designers and researchers are missing the opportunity to discuss who developed the method, what it was used for, why it was important and when it was invented. By failing to acknowledge our predecessors, information design continues to feel like a modern construct rather than a historic one with a rich, layered story.

#### REPETITION OF THE PAST

Content related to information design is readily accessible. Whether research is performed by reading books or through searches on the internet, there is an abundance of knowledge available to professionals, students, and enthusiasts. Yet, quite a few published works continue to recycle what is already known about historic information design. This repetitious pattern persists since most authors draw content from the same pool of resources. Instead of expanding the narrative, to address work from prior centuries or other geographic locations, authors revisit the same contributors time and again. Moreover, when historic content is included in written works, it is often treated as a highlight reel, where a summation of what little is known about the past is provided as

a short chapter or inserted as captions or footnotes. Some authors aim to provide more content about our field's past but fall short of developing an in-depth narrative. This occurs because they miss the opportunity to share the interconnectedness of people and methods that made the field inventive and unique. We are then left with a poor representation of the developments made by our predecessors.

Another factor that aids in a limited portrayal of information design's heritage is how authors define the word "past". Quite a few resources claim to provide a historic review of the field, but their account does not begin until the mid- to late 20<sup>th</sup> century. Babwahsingh (2012a) discusses the many challenges of information design and highlights "amnesia" as a problem the field suffers from. He states, "In the absence of an actual, formal history, relative newcomers tend to jump off from the most recent and most popularized figures like Richard Saul Wurman or even Ben Fry, while the forefathers and foremothers (Joseph Priestley, Florence Nightingale, and Herbert Bayer to name a few) end up marginalized or forgotten altogether."

Information design began with a cross-pollination of expertise and professions. Finding the right resources and piecing the various findings together could produce a historic thread that provides a more accurate depiction of the field rather than settling for the rehashed version we're all too familiar with.

## GEOGRAPHIC DEVELOPMENT OF THE FIELD

Numerous published texts identify Europe as the genesis of historic information design. Emphasis is given to countries such as England and France, as these are deemed the strongholds of information design. In actuality, we know information design exists in different parts of the world, but those locations receive less attention. To better understand why information design's growth appears to be centralized, it is important to



understand the limitations our progenitors encountered and compare that to what has been revealed presently about its global influence.

### **Limitations to the Geographic Spread of Information Design**

As we seek the worldwide impact of historic information design, it is important to identify limitations that could have played a role in its slow expansion — particularly since most published books insinuate that the origins rest primarily in Europe. It is documented that visualizations were created for several reasons. Most contributors initiated their work to solve problems. Some progenitors were inspired by discussions with their peers, while others produced visuals for educational forums or on behalf of governmental duties. However, most of these interactions occurred on a regional scale, making mass distribution highly improbable. Friendly (2006), found that “...due to the expense, most of these new graphic forms appeared in publications with limited circulation, unlikely to attract wide attention.” In addition to these findings, Davis (2017) revealed how challenging it was for forebearers to affordably produce their work using copperplates. While ideal for precise etching, there was a limit to the quantity and quality of prints produced by the copperplate. Additional costs were incurred if color was to be added by a professional. An example of this is shared by Spence and Wainer (2017), who reported that Playfair often had a direct hand in developing his work. “Playfair frequently engraved the lines himself – perhaps to save money – leaving the more delicate work of lettering and decoration to the printer; unfortunately, his engraving was often careless or inexpert.” Despite Playfair’s best efforts to circulate his work, Funkhouser (1937) revealed that Playfair was well received in Paris, but not in his own country — it wasn’t until 1879 when William Stanley Jevons, an English statistician, made mention of Playfair’s work to the London Statistical Society and challenged his colleagues to not overlook Playfair’s contributions. If Playfair encountered this much

resistance, one can only imagine the struggle lesser-known contributors were confronted with to create and share their work. They most likely lacked the resources to reach global audiences.

With sparse resources, whether due to lack of funds or not having a sponsor, and with limited prints, we can speculate that visualizations spread through Europe primarily due to proximity. Neighboring countries offered easy access and allowed for frequent visits; however, information design did not make a massive jump to other continents. Rather, if it made it to other parts of the world, it appears it was either because someone interacted (or encountered visualizations) by a contributor of the field or they were exploring visualizations on their own, without European influence. Another potential barrier, as outlined by Spence and Wainer (2017), was regarding the lack of acceptance for graphically translated information. They point out that during the 18<sup>th</sup> century, visual representations were questioned for their accuracy and overall trustworthiness. This mistrust would most likely present the challenge of having to constantly educate viewers and debate professionals about the validity of such works. Funkhouser (1937), when discussing economic and political statistics, explained that most practitioners were “violently opposed to the use of ‘table statistics’, they must have looked upon the graphic method as a more serious aberration.”

### **Historic Information Design Across Time and Continents**

While this research focuses on the 18<sup>th</sup> and 19<sup>th</sup> centuries, it is important to address the scope of information design since little has been reported beyond its European roots. A meticulous account of historic contributions, from a statistical lens, is provided by Funkhouser (1937) as he guides readers through time from ancient Egyptian surveyors to 19<sup>th</sup> century forebearers. His discussion of early visualizations, such as Descartes’ coordinates to early graphs, eventually give way to visualizations but each are

rooted in a statistical method. It is from Funkhouser's findings that the origins, while still strong in Europe, expand beyond the borders of England. He emphasizes the popularity and expansion of historic information design in France, particularly in the 19<sup>th</sup> century.

Friendly (2006), a professor known for his contributions regarding the history of information visualization, challenges the idea of historic information design emerging solely from European countries. Friendly states, "The idea of coordinates was used by ancient Egyptian surveyors in layout out towns, earthly and heavenly positions... at least by 200 BC." His example highlights how visual works from early civilizations are overlooked but could be the key to discovering the origins of our field. Much of the work he has identified, from the 10<sup>th</sup> to 17<sup>th</sup> centuries, reveal visuals that test theories, show scientific measurement, and rest heavily on navigation. Friendly particularly noted that investigations into 16<sup>th</sup> century works highlight narratives regarding time, space and distance, as well as social data. He believes these themes identify "matters related to wealth, population, agriculture land, taxes, and so forth...." It is this escalation in visual production that Friendly identifies as the shift that triggered the development of graphics when entering the 18<sup>th</sup> century.

Kahn (2019), a lecturer and design practitioner, is well-versed in the history of information design. His series of articles, regarding global information design, offer a framework to track its international development. He accomplishes this by connecting visualizations, whether by topic or location, that others fail to observe. Kahn also shares untraditional examples of information design, ones that some practitioners may argue do not fit the criteria based on their specialty or contributing field. The designs he has uncovered are quite impressive because they address artifacts often excluded from historic resources. Similar to Friendly, Kahn has argued that examples of historic works

can be traced back to ancient civilizations, such as the Mayan murals, but also from the 12<sup>th</sup> to 18<sup>th</sup> centuries. He spotlights the 12<sup>th</sup> century work of Muhammad al-Idrisi, where a world map is depicted with a southern, rather than northern, orientation. Another of al-Idrisi's 12<sup>th</sup> century maps shows a grid system being applied. Kahn provides additional innovative works from 14<sup>th</sup> century France and 15<sup>th</sup> century Korea. He also discusses the joint relationship between Jesuit Matteo Ricci and Chinese collaborators to produce a massive map in the early 17<sup>th</sup> century. According to Khan, "Printed copies of Ricci's map reached Korea and Japan within a few years of its publication, but the world view was not generally accepted." By actively seeking visualizations that predate the well-known European works, we see that information design is not tethered to one area in the world.

We do not often hear about works from European countries beyond the United Kingdom. Fortunately, educators and researchers, such as the following men, are sharing their discoveries to broaden the field's scope. Tufte (1990, 1997, 2001), who has authored books about information design, often highlights historic visualizations. While he includes work from the United Kingdom, he also shares visuals from Italy and Asia. Tufte uses examples from the 17<sup>th</sup> to 20<sup>th</sup> centuries to demonstrate the pros and cons associated with each application. He meticulously discusses the visualizations to provide lessons for present day designers. Bátorfy (2021), when researching meteorological charts, uncovered visualizations that were developed in Hungary in the mid-18<sup>th</sup> century. They show signs of potentially being inspired by works from a Dutch geographer and a Dutch scientist. This further confirms the belief that information design has widespread roots that have been ignored.

In the United States, from a statistical point of view, Funkhouser (1937) found very few graphical representations existing before 1850; "the popular works of Timothy Pitkin, Adam Seybert and others contain many tables but no graphs." However,

visualizations such as maps and charts were produced in the 18<sup>th</sup> century. This is proven by the works of Benjamin Franklin and Dr. Valentine Seaman. Nevertheless, Funkhouser (1937) acknowledges that by the early 20<sup>th</sup> century, Willard C. Brinton made a huge impact by stating he has, “...probably done more than any other person in the United States to improve the methods of graphic presentation and to make them a valuable feature in the control of business.” This quote refers to Brinton’s published books that demonstrated the use of graphs and graphic analysis.

In the 19<sup>th</sup> century, Harriet and Helena Scott of Australia made their mark as professional illustrators. According to the Australian Museum, “The Scott sisters were among the first to illustrate the life histories and immature stages of Australian moths and butterflies.” In addition to their scientific illustrations, Harriet produced work for the Railway Guide to New South Wales, which developed into three editions (The Scott Sisters, 2018). These scientific illustrations are another example of information design being produced throughout the world.

Information design has had a global presence for centuries. Visualizations have been documented in Australia, Canada, Egypt, Japan, Korea, and the United States, to name a few. We do ourselves a disservice to inaccurately portray Europe as the single point of origin. Revealing designs from countless countries will enhance our understanding of historic information design and allow us to rectify the discontinuity that plagues us today.

## CONTRIBUTORS

When reviewing historic content, visualizations are often limited to specific points in time. Early works, from the 16<sup>th</sup> and 17<sup>th</sup> centuries may be handpicked for discussion, but there is minimal documentation until we leap forward to the 18<sup>th</sup> and 19<sup>th</sup> centuries.

According to Friendly (2006), the “new graphic forms” (18<sup>th</sup> century) and “begin modern period” (19<sup>th</sup> century) were when the field underwent incredible growth, so it is no surprise that we focus on visualizations during this span of time. Friendly further states that it is during these centuries when Europe begins to reach its peak dominance in the field. North America then carries the field forward as a major contributor by the end of the 19<sup>th</sup> century and into the 20<sup>th</sup> century. It is the apex of historic information design creation when contributors were flooding the field with their methods for visually representing information, both quantitative and qualitative. Despite this fact, there is still much to learn about this time period.

When we delve into historic information design, we know there was not a particular method in place for creating visualizations. The originators of the field were experimenting with various methods to determine what was the best solution for the data they had. Some methods were implemented more than others — a decision based on the effectiveness of that method or the amount of data that was to be presented visually. Other methods evolved as designers pushed their own process or tackled methods created by another. Despite this bit of historic knowledge, there are still many unknowns. Visualizations are being uncovered by numerous researchers and enthusiasts — particularly when it comes to individuals who were often ignored, especially women.

Connections between methods and themes, as contributors' experiment with their visualizations, are rarely documented. This would enhance the historical record of our field, even if historic dates are not available. Documenting the work by our progenitors offers enthusiasts a chance to understand more than the technical application of works. Rather than produce another step-by-step book about information design, we should explore how numerous visualizations evolved before being considered the exemplar.

During the 18<sup>th</sup> and 19<sup>th</sup> centuries, contributors shared their works at various scales. Some of the largest works span the lengths of large walls, while other visuals were confined to smaller, portable formats. A few unexpected mediums have been revealed as well. This is interesting because it shows that designers were considering user interaction and user experience in their work. This pushes the field beyond the 2D displays we're used to seeing. No matter the medium, the 18th and 19th centuries allowed designers to explore several delivery options. They also learned the limitations of their work due to cost and replication issues.

Each visualization method that was tried and/or tested offered something different. Some were better suited for enormous amounts of qualitative and/or quantitative data, while others required a limited amount of information to not produce visual noise and confusion. Despite the pros and cons of each method, they share a commonality — all methods provide layers of data in a way that allows viewers to distinguish one visual element from another. Some layers provide a narrative to support the visual, while others rely on visual hierarchy of non-textual elements to provide depth. A quick glance at the collected works reveals that it's not the number of layers that determine the success of a piece. Instead, it's how those layers can be interpreted by the viewer to reach a deeper understanding or to clarify what is being displayed. Additionally, layers of information, at times, require sub-layers. Our predecessors were challenged to find a balance. Some individuals succeeded at maintaining visual stability, while others struggled to reveal the purpose or importance of their work. Either way, contributors learned from their mistakes to ensure that the content ultimately served a purpose in the delivery of the visualization.

The 18<sup>th</sup> and 19<sup>th</sup> centuries are full of untold stories. Learning more about the contributors, whether it be through their methods or connections, will present us with a

clear understanding of their accomplishments, rationale, failures, and evolutions. While this research does not provide a full collection of historic information design visualizations, it is intended to present works that display the growth and interconnectedness of the field.

## 18<sup>th</sup> CENTURY INFORMATION DESIGN

### **1700–1724**

At the start of the century, visualizations were primarily cartographies or chronological works. They were heavily qualitative and incorporated quite a bit of text to accompany the visual elements. With robust layers of content woven into their designs, these works began to test the limits of visual storytelling.

#### ***Early Maps and Timelines***

Edmond Halley, in 1701, “was the first to map the invisible,” according to Michael Friendly (Rendgen, 2019). His world map incorporated what is reported to be the first use of isolines (Meirelles, 2013; Halley, 1701). Halley attempted to visually represent magnetic movements in the Atlantic Ocean by applying the lines between the land masses (Contour line, 2021). The continents are labeled, with each city denoted, along with text to signify the oceans (Figure 1). Color has been added to bring prominence to the continents and provide emphasis to the various lines that curve throughout. This map not only provides geographic data, but it should be seen as a historical reference because it will influence future contributors. According to Meirelles (2013), Halley’s map directly inspired visualizations and the development of new methods in the 19th century. Fourteen years after his isoline map, Meirelles (2013) found that Halley created another visualization that relied on geographic and scientific data to predict the path of an eclipse. His visualization demonstrated how multitone, valued trajectories can overlay



land masses to potentially pinpoint where a total eclipse will occur. Halley's desire to explore predictive theories using visual cues tests the effectiveness of qualitative designs.

As popular as maps were in the early 18<sup>th</sup> century, we also see chronological charts being tested by various contributors. These charts took different forms and applied varying levels of interaction from the user/reader. Rosenberg and Grafton (2010) researched numerous timelines throughout various centuries. One of the earlier works they explored was by Johann Georg Hagelgans in 1718. They found that he created a world history, but in it, he incorporated geographic content, images, text, and dates. The layering of this content provided a micro and macro view of each time period he addressed. This engraved timeline predates the work of Joseph Priestley, acknowledged as the person who created the first timeline. Granted, the work of Hagelgans is vastly different from what Priestley designed. Some may argue that Priestley is celebrated because his timeline was superior and more effective than this version. The key here isn't to argue over who did it best. Instead, a flag of concern, for anyone studying historic information design, should be raised when there is proof that timelines predate the person who is given credit for developing them. Since textbooks often repeat Priestley's name and visualizations, it implies that no work of significance came before his. The truth is that many contributors predate Priestley. Hagelgans' timeline may not mimic the method used by Priestley, but it can be seen as one of the earliest attempts to organize data into a time-focused display. It is because of work like Hagelgans' that we can appreciate the evolution of the timeline, including Priestley's method 40 years later.

### ***Chronological Circles***

By the early 1720s, chronological wheels were being developed. Circular designs often mimic the passing of time, as they are generally read in a clockwise manner. Rosenberg and Grafton (2010) shared Christoph Weigel's visualization that

communicated kingdoms through time. This text-heavy wheel incorporates light hues to differentiate groupings. This design also has a pivoting arm that swivels around to assist with examining the content. While the text is condensed and challenging to read, this visualization encourages user interaction and provides a user experience. It can be argued that these initial experimentations are, perhaps, the humble beginnings for the presently popular field of UX/UI design — a field that also claims ties to historic information design.

In 1721, a year after Weigel introduced his chronological wheel, Rosenberg and Grafton (2010) came upon Girolamo Andrea Martignoni's design (Figure 2). Unlike Weigel's text-heavy design, the authors found that this wheel was meant to suppress text and "draw the reader into the visual experience of information." This is accomplished by highlighting the Roman Empire, and its territories, using metaphorical branches and icons. This design is qualitative with its content radiating from a central map. It aims to balance geographic content with the passing of time.

### ***The First 24 Years***

These early works, developed by men from England, Germany, and Italy, illustrate the possibilities of layering data with imagery. However, they also call attention to the shortcomings of the methods applied. The amount of space available on the page dictates how much data can be incorporated into the design. The legibility of the type and iconography determine what a viewer can and can't decipher. Explorations of color aid in organizing the data and/or allow features to be emphasized due to their hue and contrast. No matter the method, each was tested for a variety of topics and the outcome determined how well the design complemented the desired narrative. The numerous experimentations provided contributors with a much-needed baseline as visualizations progressed into the future.

## 1725–1749

While maps and timelines remain dominant, we're introduced to a few more methods during this period. Some are simple visualizations that were derived from the table formats found in ledgers while other works, such as diagrams, began to test their limits for conveying information.

### ***Charts and Diagrams***

Benjamin Franklin, an American polymath, designed a visual matrix in 1726 where he implemented equally spaced columns and rows with abbreviated words (Figure 3). According to his autobiography (Franklin, 1896), he created the Thirteen Virtues to develop his character and document his lifestyle progress. At 20 years of age, he began the process of identifying when he met one or more virtues by denoting it with a mark (Benjamin Franklin, 2021). His approach is binary and, when one reviews the weekly total, it is possible to see which days Franklin was successful or unsuccessful and which virtues he achieved or neglected. This visual method is quite simple and continues to be applied in the present day.

In 1727, a year after Franklin's visualization, a diagram by Jacob Leupold was illustrated (Figure 4). This visualization shows the sequential order of hand and finger gestures used to represent currency (Tufte, 1990; Leupold, 1727). Aligned in a grid format, the illustrations display varying amounts. According to Christie's (2005), the auction house that sold a first edition of Leupold's *Theatrum Arithmetico Geometricum*, which was one book from his nine-volume series known as *Theatrum Machinarum*, Leupold's illustrations demonstrate how fingers were used to display arithmetic shortcuts. The diagrams display how people can calculate without relying on written translations or other devices. The visual approach was ideal as "finger systems were always portable, reliable, and free." In the remaining volumes, Leupold produced

detailed illustrations of machinery and technology. Interestingly, his work was not developed for mathematicians or those educated in mechanics, as those individuals would already be familiar with his topics. Instead, the diagrams and illustrations were meant to educate "...the mechanic, handicraftsman, and the like, who, without education or knowledge of foreign languages have no access to many sources of information..." (Jacob Leupold, n.d.).

Nicolas Lenglet du Fresnoy, a French historian, produced a variety of visual works. Rosenberg and Grafton (2010) identified him as "among the greatest 18<sup>th</sup> century promoters of the study of chronology." His works from 1729 to 1733 are quite similar in structure (Figure 5). Lenglet du Fresnoy's visualizations are tables categorized by countries, and they emphasize the locations that possess lengthy histories (Lenglet du Fresnoy, 1733). While it is text-heavy and not necessarily a strong example of a visualization, it does show a clustering and attempt to create order. Furthermore, Rosenberg and Grafton (2010) discovered that Nicolas Lenglet du Fresnoy produced a booklet format of his 1729 table. This allowed his work to be folded and transported. Despite his contributions, he is documented as having been disappointed by the lack of value for timelines, since most practitioners of his time preferred to celebrate "the prestigious field of history".

Diagrams are highly qualitative and attempt to provide a multilayered account, with little to no text included. As we saw with Leupold's visualization, positioning of the hand and body aided in conveying appropriate figures. A diagram that pushed this method was illustrated by Kellom Tomlinson. According to Tufte (1990), Tomlinson's 1735 visualization aims to teach viewers a choreographed dance. To achieve this, Tomlinson adds motion to his work by incorporating depth and timing, along with positioning. Musical notations are made at the top of the page and underfoot of the

illustrated men. Based on their stance, the men's arms and legs are placed to mirror one another. The music notes on the floor cross paths and indicate timing, which allows viewers to identify turns and see the positions of each participant. During this time, diagrams are evolving and becoming more elaborate as the content becomes multifaceted.

### ***The Expansion of Maps***

Cartography continued to grow by displaying regional and global areas. The experimentation in detail, content, and scale are what allowed for a variety of maps to be produced by our progenitors. Henry Popple, an English cartographer, developed *A Map of the British Empire in America with the French and Spanish Settlements adjacent thereto* (Figure 6). The map was considered "the first large scale map of North America and the most accurate at the time" (Composite: British Empire in America, n.d.; Popple 1733). Interestingly, Popple connected with another practitioner, Edmond Halley, to have him authenticate his work. Halley complimented Popple on his accuracy and his comments are included on the map (Popple – 1733, 2007). Unlike maps from prior years, this one relies on fine lines to highlight every detail of the land. Micro data, such as illustrated scenes from various cities and/or landmarks, are also included and use a numeric system to identify each location. The entire map sits on a grid which adds structure to the elements and aids in accessing its overwhelming content.

By 1741, Gottfried Hensel produced a density map (Figure 7). Breaking away from the structured style of Popple, this map appears more organic due to the intermixing of content. Meirelles (2013) explains that the intention is to display language as it is used around the world by specific descendants. Colored continents and written examples, which include the first words of the Lord's Prayer in that area's language, are presented as additional layers on the world map. In terms of visual elements, this map aligns with

the style produced by Halley in 1715. The content is dense and layered, which makes it challenging to access, but from methods like this one, viewers are shown a representation of diversity.

As cities grew, there was a need to document new buildings, streets, and town plans. William Price produced a map to demonstrate the growth of Boston, Massachusetts in 1743 (Figure 8). This visualization, with its street level representation, incorporates iconography to identify points of interest. Additionally, it indicated where fires and smallpox spread to inform future inhabitants of the locations (*A New Plan*, n.d.; Price, 1743). While the illustrations may not be accurate, as they are not in perspective nor to scale, they aid in the storytelling of Boston's development.

Giovanni Battista Nolli (Nolli and Pozzi, 1748), an Italian architect and surveyor, was commissioned by Pope Benedict XIV to create a map of Rome (Figure 9). He examined the area in 1736 and it was engraved by 1748. It was considered the most precise representation of Rome and continued to be a reference for decades. Twelve sheets had to be assembled to display the city in its entirety, as it was produced as a wall map. The details are so fine that it is possible to identify waterways and gardens. This aligns with what we saw from fellow progenitors, such as Price, in 1743, but the visual style is more aligned with Popple's 1733 visualization.

## **1750–1774**

### ***Entering Mid-century***

Up to this point, various progenitors have explored topics with geographic, scientific, historic, and/or social themes. The visualizations tend to be text-heavy, qualitative more than quantitative, and appear to use methods that incorporate visual cues such as grids, icons, and legends, to name a few. As visualizations are applied for different purposes, more iterations come forth to enhance their value and, hopefully,

increase acceptance of them. The concepts visualized may not be original nor in demand, but each offers something new — whether that be additions to an established method or unexpected collaborators.

### ***The Overlooked Contributors***

History shows us that women were often at a disadvantage and rarely given the opportunity to have careers outside the home. The status of women in the 1700s was limited which meant little exposure to skill sets that were reserved for men. However, while they may not have been at the forefront, they made their contributions behind the scenes. Alice Hudson, a present-day map librarian, has compiled an impressive collection of works by female mapmakers. She has identified thousands of women who were engravers, printers, publishers, and sellers. Her findings have unlocked the mystery behind women's contributions. She has shared her work via interviews and collections with various libraries (Bliss 2016). Hudson's discoveries demonstrate that women had an active role in developing visualizations, specifically associated with maps. Their highly detailed work was primarily qualitative and often aided in enhancing the narrative of the map being made. It is thanks to Hudson's decades of work that women are no longer forgotten.

### ***Maps in Collaboration with Women***

French cartographer Gilles Robert de Vaugondy published *The Atlas Universel* in 1757. This 18<sup>th</sup> century collection of maps was highly regarded because it rectified many inconsistencies that existed in older regional maps (Robert de Vaugondy, n.d.). Vaugondy hired female engravers to aid him in producing his work and often had them developing cartouches for his maps. A cartouche can be found framing content about the map, such as the title and scale content. It is believed that cartouches were first applied to Italian maps, sometime during the 16<sup>th</sup> century, and continued to be used for 150

years. They are noted for “...their diversity, symbolism, social commentary, and artistic beauty. Many of the cartouches appear to have iconographic meanings that may be lost on us today.” (Cartouches, 2010). Elizabeth Haussard, a French engraver, produced work for the Robert de Vaugondys, but was not the sole female that Gilles and his son, Didier Robert de Vaugondy, hired. Her sister, Marie Catherine Haussard, was also an engraver. Circa 1755, Marie Catherine Haussard oversaw adding a cartouche to Robert de Vaugondy’s map of the Canadian Maritimes (Figure 10). This map has additional meaning as it draws attention to the indigenous villages in Canada and acts as “an invaluable visual and historic record of tribal locations that would soon disappear from maps of the region” (*Women in Cartography*, n.d.; Robert de Vaugondy, 1755). The work produced by the Haussard sisters highlights their attention to detail and their ability to add qualitative visual clues to enhance the narrative of the visualization. Based on the number of maps produced, it appears the Haussard sisters collaborated with the Robert de Vaugondys’ for several years. They used their initials in lieu of their full name. This was implemented to disguise their gender, which perpetuated their being unknown and unrecognized by history (Bliss, 2016a).

Alice Hudson’s research also revealed the works of Mary Biddle, a cartographer who jointly edited the 1762 *Scull and Heap Map of Philadelphia* with Matthew Clarkson (Figure 11). It is said that Biddle learned her skills from family members. While the map has been published several times, only one edition includes her name. Biddle used her skills to provide financial assistance to her family, especially when she and her husband ran into monetary issues. The map is now part of the United States Library of Congress’ American Women: Resources from the Geography and Map Collections. The edited map depicts a plan of the improved part of Philadelphia. Its layout uses a grid system



accompanied by an alpha system to identify the various streets, buildings, and docks (*Women as Mapmakers*, n.d.; Scull, N., Clarkson, M. & Biddle, M.,1762).

### ***Developing Timelines***

Chronology evolved quite a bit during the mid-1700s. Rosenberg and Grafton (2010), share the work of Thomas Jefferys, a “prolific cartographer-engraver” who developed visualizations until his death in 1771. He worked for King George III and, in 1753, produced *A Chart of Universal History*. His goal was to integrate details regarding countries and empires that reigned over those areas. While columns are present, they vary in width to depict the conquered lands and losses to the new rule. Color is included to provide visual connection between empires, since they are segmented based on the order of countries. This visualization includes elements that loosely connect it to what forebearers Hagelgans in 1718 and Lenglet du Fresnoy in 1729, were trying to achieve; however, their visual approaches differ greatly. Unlike Hagelgans, Jefferys does not include illustrations; instead, the connection between content dictates the appearance. Whereas, like Lenglet du Fresnoy, Jefferys incorporates a great deal of textual content.

Concurrent to the visualizations being produced by Jefferys, Jacques Barbeau-Dubourg developed his interpretation of a timeline. According to Meirelles (2013), Barbeau-Dubourg produced a universal timeline with dates, events, and countries all in text form, and no illustrations, apart from a crown icon. However, his work, unlike Jefferys, was developed to include a “uniform timescale to represent historical events with each year represented by 0.1 inch.” While Jefferys’ work was visually chaotic, Barbeau-Dubourg provided ample space allowing the data to be accessed with ease. His timeline was produced in a paper roll format, and it measured 54 feet.

Not long after Barbeau-Dubourg, comes the work of Joseph Priestley. The two men had similar approaches to their visualizations, as they both created content that was

organized and structured into precise timescales. According to Rosenberg and Grafton (2010), Priestley was influenced by Jefferys, but he “objected to elements, including the lack of uniform scale.” Priestley’s 1765 *A Chart of Biography* allowed a comparison to be made between people based on their lifespans (Figure 12). Cotgreave (2016) believes Priestley’s timeline is effective due to his ingenuity and incorporation of an x-axis, while Marshall (2016) attributes its effectiveness to his ability to demonstrate progress and develop an intricate visual narrative between the 2,000 people presented in his timeline. Looking to develop his method and, potentially to prove its dominance, Priestley created *A New Chart of History* in 1769, where he attempts to right the wrongs that he found with Jefferys’ design (Figure 13). As Marshall (2016) explains, Priestley reproduced the size and scale used for *A Chart of Biography* and applied it to his new visual. In doing so, he displays time as a continuous flow and accents its seamlessness with color, so each empire or significant event is easily identified and uninterrupted. Priestley was clearly influenced by other forebearers, but he took time to perfect his method while improving upon theirs. It is for this reason that Priestley continues to be celebrated for his work at present.

Around the time of Priestley’s contributions, Laurence Sterne, a novelist, wrote *The Life and Opinions of Tristram Shandy*. It was published from 1759–1767 in nine volumes. Sterne took liberties with his novel by using numerous printing techniques, deemed innovative and groundbreaking, to convey the passing of time as well as to highlight important events. When sifting through its pages, the book reveals unique elements, such as when a character dies, it’s represented with a black page. Typographic symbols are incorporated to indicate suggestive ideas or to cause an interruption (*First Edition*, n.d.). However, it is Sterne’s use of lines that are most interesting, as he applies them to depict time. The lines rise, fall, and curve, demonstrating harsh and fluid

moments in the character's life. They are a qualitative representation and despite their lack of content, they are quite expressive. In some ways, they are evocative of Tomlinson's 1735 visualization, where we were shown how dancers move to music. While Sterne's work may be unconventional and not intended to align with the field of Information Design, his experimentation with visuals has found its way into our historic lineage.

### **1775–1799**

As visualizations continue to develop, progenitors pursue new methods — particularly ones that are more quantitative in nature. Some themes remain constant, such as those with ties to history, but other topics such as the economy and statistics take center stage as we approach the end of the 18<sup>th</sup> century.

### ***Chronological Formats***

We've already been introduced to chronological visualizations, many of which take the form of a timeline. Early works, such as the ones from Hagelgans in 1718, Lenglet du Fresnoy in 1729, Jeffreys and Barbeau-Dubourg in 1753, and Priestley in 1765, provide lessons as to what was effective or ineffective in translating information visually. Meirelles (2013) found that Adam Ferguson produced a visualization displaying historic events over time. Like his predecessors, he created a structured system and layered text into colored sections to represent the start and end of civilizations or rulers. The one difference between his visualization and the others is that Ferguson presented his work in a vertical format, in contrast to the landscape format presented by his contemporaries. Ferguson's exploration may be a minor one, but it went on to be published in the 2<sup>nd</sup> edition of the *Britannica Encyclopedia*.

In addition to Ferguson's change in format, Rosenberg and Grafton (2010) discovered a timeline displaying the history of France's rulers in 1792. Interestingly, this

is designed as a puzzle and was created to support *The History of France* by Reverend Cooper. Each puzzle piece is adorned with an illustration of a ruler at the top and, just below, are details regarding that ruler's reign. It is unknown who produced this piece, but it is another example of data being interactive and engaging.

### ***Inventive Visualizations***

American information designers are, at times, minimized until the 20<sup>th</sup> century, which is when they became dominant developers (Friendly, 2006). Interestingly, some of their methods are the earliest versions of works despite, in some cases, Europeans receiving credit for the creation and implementation of the method.

Benjamin Franklin, whose chart in 1726 was an early attempt at visualizing a process, once again turned to imagery to convey his ideas. This time, he illustrated his invention of bifocal glasses (Figure 14). Diagramed within a letter to his friend, George Whatley, an English merchant and pamphleteer out of London, Franklin shared how glass was cut and combined to improve his vision for seeing both near and far. This diagram from 1785 highlights Franklin's continued use of visualizations to assist in expressing his discoveries (Franklin, 1785).

In addition to Franklin, another American, Dr. Valentine Seaman, was trying to uncover the spread of yellow fever in New York. Published sometime between 1795–1798, Dr. Seaman produced a map documenting his findings (Figure 15). He identified both individual and cluster cases of yellow fever as well as fatalities. Along the ports of lower Manhattan Island, Dr. Seaman noted seeing mosquitos, the true culprits behind the spread, but he inaccurately identified the environment at the harbors as the cause. He believed it was the “filth”, which consisted of human and animal waste, byproducts from local manufacturers, chemicals, and contaminants from ships that arrived from locations around the world (Altonen, n.d.; Seaman, 1795). Despite his incorrect

conclusion, Dr. Seaman's visual approach meant that theories could be visualized and patterns could be detected. Educating peers, the public, and international audiences about diseases was also possible. Sadly, Dr. Seaman's work is often overlooked in the field of information design. Another doctor, in London, whose work is reminiscent of Dr. Seaman's research, is recognized for his mapped method 59 years after Seaman's work.

### ***The Lady's Comet***

In previous years, women were largely making contributions in cartography; however, another woman used diagramming to document what she saw in the sky. Popova (2017) provides details regarding the life of Caroline Herschel, who was deemed the first professional female astronomer. Herschel grew up in Germany and developed an interest in astronomy from her brother William, who recruited her to assist him with his research. It is from her time with William that she learned how to use instruments and document her findings. By 1782, Herschel decided to produce a catalog to share her discoveries. Her observations contained diagrams of the stars; specifically, she was accredited with documenting a missing nebula from a published work known as the Messier catalog. Winterburn (2015) discusses Herschel's 1787 paper, submitted to the Royal Society, as carefully balancing her discoveries with the social rules women were expected to adhere to, not only with how they behaved but with the work they conducted. Winterburn states that Herschel's paper included sketches, descriptions, and incorporated geometry to demonstrate the relationships she observed. Even though she provided a well-documented paper, it seems she was often compared to her brother, who discovered the planet Uranus. Therefore, Herschel made it a point to state that her brother was out of town (or country) whenever she provided her discoveries. Herschel was clearly engaging in a male dominated field, but that didn't stop her. Prior to her work, we know Edmond Halley, an early contributor, was credited for his comet in 1705.

Herschel's comet was deemed the "lady's comet" according to Winterburn. However, what really cemented her contribution, according to the author, was that her 1787 paper was "...the first paper by a woman to be read to the Royal Society. It was one of the first papers by a female author to appear in any scientific journal throughout the world."

### ***The Rise of Playfair***

Up to this point, most visualizations have taken the form of maps, timelines, and diagrams. William Playfair changed all of that with his groundbreaking statistical visualizations. When investigating his life's achievements, Spence and Wainer (1997) identify Playfair as a polymath. It appears his numerous occupations as an economist, draftsman, journalist, statistician, and accountant, to name a few, aided his ambitions by allowing him to fearlessly breakaway from traditional practice or thought. In 1786, Playfair created statistical visuals, 44 graphs without maps, and published them in his *Commercial and Political Atlas*. The visualizations often had structured layouts, as Playfair was directly influenced by Priestley's work from 20 years earlier, and they contained layers of content to display the results. Color was frequently incorporated to accent or organize details within the visual displays. The designs were simple, yet informative. Playfair determined "...that making sense of empirical information was aided enormously by the use of statistical graphics" (Spence and Wainer, 1997). From Playfair, during this time span, we gain line graphs and bar charts (Figure 16). These are visualizations we take for granted in the present-day, but they are the seeds of creativity that aided in the development of our field and encouraged the visual boom into the next century.

## 19<sup>TH</sup> CENTURY INFORMATION DESIGN

### 1800–1824

The previous century introduced us to novice visualizations. As the new century begins, a few familiar methods and themes carry over, but the amount of work being produced increases unlike before. We are transported into new territory as experimentation increases and layering of data grows. Additionally, we see the return of women as they develop their skills and challenge the status quo.

#### ***Playfair's Progress***

Playfair continued to be a notable figure as he introduced advanced methods of visualizations via his 3<sup>rd</sup> edition of *Commercial and Political Atlas* as well as his publication *Statistical Breviary* (Spence, 2006). Quite a few visuals focus on the economy, but we see references to topics such as history, politics, geography, and social standing. From 1801 to 1823, Playfair developed his methods and added subtle revisions to improve their visual capabilities (Figures 17 and 18). We're introduced to the pie chart in *Statistical Breviary*, where he compares countries, populations, and revenues. In it, Playfair states, "The advantages proposed by this mode of representation, are to facilitate the attainment of information, and aid the memory in retaining it...." He suggests,

Of all the sense, the eye gives the liveliest and most accurate idea of whatever is susceptible of being represented to it; and when proportion between different quantities is the object, then the eye has an incalculable superiority; as from the constant, and even involuntary habit of comparing the sizes of objects it has acquired the capacity of doing so, with an accuracy that is almost unequalled.

(Playfair, 1801).

Playfair furthered his visualizations to handle more content and layers between 1786 and 1821. In the early 19<sup>th</sup> century, Playfair (1821) focused on displaying agricultural

distresses. He presented his work as a letter, addressing his readers as “My Lords and Gentlemen”. Playfair sought to outline the prices of wheat, bread, and labor to depict the issues the country was facing. He states his intention, “The difficulty under which this country labours at this time are many and great, as you, my Lords and Gentlemen, must know and feel; but I am persuaded that the distresses of the agriculturists are the main cause of all, and therefore it is of the highest importance to find out the chief and primary cause of their difficulties.” As he visualizes his findings, bar charts now include color, with some shown as solid and others gradated, along with overlapping methods, in this case, a line chart superimposed onto the bars. Additionally, in the future, his line chart, by 1823, becomes more dynamic with an abundance of overlapping data, colors, and content. We also see that he begins experimenting with different line patterns for improved identification and comparison. His affinity for creating compelling visualizations, combined with storytelling and purpose, appears to be the secret to his longevity.

### ***Visualizing Constellations***

The former century introduced us to chronological wheels, where work was displayed in a circular format. In 1801, Johann Elert Bode published *Uranographia*, a visual depiction of constellations shown in a round format, to mimic the shape of the globe (Figure 19). In it, he provided “...a collection of 20 star maps accompanied by a catalog of 17,240 stars and nebulae” (*Britannica*, T. Editors of Encyclopedia, 2021a). Unlike similar studies of constellations, his design displayed stars that were visible without the help of a telescope (Bode, 1801). Bode illustrates the stars and overlays colorful symbols (or icons) that relate to the shape and name of the constellation. While his work is visually noisy, its qualitative details attract viewers thanks to its bold imagery and encourages them to decipher its layers of content.



## ***Evolving Mapping Methods***

Whether exploring continents or cities, maps are often displayed from a bird's-eye view. Wulf (2016) researched Alexander von Humboldt and found his work challenged traditional approaches. In 1807, he created *Naturgemälde*, his depiction of Chimborazo, a volcano in Ecuador. Implementing visual depictions of the environment based on his observations, he documented the plant life and added a cross-section view to identify the numerous species found at each elevation. His graphic was captured on a 3' x 2' display. Miller (2019) credits Humboldt with finding the “interconnectedness of climate, geography, nature, and human societies” with his visualizations. It is this balance that allows for relationships between displayed elements to be revealed and shared in a way that his peers have not done before. However, Humboldt didn't come to this realization regarding the power of visuals on his own. According to Wulf (2016), he was inspired by Playfair's charts, specifically his *Chart of the National Debt of England*. Humboldt incorporated the techniques from Playfair's visuals and repurposed them for his work. Schulten (2013) states "...he invoked maps and graphic visualizations not only to illustrate his ideas about spatial distribution, but to formulate them. In other words, his visualizations techniques both expressed and advanced his ideas." Humboldt evolved what it meant to map a location and its landscape. He empowered his contemporaries to use visuals and demonstrated the amount of detail that could be transmitted, understood, and retained by viewers.

As geographic content continued to be a popular subject, progenitors attempted to find a middle ground — where maps and data would work simultaneously to share a broad story. In 1811, David Ramsay created a visualization that combined a map with bars and a timeline (Rosenberg and Grafton, 2010). Like Humboldt before him, Ramsay borrowed methods we previously saw from Priestley and Playfair, but he clearly arranges

each method into its own area on the page. His integration of the visuals allows relationships to reveal themselves. In fact, Rosenberg and Grafton (2010) state this is “...one of the first charts to explicitly combine the logic of Priestley’s historical and biographical charts into a single work.”

Ten years after Alexander von Humboldt’s initial experiments with mapping occurred, he returned to present a visual that denoted temperatures, latitude, and longitude points along with locations (Meirelles, 2013). According to Wulf (2016), his visualization was produced to accompany an essay regarding climate. Humboldt was aware that meteorological data was presented in formats that were anything but user-friendly. Boundless tables and lists containing geographic and climate conditions were available for consumption but did not allow users to see relationships or compare the recorded information. To overcome this hurdle, Humboldt invented an isotherm map and deemed it “comparative climatology” — presenting a new way for people to understand and see climate related issues. His creation was a bit abstract, but his method should seem familiar. While his creation of isotherms was new, it is akin to the isolines produced by Halley in 1701.

### ***Students Educated in Cartography***

Many female European students were taught geography by copying existing maps to better acquaint themselves with the world. Their instructors, who were often women, aided them in advancing their design, artistic, and geographic skills. In the United States, schools reflected what European students were exposed to and students began to learn subjects beyond domestic skills. Bliss (2016a) highlights one artifact, an embroidered silk globe, from Pennsylvania’s Westtown School. The globes, as uncovered through Hudson’s research, were used to teach not just geography, but also astronomy and needlework. Details, such as latitude and longitude, along with labeling the

continents, were added with basic stitch work. Eventually the practice of producing these artifacts ended as paper and pencils became readily accessible as well as affordable during the mid-19<sup>th</sup> century.

Mary Hall in 1814 and Emily Hill in 1820 were students in the United States learning about geography. To practice their newly acquired skills, they, like many others at the time, recreated existing maps. Hall produced a map that illustrated the northeastern portion of the United States (Figure 20). The work is quite neat and detailed despite being produced by hand. In Hill's case, she produced a copy of Abraham Bradley's "A Map of the United States of America" (Figure 21). Whether she drew this independently or with her teacher's assistance remains unknown, but it is questioned due to the size of the map. The entire piece is 100 cm by 114 cm and required six sheets of paper to be linked together in order to show the work in its entirety (*Women in Cartography*, n.d.; Hall, Mary, 1814; Hill, 1820). Once again, this demonstrates women's ability to provide layered information in a visual format. While still a novice, Hill's work reveals the incorporation of geographic landmarks, labeled content, colored borders, and what appears to be a hand painted cartouche. Students, such as these women, are documented well into the latter part of the century. Louisa Pinchon was a student in Normandy, France. She developed her work following the same method 60 years after these two students. Several of Pinchon's maps are still available for viewing today (APSU GIS Center, 2021).

### ***The Fluctuation of Timeline Designs***

Time is frequently used in conjunction with other themes, such as with historic accounts. Rosenberg and Grafton (2010) introduce us to a few works from 1807 through 1809 that demonstrate forebearers experimenting with visual timelines, yet their work reflects what was seen in the prior century. It appears these individuals are still

determining which method(s) are ideal for conveying the passing of time. C. V. Lavoisne created a genealogical, historical, and chronological visual that shows a network of lines used to display the relationships between the ruling families of Italy. This is an unorthodox visual in that it emphasizes order through genealogy more so than chronologically. According to the authors, Lavoisne's work was influenced by a French aristocrat. Interestingly, the layout is reminiscent of site maps, a method used to plan the design for present-day websites and apps. Rosenberg and Grafton (2010) also presented the work of Stephen and Daniel Dod, who reverted to 18<sup>th</sup> century methods rather than evolve the method into the 19<sup>th</sup> century. Their organic, tree-like visual, that "grows" from the base upward, inserted names throughout the "branches" to reveal connections. As we've observed from prior contributors, the creators attempted to represent empires and relationships using thickness and movement. Lastly, Rosenberg and Grafton (2010), share a timeline by an unknown creator circa 1809. It documents what produce was available at a vegetable market. The visual reflects the structure shown in Barbeu-Dubourg's 1753 work and proves that the method from the 18<sup>th</sup> century can be adapted for application to other topics. The authors mention that while the creator of this work is unknown, it was found preserved in papers belonging to Thomas Jefferson. These visualizations did not veer far from the works we previously encountered; however, they should not be interpreted as a step backward. These works remind us that contributors are still breaking away from traditional methods, even if their ideas and applications are somewhat repetitious.

Attempting to further advance visual systems, Robert Wilkinson published numerous atlases. Two were produced during this period, one in 1808 and the other in 1823. His book, titled *Atlas Classica*, from 1823, demonstrates how he nurtures the methods that are often found during this era. Wilkinson methodically reveals data using

maps or chrono-genealogical charts, created with “trees”, to show relationships (Figures 22 and 23). He also incorporated colors and descriptions throughout to assist the viewer as they examine his content (Data Visualization 1817, 2017; Wilkinson, 1821; Wilkinson, 1823). It could be argued that his work furthered the methods of Lenglet du Fresnoy in 1729 and Jefferys in 1753.

### **1825–1849**

There was an unsteady development of visualizations in the first 24 years. We witnessed the birth of new methods yet found ourselves revisiting old ones — this could be due to the geographic location of the creator and their access to visualizations. If progenitors were in close proximity to others developing visualizations, they would most likely have been exposed to the work of their peers. However, if they had little to no interaction or minimal exposure to published visualizations, their work may reflect older methods. That said, the promise of new creations and the inclusion of women made a strong impact, and the momentum carries forward to the mid-century mark.

#### ***Mapping as a Tool for Documentation and Education***

Cartography begins to expand by becoming a tool for chronicling details about populations and statistical data. In 1741, we saw how Hensel used maps to unveil descendants and dominant languages based on their geographic location. Hensel’s idea evolves and becomes more visual in this century. Meirelles (2013) explains that in 1826, Charles Dupin produced the first statistical map by identifying high and low illiteracy rates throughout France. Unlike Hensel, Dupin’s method revealed statistical data within the map by applying varying values. His method, a choropleth map, was used for a variety of topics; it offered viewers the ability to track rates without much effort since the value scale is easily decipherable (Figure 24). His work is said to have been inspired by Halley, but Dupin’s method would influence classes in choropleth maps during the

1930s. Just seven years later in 1833, Meirelles (2013) highlights the work of André-Michel Guerry who applied the choropleth method to his visualizations (Figure 25). Using a map of France, he presented areas with high/low crime rates. Guerry has been identified as the pioneer of criminal statistics (Guerry, 1833). While his method is quite similar to Dupin's, it is unclear if they interacted with one another. Additionally, their reasons for applying this method appear to be driven by different goals. Interestingly, based on Princeton University Library's Thematic Maps Collection (*First X, Then Y, Now Z*, 2012), it is revealed that the introduction to Guerry's publication, *Moral Statistics*, references both William Playfair and Alexander von Humboldt. In stating their names, he assures his audience of his intent by associating with others who have implemented visualizations. His appreciation for Playfair is apparent as his publication also includes miscellaneous data in the form of bar charts.

Emma Willard is often one of two historic female forebearers who is known by most present-day designers. An American educator, Willard founded Troy Female Seminary, an academy for young women, in 1821 (*Britannica*, T. Editors of Encyclopedia, 2017). Students under her direction later opened or founded their own colleges as education for women became more accepted across the United States (*Women in Cartography*, n.d.). Bliss (2016b) explains that Willard preferred to approach geography by teaching it from a local perspective. This allowed students to connect their cartography lessons to their hometowns or regional areas instead of having them address complicated global depictions first. Willard produced a variety of work during her lifetime, from books to maps to timelines. In 1827, she partnered with William Woodbridge to create *Universal Geography*, and within that text, they produced a piece titled "Map No.11 The World as Known to the Ancients" (*Women in Cartography*, n.d.). This visualization illustrates the world on a curve, rather than flat,

and it relies on labeling to highlight the proximity of various countries (Figure 26). Faint hues are added to distinguish the borders of each country from one another. This visual aligns with what Wilkinson produced in 1823, but their version adds visual sensitivity and optical balance that is not often applied by early mapmakers. According to Benbrahim (2020), Willard explored and applied techniques that were not standard for most geographic reproductions. Willard understood that, whether designing timelines or maps, “The attempt to understand chronology by merely committing dates to memory, is not only painful, but it is as useless as to learn latitudes and longitudes, without the study of maps.” Osborn (2016) and provided evidence of Willard’s effort to improve the way maps are used to convey information. For her *Locations and Wanderings of the Aboriginal Tribes* map, Willard (1828) identified the territories and movements of Native Americans by encircling the tribe’s name in color and then drew lines to show their movements throughout the eastern coast of the United States (Figure 27). As Osborn points out, “Trying to capture the dynamism of human movement on a static map is inherently difficult, perhaps problematic, task, yet her attempts help convey just how populated the continent was prior to European contact.” Willard continued, in 1828, to use color and labels for her *Map of 1826*, but it is much more structured. Hues carefully outline the territories and borders of the east coast while text is added to discern who was admitted to the Union, what year they did so, and where tribes resided.

Willard was not the only woman contributing to the field of Information Design. Her sister, Almira H. L. Phelps, also developed designs to educate others. The sisters appeared to encourage process over ornamentation and understood the power of visualizations. Harvey (2020) reveals that Willard and Phelps were both influenced by the work of Alexander von Humboldt, as was Willard’s collaborator, William Woodbridge. Specifically, Willard and Woodbridge drew inspiration from Humboldt’s

isothermal lines, while Phelps was influenced by his visualization, *Naturgemälde*. Phelps taught in her sister's school from approximately 1823 until 1831. She proceeded to publish *Familiar Lecture on Botany* in 1829 (*Britannica*, T. Editors of Encyclopedia, 2021b). Harvey (2020) states that Phelps replicated Humboldt's design, in English, for the frontispiece of her book. Harvey added that "Both sisters' books were immensely popular in schools. Lincoln's [Phelps] went through twenty-eight editions over forty-four years and it may have sold more than 350,000 copies between 1829–1872." Phelps, in particular, created illustrations and diagrammed sequences of botanical stages in her texts. Her visuals supported various lectures allowing students to connect what they read with what they saw. Both women left an indelible mark on education and their ability to communicate with visualizations is what makes their contributions important to our field.

Following the work of Willard and Phelps, Rosenberg and Grafton (2010) share maps by Edward Quin where his visualization displays the political leanings of countries (Figure 28). Produced for his atlas, these 1830s maps incorporate dark clouds to encircle the countries. Not only do these clouds rollback to highlight specific regions, but they "indicated how much of the world was known to the West at each stage in history." Interestingly, in 1836, Willard developed maps that replicated the dark clouds seen in Quin's visualization (Willard, 1826b). This method of spotlighting a specific space is not new. A loose connection can be drawn between Quin and Halley. In 1715, Halley used overlapping values on a map to create a focal point that would predict where a total eclipse would occur. Quin seems to be doing the reverse by highlighting an area with light and surrounding it with dark. Granted, the methods implemented tell two very different stories; Halley's work was predictive in nature while Quin's is comparative.



Yet, it is the application of these methods and their noticeable attempts to accentuate information that connects them.

Around the time Americans Willard and Phelps were producing works, Alice Hudson's research revealed an indigenous contributor. Up to this point, forebearers were primarily of European descent and Caucasian. Bliss (2016a), who interviewed Hudson, introduces us to Shanawdithit, a member of Newfoundland's Beothuk tribe. As the sole surviving member of her tribe, she learned to read and write in English while working as a servant. William Cormack, an explorer, took interest in her and by 1829, she created maps based on her memories (Figure 29). "Shanawdithit was able to recall the attacks on her people and created a series of maps that tracked their movements. Her work remains one of the few primary sources on the Beothuk tribe." (APSU GIS Center, 2021). As reported by Bliss (2016a), the accuracy of Shanawdithit's five maps were recognized by fellow explorer, James P. Howley, who penned a book about her tribe in 1915. This demonstrates how visuals produced by a female were just as good, if not better, than trained men who shared similar maps, but her accuracy was unmatched.

### ***Maps as Comparative Tools***

While maps continued to reveal the exploratory findings of travelers, we also began to see maps as comparative tools. Through David Rumsey's Map Collection (Finley, 1831), it was found that Anthony Finley, in 1831, created a geographic map that displays the heights of mountains from around the world (Figure 30). Details such as feet, miles, elevation, and continents are overlapped to show a collective comparison. Additionally, Finley applied color to highlight each range and identify their location, while also incorporating a numbering system to assist viewers as they sought specific details about the various ranges. While the scale and/or appearance of the mountains on a single page may be distorted, the applied method moves away from standard topography mapping

styles by mimicking the side view representation we saw from Humboldt's 1807 *Naturgemälde*. Three years after Finley's visualization, in 1834, Rumsey's collection (Heck, 1834) shares the work of Johann Georg Heck, a German cartographer and geographer. Heck produced his version of a comparative geographic map where he, similarly, displays mountain ranges across the world (Figure 31). The layering of information and visual detail has been refined from Finley's contribution, and his incorporation of color reflects hues we see in nature. While his design may also be a bit skewed with sharp peaks and limited space for content, it is clear the method has evolved toward a more realistic representation of landscapes. Visualizations that displayed varying elevations and acted as comparative tools for mountain ranges would continue over time. Miller (2019), when interviewing historian Susan Schulten, discovered that this method for documenting nature in untraditional ways, such as Humboldt did, influenced many. In the years following Finley and Heck, Alexander Keith Johnston, a Scottish cartographer, followed in their footsteps when his *Outlines of Botanical Geography* was published in an atlas from 1850. His visualization was clearly influenced by the work of forebearers who predated him. Like them, Johnston strived to expand on the discoveries and methods he used to explain the world's landscape to those who viewed his work.

### ***Evolving Mapping Styles***

Robinson (1955) conducted extensive research on the work of Henry Drury Harness. Through his probing, it was discovered that Harness was assigned to develop maps for the Irish Railways Commission. Harness' work from 1837 reveals details regarding traffic and population density as well as the movement of goods. Harness used line thickness and value to visually convey his findings — he is credited with having published the first flow map (Figure 32). Harness produced multiple visualizations and,

like many contributors before him, developed a thematic map (or choropleth) to identify which territories were dense or sparse throughout Ireland. His work and methods will carry the field forward, as they inspire another well-known contributor approximately 18 years later.

By 1840, another female progenitor came to light thanks to the research of Alice Hudson. F.C. DeKrafft and William Morrison produced a map of Washington, D.C. where details of the city radiate from the center outward. Labels identify the rivers, block numbers, wards and government buildings. The entire site is organized as it reveals a system that is broken into compartments, a loose grid of sorts, where some areas have more land than others (Figure 33). However, DeKrafft and Morrison's visualization came to fruition with the help of Elizabeth Lenthall Stone, a lithographer. It is believed she learned how to engrave from her husband William James Stone, "famous for his 1823 facsimile copper engraving of the Declaration of Independence." The daughter of an architect and niece to two surveyors, Stone had the opportunity to learn from relatives in order to develop and hone her skills (*Women in Cartography*, n.d.).

Most map visualizations, as previously mentioned, were flat interpretations of the world. Willard and Woodbridge opted for another view when they displayed the curvature of the earth in their 1827 map. Meirelles (2013) provides another example of a map representing curved earth by Heinrich Karl Wilhelm Berghaus. His visualization presents a polar projection where he aimed to provide the mean temperature of the Northern Hemisphere. Meirelles explains that Berghaus' work was considered a great achievement, particularly in regard to thematic mapping. Wulf (2016) expands on Berghaus' accomplishments by highlighting his map of volcanoes and earthquakes as well as his botanical geography (Figure 34). She also revealed that Berghaus collaborated with Humboldt and "produced an atlas that accompanied Humboldt's bestselling book

*Cosmos.*” While Berghaus created a name for himself due to his visual contributions, it is another important example of contributors partnering to advance the field.

### ***Visualizing the Spread of Illness***

Approximately five decades after Valentine Seaman introduced us to his epidemiological map where he tried to identify the source of yellow fever in Manhattan, New York, we see the method being applied again. Thomas Shapter published *The History of the Cholera in Exeter in 1832*, which included a map displaying deaths due to cholera from 1832–1834 (Figure 35). His work showed the spatial spread of cholera by revealing clusters as it traveled throughout Exeter (Shapter, 1849). Shapter’s detailed map identified streets, locations, and parishes in Exeter, England. Red shapes, corresponding to the three years of documented data, represent the spread of cholera. Bars (‘32), diamonds (‘33), and dots (‘34) can be found throughout the area to mark the passing of a resident, along with notations of burial and burn sites. Based on the deaths, proximity to the river, and cluster communities, Shapter successfully identified how cholera spread within Exeter (*First X, Then Y, Now Z*, 2012). During the same year, in 1849, Henry Williams explored the spread of cholera in Boston, Massachusetts. His focus was to identify cases that occurred at the hospital as well as fatal cases throughout the city. Black dots designate the locations of people, while a listing of figures provides specific numbers for each location (Schulten, n.d.). Unlike Shapter, Williams steers clear of incorporating color, but his method is equally successful. It is fascinating to see two contributors tackling the same problem with similar approaches. It is unclear what inspired the men to use visualizations, but their efforts and methods carry forward beyond their lifetime.

## ***Experimentations of Timelines***

Rosenberg and Grafton (2010) shared the work of Henry Bostwick from 1826. His timeline challenged the methods we saw from Barbeau-Dubourg and Priestley in the mid-1700s. Bostwick's timeline was organic and less structured than the work of the forerunners who preceded him. Yet, like other early contributors, he applied color to assist with deciphering the information presented. Bostwick incorporated line scales to show relationships between people in his timeline. His focus was to highlight genealogical connections and successions. While it's easy to see lines arching off others, text interacts with the lines, making it challenging to read. The authors state that visuals equivalent to what Bostwick produced were often used as teaching displays; however, they emphasized that while numerous individuals tried to produce unique visualizations, many were simply derivatives of Priestley's work.

In the prior century, we were introduced to circular formats. In the early 1720s, Weigel and Martignoni attempted to display data in the round. Rosenberg and Grafton (2010) provided the work of Richard C Shimeall, as he attempted to display the passing of time from creation to the apocalypse. His radial representation incorporates text, colors, and imagery all in one piece. The circle is divided into sections and each one represents a century. It can be argued that his work is dense and difficult to read, but the circular presentation is interesting in that the piece appears to be portable. It is not known if the visualization was produced for religious study or as an educational tool, but this experimentation does open a potential door to the transportation of works.

As contributors aim to discover a better way to present time-related events, rather than mimic their predecessors, they shift their perspectives and generate a group of abstract visualizations. Rosenberg and Grafton (2010) present the work of Thomas Clarkson. According to their findings, Clarkson first produced his "stream chart"

sometime between 1801 and 1808. The authors indicate the design was shared again as the “1836 New York edition” (Figure 36). He used water-like forms that mimicked streams to show supporters of political movements over time (Clarkson, 1808). Clarkson clearly draws inspiration from nature as he visualizes support of abolition. While his method for interpreting time has its challenges, as some would argue the effectiveness of this visualization, the interesting aspect is its slightly akin to the method introduced in 1721 by Martignoni, since both use organic shapes to convey their information.

Not new to creating visualizations, we return to examine the contributions of Emma Willard, specifically her timelines. In the mid to late 1830s, Willard created *Picture of Nations or Perspective Sketch of the Course of Empire* (Figure 37). She applied a perspective technique to create depth and changed the thickness of lines to identify the successes and losses of each empire over time (Willard and Huntington and Co., 1839; Willard, 1836a). By 1846, Willard designed another well-known perspective piece known as *Temple of Time* (Figure 38). However, rather than include organic shaped branches, like other time-based works, this piece used columns to create structural dimension (Willard, 1846). According to Willard, “information presented spatially and visually would facilitate memory by attaching images to the mind through the eyes” (Benbrahim, 2020). Her work continues to resonate as her “pedagogical model at Troy was widely adopted by other colleges (including all-men schools)” and allowed for her students from Troy to be “agents of cultural diffusion” to promote women’s education (Osborn, 2016). According to Rumsey’s Historical Map Collection site, Willard also experimented with telling time as a historic tree (Figure 39). Willard used colors, labels, bars, and dates to account for the events that took place from the 15<sup>th</sup> to 19<sup>th</sup> centuries. An illustration of a tree with numerous branches extends outward in a half circle formation. The branches touch a curved bar graph broken into centuries (Willard,

1845). Clearly, Willard is not afraid to experiment and evolve her own methods, rather than stick to one application. Her ability to explore options is reminiscent of Playfair and his ability to develop new visualizations.

Further experimentations are developed as contributors move closer to the mid-century mark. Rosenberg and Grafton (2010) uncovered numerous visualizations presented as games. *Wallis' New Game of Universal History* is presented in a spiral format and exhibits colorful illustrations. According to the authors, this game "... highlights events like the first paper use in England, invention of engraving, and the discovery of longitude." This visualization, along with others, like the puzzle we saw in 1792, used game formats to educate viewers. This approach is rare but, as explained by the authors, creators "...experimented with every format they could get their hands on." It is further proof that data can be shared in traditional and unorthodox ways.

To further highlight the experimentations of timelines, Rosenberg and Grafton (2010) share a millerite chart by Joshua Himes. This visualization heavily integrates illustrated images with supporting text. Dates, locations, symbols, colors, and descriptions come together to present a prediction of when the world will end. According to the authors, the design mixes religion with facts. Additionally, the layout also breaks away from traditional timelines by aiming to use visual logic to explain the content presented. This is another example where the effectiveness of the visual could be argued, but despite its unusual approach, it demonstrates how imagery is pushing the boundaries of what is possible. Following Himes' visual shift from traditional timelines, there is a return to a slightly more familiar layout, but with subtle additions. Once again, thanks to the research of Rosenberg and Grafton (2010), we are introduced to a timeline by Edward Bishop Elliot. In 1844, he produced a multi-volume study of creation to the apocalypse. Unlike Himes, Elliot does not incorporate imagery; instead, much of his

visual is text heavy. However, he places his content on two illustrated scrolls that appear to have been unraveled. The execution adds a bit of depth and allows the content to be seen as both macro and micro, with its generalized overview and specific details. Elliot's visualization was a religious piece first published in London. It appears to have a dense amount of detail like Shimeall's 1833 timeline and aims to bring a hint of dimension to the page, but it is not as experimental as Willard's perspective visuals. Lastly, Rosenberg and Grafton (2010) shared the work of J. Pearson who, like Himes and Elliot, produced a timeline to share religious and apocalyptic predictions. Specifically, it tries to pinpoint the "precise dates of Christ's life from historical data on eclipses of the sun." Unlike the prior two visuals discussed, this one relies on simplicity. While it includes an enormous amount of supporting text, the visuals themselves are quite subtle. A horizontal rule, or x-axis, is presented as the base and, from it, arcs connect events while vertical lines show details about the sun. This visualization may not have the depth and appeal as the others with their colors and imagery, but its attempt to clarify the data is another instance of contributors determining the best way to convey information that deals with time.

## **1850–1874**

### ***Embracing Visualizations***

The development of visualizations over the past 150 years appears to have reached a point where imagery is an accepted method for conveying information. As we hit the midpoint of the 19<sup>th</sup> century, we are introduced to new individuals and see the return of contributors from prior years, as they expand their methods or share newly developed ideas. The inventive visualizations are produced for their respective fields, yet there continues to be a connection between methods and themes.



### ***Broadening the Application of Visualizations***

Quite a few visualizations have been implemented as books or act as visual displays that accompany scientific or educational presentations. Rumsey (Smith, 1850) has collected numerous visualizations for public consumption and shared the work of Asa Smith. In 1850, Smith published a book titled *Eclipses*. In it, he provided a diagram that visually explains how an eclipse occurs. While supportive text accompanies the visuals, it doesn't avert attention away from the illustrations. In 1715, we saw Halley's work where he was predicting an eclipse event. While the topic is similar, we see a different approach to how it's presented because each had a different goal. Halley overlaid trajectories onto a map, where Smith is also sharing trajectories, but they are to explain how an eclipse occurs. That said, Smith produced diagrams using high contrasting shadows and light while relying on the arrangement of visuals to convey his viewpoint. The methods applied by both men are contrastive, but they effectively use layers to educate their audiences.

In the early 1830s, we were introduced to methods by Finley and Heck, where mountain ranges from around the world were compared by aligning them on a single page. Rumsey shared an 1851 visualization that uses the same method, only this time it compares rivers and lakes. James Reynolds and John Emslie produced a hand-colored engraving that aligns rivers based on their length (Reynolds and Emslie, 1851). Surrounding the rivers are the lakes positioned throughout to show their shapes and compare their sizes. At the bottom of the document, viewers will see text that classifies each water type with its corresponding continent. A numerical system is applied so that viewers can connect the name with the factual data presented, such as the name and size (or length) of each water type (Figure 40). This method continues to be applied because of its effectiveness in displaying visual relationships.

William Farr, an English epidemiologist and statistician, produced his *Temperature and Mortality of London for Every Week of 11 Years (1840-1850)* visualization. Farr collected data and applied it to determine how cholera was spread (Rendgen, 2019; Stepro, n.d.). Initially, Farr believed that bad air was to blame, a view shared by those who believed in the miasmatic theory, but he later changed his position. Farr eventually aligned with Dr. Snow, who is credited for accurately identifying the spread of cholera (Granados, 2021). Farr's creation differed greatly from what we'll see from Snow in 1854. Farr displayed twelve circle graphs, each presenting the year, months, dates, temperatures and number of deaths. Based on the data collected, he used color to reveal patterns as viewers compare the findings for each year. Farr's work appears to be a combination of methods we first saw from Playfair, in that he took a circle, like the pie chart, but applied an x- and y-axis to plot points, similar to the line graphs we previously encountered. Despite Farr's inaccurate conclusion, his visualization certainly expanded the possibilities doctors had for conveying their work, as he did not plot cholera on a map, like many of his peers.

Edward Tufte (1997) shared a qualitative diagram by Edward L Youmans. Produced in 1854, Youmans depicted a farm with an illustrated representation of land, animals, property fencing, and a home. Above the illustrated landscape, arrows are shown flying in an arc pattern, some from left to right and others right to left. Next to each arrow is a square shape, small or large, in either black or red colors. A key (or legend) identifying the meaning of the squares and colors is located at the top of the page. Youmans' work visually demonstrates the motion of elements as they enter and exit the air. This piece conveys how flora and fauna impact one another as well as the atmosphere. While the visualization is quite simple, it contains many layers and the representation through symbols is quite effective.

Edward Tufte (2001) shares a sample of Minard's work to elaborate on the technique of comparisons, specifically using before and after visuals. In 1856, Minard created an illustrated diagram that conveys the foundation shift of a bridge on the Rhône in 1840. He showed the structure in before and after views, which aided in understanding the direction of the collapse, the foundation issues, and the degree to which the structure shifted. This illustration is different from the work Minard will produce later. His visualization methods will evolve to provide more depth and layers. Minard had the ability to adapt his approach based on the amount of data he had to portray.

We have been introduced to a few women throughout the 18<sup>th</sup> and 19<sup>th</sup> centuries, but one is credited most often. Florence Nightingale is constantly recognized for her 1858 Polar Area diagram, also known as a Rose chart (Figure 41). This diagram aided her in educating others about the causes of mortality affecting the army in the east. She successfully used colored wedges to identify various findings, which included deaths from preventable diseases, deaths from wounds, and deaths from other causes. Nightingale was concerned the statistics would seem dull, so she produced the visual representation to highlight her findings (Conway, 2012). In reviewing Nightingale's life, Andrews (2019) found that she produced numerous visualizations, everything from bar charts to density plots. Her goal was to have these visual methods highlight where reform or interventions were necessary to improve practices implemented at the time. Unfortunately, Nightingale's work was often criticized by males since she was a woman. Not required to answer to military officials nor medical colleagues, Nightingale was quite capable of being self-sufficient. She self-published her works and they were often shared with those involved in government and the medical field. It is said that she was also a favorite of Queen Victoria and Prince Albert. Despite receiving criticism, she overcame

challenges and found support for her work. Nightingale even collaborated with physician William Farr, as they both saw value with visualizations. While some of her creations may harken back to methods originally invented by Playfair, her Polar Area chart is said to “...likely reference André-Michel Guerry’s simpler 1829 cyclical plot of meteorological data.” Her work continues to leave its mark on the present study of historic information design.

Two visualizations that explore the topic of classifications are found in the research of Meirelles (2013). One comes from Charles Darwin in 1859 and the other from Ernst Haeckel in 1866. Both produced branch-like diagrams to simultaneously reveal origins and relationships. Darwin’s visual is abstract; it relies on lines and an alphanumeric system to show the common ancestors. Haeckel’s design includes a literal illustration of a tree with connecting branches that extend vertically and widen horizontally as they ascend from the bottom of the page (Figure 42). A key is present, as are labels, to explain the classifications. Darwin’s visual approach appears to be more structured, like the work of Barbeau-Dubourg from 1753 and C.V. Lavoisne in 1807. He seems to have improved upon the 1826 method Bostwick applied to display connections. For Darwin, a structural flow allowed the data to reveal commonalities clearer compared to the arcs that Bostwick developed for his work. Haeckel’s design, while homogeneous to Darwin’s topic, mirrors the aesthetic qualities we saw from Martignoni in 1721, Dod in 1807, and Willard in the late 1830s, where they developed organic lines, or steam paths, that flowed based on expansion or loss. Both men were challenged to represent evolutionary growth. They shared a comparable approach, despite being created seven years apart. The aesthetics are what make their contributions feel distinct, but their visualizations align with what creators before them experimented with.

We've encountered circular timelines and charts, but Meirelles (2013) came across a circular diagram by Alvin Jewett Johnson circa 1860 (Figure 43). This visualization displays the differences in time around the world. Miniature clocks are perfectly aligned as they create rows of rings radiating from the center out. The clock situated in the middle of the piece, in which all the other time zones are based on, displays the time for Washington (Johnson, 1860). Hues are applied and linear guidelines are added to connect the various times as national and international hours are represented. The content is quite direct and effective. It is an example of how accessible data can be when it is presented in a manner that supports its story. We can see how circular designs have evolved and become more structured.

Forebearers have produced derivative visualizations based on the methods of others who came before them. Meirelles (2013), in her book, shared a visual by Francis A. Walker from 1874. He adapted the bar chart by incorporating multiple columns and color-coded the data to represent public debt from 1789–1870 (Walker, 1874). Walker's visual combines years, debt, revenue, and expenditures by department (Figure 44). Patterns are revealed as colors spread over time and a legend is positioned above each column of bars so viewers can determine which sector is being exhibited. The visualization is further proof of methods being revisited decades after they were invented and their relevance as they continue to be used in the present day.

### ***The Abundance of Mapped Data***

Continuing with the exploration of data maps, we find that illness continues to be a popular subject. Previously, epidemic maps from Seaman in 1795, Shapter in 1849, and Williams in 1849 were discussed. Based on his research, Altonen (n.d.) found that between 1848–1852, Heinrich Berghaus, who has already made contributions to the field of information design, returns and maps the spread of diseases. Like the forebearers

before him, he overlaid colored areas on maps to highlight the various outbreaks around the world. Berghaus created multiple visuals to illustrate which diseases affected which areas. The illnesses include pox, yellow fever, and cholera, but they also provided regional sicknesses along with their symptoms. His work presented a broader view of how the world was affected by similar epidemics. Following Heinrich's work, Altonen (n.d.) shared John Snow's map that plotted the spread of cholera in London (Figure 45). Despite a handful of forebearers using the same, or a similar, method as Snow, his work is often celebrated as the classic example for combining the topic of epidemics with mapping. The reason Snow's 1854 visualization is celebrated above all others is still argued today. The author states that prejudices amongst medical geographers determined who received recognition for their findings. With forebearers actively being overlooked, Snow remains significant compared to other practitioners, such as the lesser-known 19<sup>th</sup> century Russian medical geographers, as pointed out by Altonen. Snow's method does not deviate from what has been presented by his predecessors. Had his method evolved or revealed a technique not yet explored, then one could potentially argue his contribution deserving the recognition it presently receives. Another contribution discussed by Altonen (n.d.) is Adolph Mühry's 1856 *The Geographical Relations of Diseases, or Outlines of Noso-Geography*. He, much like Berghaus, designed a world map that aimed to highlight what caused the spread of disease. His research, according to Altonen, receives less attention than Alexander Keith Johnston, who also produced a map regarding worldwide diseases. The men approached their maps differently, but both include isotherms we previously saw from Humboldt in 1817 (which were also like the isolines from Halley in 1701). As Altonen explains, Mühry attempted to identify how human and social factors contributed to the spread of disease while Johnston avoided such connections. Both men's maps were quite detailed. Mühry's

included isotherms, climate issues, flow patterns, ocean currents, and colored markings identified sites of different disease occurrences. Johnston's map is compared to Berghaus, rather than Mühry's, and highlights similar elements such as isotherms, flow patterns, and colors to denote areas affected by disease. However, Johnston's map, as pointed out by Altonen, was to present risks by displaying where diseases were prevalent. Whereas Mühry was seeking how human and natural events impact the spread of illness, Johnston was warning that certain diseases would be experienced by people who moved to specific areas. Altonen further explains that while each approach had its pros/cons, he also acknowledged that Mühry was not afraid to go against the establishment, where Johnston fell in line with them, and perhaps that is why Mühry is overlooked or receives less attention for his world disease map.

Moving away from medical driven data mapping, Meirelles (2013) discusses Charles Joseph Minard's 1855 work where he overlaid colored flow lines onto a map to show products transported throughout France (Figure 46). The method, with its thick and thin arteries, mimics the visual system created by Harness in 1837. The map provides structure, but it is secondary to the flow lines. The attention placed on the colors allows viewers to identify the transport of the products and it reveals a circulation pattern. Minard has a knack for visualizing economic impact, as he follows it up with similar visualizations in 1864 and 1866. Only in 1864, Tufte (2001) notes that Minard focused on the export of French wine. One can see that this visual has an added component, a graph, to support his findings. This is not something we've seen from Minard in the past; therefore, it implies that he is open to adapting his favored method. According to Rendgen (2018), in 1866, Minard provided a small multiple view, where maps are aligned with data for different years, to show how the export of cotton was affected by the American Civil War (Figure 47). This visual incorporates bold colors,

again, with thick and thin lines. Viewers can quickly see the negative effect the war had on the American economy, and it demonstrates how the United States had to compete with other countries, such as India, Haiti, Egypt, and Syria for cotton. While Minard's method was repurposed, he was still exploring other ways to show data. Meirelles (2013) provides an example of Minard applying pie charts to a map in 1858, in between the time he produced the work previously mentioned (Figure 48). The method connects back to what was produced by Playfair in 1801 along with the 1826 work of Dupin and 1833 work of Guerry. His adoption and adaptation of the pie chart and mapping method displays his ability to be inventive. By incorporating the map, pie chart, and thematic coloring into his design, he can tell a richer story. Minard's intermixing of methods allowed him to display the quantity of meat, who supplied it, for how much, and where it was sent to, all throughout France. One of Charles Joseph Minard's most celebrated works, often shared by Tufte (2001) is his abstract and multi-layered graphic portraying Napoleon's retreat from Russia (Figure 49). This 1869 visual is particularly effective due to its ability to convey the story of the soldiers. It captures their confidence and their defeat on one page. While the map, in terms of hierarchy, receives less attention than the army, the cities and waterways are clearly labeled. The size and direction of the troops is indicated through line thickness, color, and the passing of time as they move from one location to the next. Below the primary graphic, a chart shows the frigid temperatures as the soldiers return from their failed attack. The visual elements come together and succinctly communicate how the army was unsuccessful in its attempt to invade Russia. The simultaneous interactions of the elements make this visual exceptional and exhibit how engaging a design can be when layered with generous content.

While Minard was producing his visualizations, another individual was exploring how to apply maps for educational purposes. According to the research of Hudson, Sarah



Sophia Cornell was illustrating geographic maps and incorporating them in her textbooks for beginning and intermediate learners. Primary students would refer to her texts to learn geographic terminology or generic geographic elements (Figure 50). Her illustrations varied as some were flat views and others depicted depth. Each visual was accompanied by text to aid in student comprehension. Like Phelps in 1836, Cornell would continue to produce texts over the years. When we compare the works Cornell developed in 1857 to that of 1869, we see her methods evolved (Figure 51). Perhaps this is because her first text utilized fictional locations to teach basics of geography, but her latter work applies the same comparative methods (of mountains) that we saw from Finley in 1831, Heck in 1834, and Reynolds & Emslie in 1851. As with her fellow female contributors, Cornell's works were published using her initials, S. S. Cornell, as to not disclose her gender. (*Women in Cartography*, n.d.).

Within the David Rumsey Map Collection (*Stanford's Map of India*, 1859), the work of Edward Stanford can be found. His map of India is quite detailed, and the layers of content included are quite impressive. In addition to viewing the country, seeing labeled locations and scales, this visualization also includes railways (both operating and sanctioned but not built), military stations, post office locations, and distances. Outside of the land map, three circles are presented to share the distance from major cities to smaller locations. Each uses a line to connect the furthest point to the center. This allows viewers to quickly interpret the relationship between locations without having to search for them on the primary land map (Figure 52). While it isn't unusual for color to be added to a map, it is incorporated here to identify territorial acquisitions. The map has vast areas of red, the hue selected to highlight areas under "The British Possessions," while green, blue, and brown reveal independent states, French settlements, and Portuguese settlements. The macro and micro details displayed reflect methods from

prior mapmakers, but the sheer amount of content shown is proof that visual systems for maps continue to evolve and add clarity.

In the early 1800s we were introduced to the choropleth method of mapping by Dupin in 1826 and we saw Guerry apply it in 1833. Once established as a successful visualization technique, the method persisted and was applied by Harness in 1837 and Minard in 1858. As a result, we saw Edwin Hergesheimer use it in 1861 to represent the slave population in the United States (Hergesheimer, 1861). Using a value scale, the location of slaves and the density (percentage of the population) was represented by county (Figure 53). The data represented was compiled from the census of 1860. In addition to the mapped area, a table is also present on the map. It lists 15 southern states and compares the free population to the slave population. A notation on the map states, “It should be observed that several counties appear comparatively light. This arises from the preponderance of whites and free blacks in the larger towns in those counties....” Schulten (n.d.), when researching this map, found that it is listed as “one of the first American attempts to translate the census into cartographic form, and a favorite of President Lincoln during the Civil War.” Upon further inspection of the map, at the top, it states, “Sold for the benefit of the Sick and Wounded Soldiers of the U.S. Army,” so we can assume that the visual is marketed to citizens to help support those that serve (Hergesheimer, 1861). The publisher of this piece, Henry S. Graham, collaborated with Hergesheimer around the same time to create additional slave population maps, but they were three monthly depictions of Virginia and West Virginia (Schulten, n.d.). The choropleth method was ideal for information about society. We’ve seen it applied to present accounts of illiteracy, crime, and population. However, around the same time as Hergesheimer and Graham’s work, Altonen (n.d.) discovered the method being applied by Henry L. Bowditch. Like Hergesheimer and Graham, Bowditch sought a method that

could be applied at a county level to highlight the spread of consumption. His 1860 map of Massachusetts uses the choropleth method, but rather than use a value scale, Bowditch appears to create his own legend. Unlike most contributors before him, Bowditch selected bright blue and red hues, shown in square form, to denote which areas display more or rare cases of illness. Additionally, he varied the squares, by adjusting the thickness of its border, or color of the stroke, to represent a variety of scenarios surrounding the spread of consumption. According to Altonen (n.d.), the map “relied heavily upon the popularization of soil studies being performed in order to determine how disease relates to specific chemical and physical behavioral features of soil....” Bowditch’s map combines two methods we’ve previously encountered, the choropleth method and medical mapping. His visualization is where we see the work of early contributors expanding beyond the fields they were inducted into. If we keep that in mind, we can connect Bowditch’s work to visualizations by Seaman in the late 1700s, Shapter in 1849, Williams in 1849, Berghaus in 1852, Snow in 1854, as well as Youmans’ farm and atmospheric diagram from 1854 (not in method, but loosely in topic based on the study of land and air). The use of choropleth mapping didn’t stop with Bowditch. Meirelles (2013) came upon the work of Francis A. Walker, who we previously discussed for his re-envisioned bar chart. During the same year, 1874, he produced a map that portrayed population growth in the east coast region of the United States (Figure 54). Like Hergesheimer and Graham, he used census data, from the first through fourth census, to aid him in developing his visualization. The result was a small multiple layout, where a map of the east coast was repeated four times, and a shaded area, based on a value scale, showed an increase in population as the values swept from coastal to inland areas (Walker, 1874). In displaying the four census maps at once, comparisons can be made quickly, much the same as Minard portrayed data in 1866. Combining methods,

such as maps and data, and displaying them in a variety of ways allowed information to be conveyed in a succinct manner. Perhaps this is why they were so popular and remain favorites in the present day.

### ***A Transformation of Time***

Throughout the years, timelines provided contributors a way of connecting people, places, and events. While most followed a linear portrayal, a few outliers challenged the expected chronological approach. Willard, who we know depicted time through organic-shaped lines (or paths) and displayed the content in perspective during the late 1830s, returns in 1851 to display the *Chronographer of Ancient History*. Similar to her *Temple of Time* from 1846, Willard once again uses perspective as a tool for storytelling. The columned structure itself also adds to the stability and power of the content being conveyed. Data can be seen on the floor, columns, and roof of the framework. Each of these portray information that adds to the overall story. According to an article by Onion (2015), historian Barry Joyce believed that Willard was “possibly inspired by her study of ancient Greek commentaries on history and memory” as she wanted to transition chronology from a flat format into one of implied “physical dimension”. As she did in prior years, Willard relies on proximity of text and illustrations to convey a relationship. Hierarchy is presented through the size of content, where text becomes smaller and harder to read as one looks back in time. Willard is clearly testing the limits of this method, in terms of the amount of content that can be included in such a visual structure, but also doubling down on her design by repeating it numerous times over the years.

Willard wasn't the only contributor experimenting with visuals to enhance narratives. Rosenberg and Grafton (2010) shared the work of Jonathan Cummings. His visualization from 1853 is reminiscent of what we saw from Himes in 1842. Both

contributors based their designs off the millerite chart. They applied this method to share their prophetic religious views. However, unlike Himes, Cummings removed chronological scales and allowed his illustrations to do the talking. Additionally, Cummings chose to intermix numerous methods, such as qualitative illustrations and a colored map, into his visual story. Compared to Himes, Cummings was looking to make a bold visual impact. His visual elements may not provide the legibility one may desire when translating a visual story, but he is pushing the boundaries by producing a timeline without actual time present.

Following the unconventional work of Willard and Cummings, another contributor challenged tradition and transformed how timelines were displayed. Elizabeth Peabody questioned how design could facilitate knowledge. Peabody's beliefs were that visuals allowed for personalization, and she wanted viewers to control how they interpreted, documented, and recalled information (DeSpain, 2018). This meant that the viewer would produce historic knowledge for themselves rather than for the masses. It is a viewpoint that departs from what most information design contributors were doing at the time. She, in a sense, is promoting self-enlightenment with data, while others are seeking individuals to gain knowledge externally. Although the visuals may not make sense to anyone but the creator, the grid does apply a visual system. In fact, the grid arrangement is evocative of the work produced by Antoni Jazwinski (Figure 55). His "Polish System", an 1834 color-coded grid layout, was created to assist in memorizing historical events (Jones, 2021; Jazwinski, 1834). According to DeSpain (2018), Elizabeth Peabody placed fabric pieces into a grid format to provide an abstract overview of historic events. The entire piece represented a century, while the individual squares depicted a year. Hues were used as a legend to denote what type of event occurred, such as war. Peabody (1856) explains, "...if you have the dates represented perfectly by heart,

events are so connected in the narrative of history, that you can easily place any one, by the exercise of your imaginative memory, in its locality, and see its general chronological relation.” To promote her visual system, Peabody would travel to various locations to sell her textbook. DeSpain (2018) further stated “For every classroom that purchased a textbook set, Peabody would make a large-scale fabric grid as accompaniment, a task she described as backbreaking labor.” Klein (2015) revealed that Peabody traveled “as far north as Rochester, NY; as far west as Louisville, KY; and as far south as Richmond, VA.” Klein emphasizes the physical toll Peabody endured in the 1850s to promote her work. Unlike women before her, Peabody was not living in an era where she had to hide her gender, but like the women who preceded her, she had to put in extensive time and effort for her work to be purchased and valued.

Following the abstract visual work of Peabody, we see a familiar timeline method, but this time, it incorporates a lot more content than its predecessors. In 1858, Eugene Pick created a timeline that, like Willard and others before, presented a historic telling of civilization (Timeline Maps, 2012; Pick 1858). However, it is his execution for displaying the information that has transformed this former method (Figure 56). It is unclear if Pick had direct influences from other practitioners; however, it’s noted that his method comes from Friedrich Strass, an Austrian who created *Strom der Zeiten* in 1804 (Timeline Maps, 2012). That said, Strass isn’t the only contributor whose work visually connects with Pick’s design. If we return to Martignoni in 1721, Dod in 1807, Wilkinson in 1817, and Willard in 1836, we can see loose connections between their visuals and his. While Pick’s work isn’t circular like Martignoni, Pick uses streams (or paths) to show how new territories were developed, lost, or conquered. Much like Dod and Willard, we see the same paths, but in a vertical representation. Pick applies vibrant hues, as Wilkinson did, to show relationships between the content, but that’s where the similarities end. What

Pick adds to his text-heavy layout are visual depictions of places, people, and events. Bordering the left and right sides of the substrate, illustrations with high contrast aim to support the storytelling streams in the center of the page. Pick attempts to advance this method with his inclusion of qualitative data.

## **1875–1899**

### ***Prospering Advancement***

With the 19<sup>th</sup> century coming to a close, visualizations finally take hold and become the primary way contributors convey their content. Maps and timelines continue to be developed as they have for centuries, but rich storytelling, bold colors, and diverse layouts take hold. It is the work in this final era that sets the tone for the variety of methods that carry forth into the 20<sup>th</sup> century.

### ***The Polarity of Timelines***

The methods applied to timelines we saw in the 1850s linger and influence what is created in the late 1870s. Rosenberg and Grafton (2010) demonstrate this when revealing the work of Sebastian C. Adams. His designs are colorful with numerous illustrations. Similar to his predecessors, he incorporates a religious theme and presents it in a scroll format that offers a macro and micro view of content. According to the authors, this particular visual was well-received and unique in that it could be wall mounted. The detail of this piece surpasses what we've encountered before; however, the method itself aligns greatly with what was created by Himes in 1842 and Cummings in 1853. Adams (1881) constructed additional pieces between 1878 and 1881. He once again touches on religion, but the theme goes a step further by adding portraits of "Principal Reigning Sovereigns of the World" along with a written portion titled "Presidents of the United States Chronological Table of Events in United States History" (Figure 57). Adams' work emphasizes progression from what was to what is his present. Adams filled

every inch of his document with information to maximize his narrative. While this piece strays greatly from where we saw timelines begin, it offered another method to those eager to present visual content.

While Adams was moving forward with the timeline trends of his predecessors in the mid-1850s, Tufte (2001) shares a visualization by Etienne Jules “E.J.” Marey. Unlike Adams, Marey returns to following the more structured timelines of Barbeau-Dubourg in 1753 and Priestley in 1765. However, his layout appears to combine itself with another method, a bar chart. Rather than apply lines, Marey, in 1885, inserted bars to identify each ruler’s reign. His work compares over 200 years of rule along with lineage. Just below his timeline is a bar graph divided into light and dark sections. Here, Marey allows viewers to identify times of war and peace in conjunction with the rulers and their duration as leader. It is obvious that timelines continue to undergo visual shifts. As we review the chronicled designs, it is possible to identify how they have evolved and their influence into the 20<sup>th</sup> century.

### ***Creating Awareness with Mapped Stories***

In the early part of the 19<sup>th</sup> century, the choropleth map was introduced. Throughout this period, it has been applied numerous times from Dupin in 1826 to Walker in 1874. Meirelles (2013) provides an 1883 example from Fletcher Hewes where red and blue hues display the United States popular vote for 1880. Counties, states, and votes are presented on a scale — this allows for a ratio of predominant votes to total votes to be displayed. Additional visuals, such as tables and bar charts, are provided near the map to highlight other details. The colors effectively identify where party lines fall across the nation. This particular visualization is part of a book that was produced by Hewes and Gannett (1883). It will be discussed further in the next section, but it is worth noting



that the content focuses on revealing stories about the United States' development, which include sharing details about the country's political, social, or industrial climate.

David Rumsey's collection reveals a map unlike what we've encountered before. Created by E. McD. Johnstone, this 1885 visualization has numerous inset maps to feature different aspects of the state (Figure 58). Each detail brings attention to a distinct characteristic of California, from the size of the state, when compared to others, to temperature and soil details. Additionally, to spotlight the elevations California offers, mountain ranges and valley floors are placed side by side for a collective view. Lastly, illustrated scenes are displayed throughout the state, at varying scales and in different shapes, to spotlight the type of environments one can find in California (Johnstone, 1885). This map, rife with content, is quite overwhelming. It appears to take cues from the visual timelines we saw from Cummings in 1853 and Adams in 1878. These visualizations rely on illustrations to communicate the information to the viewer. They exhibit bold colors, high contrast, and lots of layers with little to no text.

Four years after Johnstone's map, in 1889, another progenitor developed a visualization that challenged the living conditions people were subjected to by class. Charles Booth, according to the London School of Economics and Political Science, was an industrialist and social reformer. He is best known for his poverty maps, where he highlighted the areas throughout London where lower-, middle-, and upper-class individuals resided (Figure 59). He achieved this by collecting data and translating that onto a map using a color-coded legend. His initial data collection, known as the Poverty Notebooks, documented details about the occupants' households, location, and number of children. His work would expand into the late 1890s/early 1900s to review other social issues such as religion and trades. He also investigated conduct throughout London by having his researchers accompany the police and document their routes.

Booth's work, *Life and Labour of the People*, consisted of two volumes. He would produce additional works that also resulted in multi-volume publications. His visualization brought to light the conditions of the classes and aided in reforming laws (*Charles Booth's London*, 2016; Booth, 1889).

Following Booth's work, a group of women in the United States were inspired by his social reform and adapted his method to aid their cause. In 1895, the Hull House Maps were created by Jane Addams, Florence Kelley, and Agnes Holbrook. Jane Addams, the founder of Hull House, understood that the residents of low-income areas must document poor conditions and translate that into tangible visuals if they wanted to see change and reform (Blakemore, 2016). As a resident of Hull House, Kelley took the initiative to collect information (Blakemore, 2016; *Women in Cartography*, n.d.; Addams and Kelley, 1895). With data in hand, the women were able to extrapolate statistics that highlighted the conditions of Chicago's poorest regions. To translate the collected information into a visualization, the women selected a map, created by Chicago surveyor Samuel Greenley, as their base (Figure 60). Their thematic system was overlaid onto the map to emphasize inequalities and raise awareness of the social ramifications felt throughout the district (*Women in Cartography*, n.d.; Addams and Kelley, 1895). The effective use of color, mapping, legends, and location details all enhanced the narrative. According to Blakemore (2016) "The echoes of Kelley's infographics can be felt in academia and labor laws to this day — a reminder that it's as important to see statistics as it is to read them." Bliss (2016b) believes that their work influenced not only the growing field of sociology but also contributed to the development of GIS mapping.

### ***Proliferation of Visualizations***

Over time, visualizations have taken many forms and undergone numerous adaptations. In these final years of the 19<sup>th</sup> century, not only do we see advancement in

the execution or production of these works, but we also see crossover, where methods are further combined to create a richer story.

In her book, Isabel Meirelles (2013) provides a visualization by Eadweard Muybridge from 1878. As he attempts to study the directional flow and pattern of a horse's footing, he combines the method of diagramming and photography with that of a timeline. Through framed sequences with silhouettes of horses overlaid on them, one can see the gait of the horse as it charges forward. Muybridge uses lines to connect the hooves from first to second position and adds notations to show the areas where the hooves made contact with the ground. Diagrammed motion, along with a timeframe, helps viewers spot patterns and motion. Unlike most timelines that present content over decades or centuries, here, we see seconds represented. Muybridge's experimentation with motion harkens back to Tomlinson's 1735 visualization displaying a dance.

While Muybridge was diagramming his process, Rosenberg and Grafton (2010) highlight the work of Luigi Perozzo. In their book, they display a Swedish census that was created by Perozzo in 1879. His chart compares the births and deaths of males from 1750–1875. What makes Perozzo's work different from the charts Playfair introduced to us in 1786 and 1801 is that he represents his content in 3D. The graph is set up in an x-, y-, and z-axis, so that content flows to provide depth. This creates the illusion of information flowing over a large area as it interacts with one another. Furthermore, shaded peaks and valleys add form to the appearance and call attention to the graphed terrain. According to Michael Friendly, "Perozzo's stereogram testifies to how the field of statistical visualization had diversified through the 1800s and to the growing desire to display more complex phenomena...." (Rendgen, 2019)

During the same year as Perozzo's 3D line chart, Meirelles (2013) shares an updated visualization by Ernst Haeckel. He continues to explore evolutionary history by

developing a variation of his 1866 work. For this piece, Haeckel uses a similar approach to his prior design; however, now, to accompany the branched content, he has added classification labels to the left of his diagram. In doing so, he has organized his branches vertically and incorporated rows to identify time periods, species, and evolution. Haeckel's prior version allowed for more emphasis on the labels within the branches. He achieved this by adding more white space around the words. This time, he has overlapped the labels onto the branches, perhaps to emphasize the connection of where the branches developed most along their chain of evolution. Some can argue that readability is compromised as the branches and text interact, but he is clearly experimenting with his latest version. In addition to the changes in text treatment, the branches in this piece appear to be inspired by actual patterns seen in nature. His 1866 version loosely mimicked actual branches. Haeckel, like Darwin in 1859, continues to explore visual formats that not only explain evolution but aid it layering the complex content.

As we've seen in prior years, the United States began transforming their census responses into visualizations. The Library of Congress maintains quite a few of these early works. Published in 1883 by Fletcher W. Hewes and Henry Gannett, *Scribner's Statistical Atlas of the United States Showing by Graphic Methods their Present Condition and their Political, Social, and Industrial Development* provides numerous designs that portray the development of the country (Figure 61). The authors understood that data can be "dry and difficult" to convey and comprehend. To excite readers and encourage them to engage with the content, they decided to graphically represent their data: "...the masses of people, who make public sentiment and shape public policy, may acquire that knowledge of the country and its resources which is essential to intelligent and successful government." (Hewes, F. W. & Gannett, H., 1883). Within the book,

mapping systems, diagrams, and charts are provided. Quite a few draw inspiration from mid-18<sup>th</sup> century to late-19<sup>th</sup> century contributors, such as Barbeu-Dubourg, Playfair, and Dupin. A combination of a timeline, bar chart, and line chart was created to rank the most populous cities for the first ten censuses. Other unique visualizations were produced throughout. When exploring dominant political parties, a colored line chart of sorts was developed to sit within a grid system. Each boxed area represents a president and branches, much like the ones we saw from Haeckel, are used to show changes in the party based on laws or events (Hewes, F. W. & Gannett, H., 1883). Choropleth maps, such as Hewes popular vote map, which was shared by Meirelles (2013), were also a part of this collection. Ultimately, this book reinforces what the early contributors regarded to be true: “In the belief that the simpler methods of illustration are, as a rule, the most effective, care has been taken to avoid overelaboration” (Hewes, F. W. & Gannett, H., 1883).

Following the 1883 publication of Hewes and Gannett, Meirelles (2013) provides a design by Etienne Jules Marey. We discussed work by Marey before, and while his designs include a time component, the methods he used for each design change. Marey’s 1885 visualization provides a macro/micro interpretation of the train schedules in France. Marey overlaps layers of lines from one point to another to depict the distance and speed to each train stop. The cities with train service are listed on the left, while the top and bottom display the time of train operation. This visualization makes use of lines as Barbeu-Dubourg did in 1753 and Playfair in 1823, as each contributor created an x- and y-axis framework to structure their content. This allows viewers to comprehend the information and see connections much faster. However, since Marey’s lines are used to mimic a timetable, his lines are not like the line charts from the past which aim to show

trends or growth/loss. Marey's goal is to display relationships and provide options to viewers as they travel.

Whether it be bars, lines, or any other graphic method, time is a popular component incorporated into many visualizations. Circular designs, as we saw from previous 18<sup>th</sup> century works, complement time driven data. However, circular designs were not implemented as often as other methods. Perhaps contributors avoid circles because the data can be challenging to access and read. That said, Tufte (2001) shared a design by Antonio Gabaglio from 1888. The visualization was designed to show Italian post office deposit totals. The circle itself is composed of line intervals radiating from the center to the outer ring. Rectangular shaped boxes are organized in a counterclockwise spiral and gradually reduce in size as they approach the center. Labels displaying the months, years, and deposit amounts are provided. This visualization attempts to convey quantitative information, compared to prior examples of circular graphs which were more qualitative in nature. By combining time with the deposit totals, viewers can see that growth and total deposits increase as years pass.

As contributors' experiment with mixing methods and applying different types of data to those methods, it is a significant sign that visualizations are escalating. Gannett, who produced census work with Hewes, returns with another census atlas. Much like the previous book, this one incorporates a plethora of visualizations. Gannett (1898) shares colored bar charts, pie charts, mapping systems, and other methods to his latest atlas. The eleventh census, 1890, included topics from his prior book; however, there is a change in how he displayed the data. When visualizing the populous cities, he maintained the structure from the prior atlas, but he removed the arrows and bars that aided in highlighting their growth (Figure 62). He replaced those with colored patterns and thin, non-distracting lines. Gannett relied on pie charts to tell the stories of religious

affiliation and foreign-born population. The visuals are arranged at different scales and the hues vary in contrast. On another page, multiple visualizations are grouped together, where pie charts and bar charts compete to tell their story. It seems Gannett embraced what he started and attempted to display the benefits of visualized data for future generations.

### ***Educating through Diagrams***

As we enter the final decade of the 19<sup>th</sup> century, diagrammed visualizations are gaining ground. Harriet and Helena Scott, sisters who replicated flora and fauna for scientific publication, obtained recognition in Australia for their illustrations. Working alongside their father, A.W. Scott, who supported his daughters and wanted them to receive the prominence they deserved, the sisters developed their skills and learned to painstakingly replicate the smallest details found in their subjects. They not only exhibited a variety of species, but they also visualized the transformations (or phases) plants and insects experienced over time. The sisters' work was published throughout the late 1800s, and multiple versions were often released. Their work is celebrated in the science fields but not often mentioned as contributors to the field of information design (*The Scott Sisters*, n.d.)

David Rumsey's map collection is not limited to cartographic visualizations; he also includes diagrammed work. It is through this that we're introduced to Robert Stawell Ball. As part of his *Atlas of Astronomy*, Ball attempted to represent the moon and planets. In 1892, Ball created a spread where an outline of the moon sits on one side and the facing page displays a more realistic representation of the moon in the same position (Figure 63). A key is provided so viewers can connect the numbered areas, where craters are identified, with their position in relation to the realistic representation. Ball identifies other non-crater terrain, such as the moon's mountains. His spread allows

viewers to educate themselves about the moon while simultaneously comparing the size and position of the craters (Ball, 1892).

Another piece identified by David Rumsey is the diagrammed work of Levi Walter Yaggy. His 1893 diagram displays the earth's geologic rock layers. Using color, Yaggy displayed each section with their accompanying era, period, epoch and development description (Figure 64). He achieved this by providing a cross-section view so the oldest layers can be compared with the newest layers. This method is similar to the visualizations we saw from Humboldt in 1807. In addition to the rock layers, Yaggy provides a painterly portrayal of the sky with clouds. He does this to educate viewers about cloud classifications, which he lists at the bottom of his work (Yaggy, 1893). Yaggy, like the Scott sisters and Ball, created diagrams with such depth that viewers must examine every detail to uncover the numerous layers of content being visualized.

The diagrams previously discussed educated the audience by comparing phases or outcomes over a period of time. Etienne Jules Marey is no different as he uses a diagram method to address movement. Tufte (2001) once again highlights Marey, who is applying a different method when compared to his prior work. This time, he is studying motion. His research has him examining horses as he captures their steps, gait styles, and shoe markings to understand their physiological movement. On a single page, he documents the markings made by the horses as they changed the speed of their movements from an ordinary walk to a gallop. The variety of hoof prints allows viewers to compare the positioning, distance, and frequency based on the pace. It is a simple, yet effective way for Marey to share his findings. His diagram aligns with the work we saw from Tomlinson in 1735 and Muybridge in 1878. Diagrams have proven their worth and continue to be a lasting method. While maps, timelines, and charts have been favored throughout the centuries, diagrams have proven to be an equally important method.



## OVERVIEW OF 18<sup>TH</sup> AND 19<sup>TH</sup> CENTURIES

Contributors from the 18<sup>th</sup> and 19<sup>th</sup> centuries were a heterogeneous group who sought to transform information. Their collective wisdom allowed the field to evolve, and they understood that visuals were the fastest way for content to be disseminated for further consumption and understanding. While the intention of each contributor may differ, methods and themes unite them and forever connect their stories. While most of the progenitors worked independently, for some, we found collaborations or were provided instances of direct and indirect influence as they developed their work.

In various parts of the world, we saw themes and similarities in subject matter. Whether our progenitors may not be aware of their impact, the field was being propelled forward by their contemporaries. The bulk of progenitors often hail from the United Kingdom, but we've seen work developed from Germany, Italy, France, Canada, Australia and the United States. From these geographic locations, we saw themes advanced based on the local issues, whether they be about illness, economy, history, or geography, to name a few.

In examining the expansion of information design between these centuries, we observed that the 18<sup>th</sup> century was much more reserved. Visualizations fluctuate as they are either created by hand or in combination with printed details. Color is implemented, but much more sparingly during this century. Visualizations are primarily qualitative, and most are accompanied by written content, some more than others. The scale of work is wide-ranging, as some pieces are capable of being held in hand while others are extremely large and require multiple parchment pages — some of which mimic large tapestries by concealing or adorning a wall. Most of the works during this time period are produced by males. However, women were present in the 1700s but hidden due to

societal rules. While their impact may be direct or indirect, their contributions still assist in the development of visualizations being produced.

By the 19<sup>th</sup> century, there appeared to be monumental growth. Methods seem familiar but have clearly evolved to take on more meaning and visual layers. Religion, history, economy and geography are still popular topics, but a few new ones emerge. The visualizations, in some cases, seem more refined with works being outsourced to engravers and printers, but that's not to say work by hand has disappeared. They, too, exist and are finding their place in this new century. Color seems abundant now and is used heavily during this period. The size of the work remains diverse. Men remain the most visible contributors, but when one takes a closer look, the number of women who have a hand, whether direct or indirect, in producing information design visualizations surges. In some cases, the women produce their work independently, while others continue to collaborate with men. There is also a push from women who produce their visualizations specifically for academic texts and social reform. By the end of the 19<sup>th</sup> century, women began to rival the work of their male counterparts. They demonstrate how they are equally competent and talented at handling data for visual translations and interpretations.

We have now established a holistic view of methods, themes and contributors from the 18<sup>th</sup> and 19<sup>th</sup> centuries. The knowledge they left behind and the work they invented exhibits their interconnectedness (APPENDIX C and D). Without their developments, failures, success, and lessons, Information Design would not exist in the present day.

## CHAPTER 3

### METHODOLOGY

#### INTRODUCTION

Since information design is a blend of disciplines, understanding its origins means examining it from various perspectives. It is not enough to rely solely on the content provided in textbooks or online sources. Instead, one needs to expand their knowledge beyond a literature review by researching the design community itself, which includes educators, practitioners, and students. The community plays an active part in identifying how much we know about our history and how diligent we are in researching the breadth of our field. Even if we are successful in building a succinct historic record, additional steps must be taken to broaden the view. This is accomplished by adopting methods from other disciplines and applying them to this research to enhance the documentation of information design's history. For this, the researcher turns to archaeology and cultural studies. Using these methods in tandem will produce a well-rounded view of historic information design. Additionally, through the incorporation of data collection methods, new or unknown details about the field will come to light.

#### LITERATURE REVIEW

In order to understand the documented history of information design, a review of numerous books, journals, and websites has been researched. The focus is on the 18th and 19th centuries; however, dates that pre-date or follow these time periods will be studied to determine how they impacted the spread of information design. Resources that explore similar fields of study will be reviewed to better understand who contributed to the history of information design. Books that offer theories or methods from fields

outside the realm of design will be examined to potentially guide the research down paths previously unexplored. These include texts from the fields of archaeology and cultural studies, as both provide methods for collecting, analyzing, and interpreting information to construct a history. Patterns or techniques for uncovering lost material will act as stepping-stones and ultimately identify networks that broaden our view beyond the European model we are all too familiar with.

### CULTURAL HISTORY ANALYSIS

Visualizations will be evaluated based on techniques from the field of Cultural History. When dates or other identifying information is not present, reviewing topics affecting society (or the visualizations produced by a specific group) will reveal details about their lives and interests. An analysis of various collected works, such as charts, maps, diagrams, and illustrations spanning the 18<sup>th</sup> and 19<sup>th</sup> centuries will disclose aesthetic and topic/subject patterns between designs and designers. The analysis will require the creation of a form to document and categorize all collected/reviewed works by historic information designers. The cultural construct will explain how their desire for visualizations impacted them and the communities they lived in. Additionally, a humanistic viewpoint may be developed which could allow modern designers to understand the circumstances of their predecessors. A cultural analysis will divulge general motivations, contributions, and topics that allowed this field to come to fruition. It will be possible to determine what topics our progenitors favored, what methods they explored, and how frequently they aligned or diverged from others practicing similar techniques. From this, a story can be constructed to elaborate on the indelible mark these individuals made and left for those of us in the future to uncover.

## SURVEYS

To understand what educators, practitioners, and students know about information design's history, two online surveys were created to identify areas of knowledge, areas of opportunity, and where they lack information. Each survey is tailored to the focus group, meaning students would not be asked questions that are better suited for educators and practitioners. The surveys address what time periods the respondent is familiar with, how many contributors they are aware of, how they incorporate history into their work (if at all), when they were exposed to historic information design (if at all), and what they consider to be elements of historic information design. Multiple surveys will be sent out with the intent of collecting 30–50 responses in total. From the collected responses, one can deduce the modern view of historic information design and compare that to the intent our ancestral contributors sought to bring to the field. It will also reveal responses that can aid in understanding how the field is evolving for the future of the discipline.

## INTERVIEWS

Semi-structured interviews in questionnaire form will be conducted with modern Information Design educators and practitioners, which may shed light on their knowledge of the field's past. It is imperative to interview educators and practitioners as they are the individuals currently shaping the field. Understanding their views and mastery of information design history will support or argue against the need to identify the field's origins. The opportunity to hear from professionals will aid in determining what eras are well-known and which ones are absent from their knowledge. Additionally, it will allow the researcher to determine which practitioners (past and/or present) have influenced these individuals in their own work. In having the interviewees share their expertise, it may be possible to document their education to understand where they are

getting their information from, whether it be due to their educational background or if they are self-educating based on experience or via documented resources.

#### PHOTO ELICITATION ACTIVITY

The anthropological technique of photo elicitation will be implemented to collect data from student designers. Documenting their identification, analysis, and understanding of various visualizations will uncover individual working knowledge of historic information design. According to Collier, Jr. and Collier (1986), “open observation, recording, and analysis are essential for the discovery of the new and unforeseen.” Essentially, this method allows the participant to express their thoughts and/or views without restricting their opinion, as there is no right or wrong answer. The collected responses will support or eliminate assumptions made by the researcher as well as provide the researcher with additional avenues to explore.

It is important to incorporate visuals into this research since our field is image-based. The photo elicitation activity will be conducted with students in group settings or individually. Four samples of work from various historic time periods have been selected for their diversity as well as their creator. Since this is more of a free thinking and open commentary type exercise, it will be used to see if the participants can link past works to the present. The goal is to determine if students can connect methods, identify layers, and understand content based on when the works were produced. Observing the participants aids in understanding what they are and aren't familiar with.

## DOCUMENTATION SYSTEM

Historic works are often categorized either by chronological order, by method, based on profession, or by creator. However, to demonstrate that the designs can be analyzed further, a new system should be tested. Context recording sheets, used in the field of Archaeology, will be modified to catalog the visual works collected for this research. As visualizations are encountered/discovered in the research process, they will be analyzed, and the information will be chronicled. The visualizations will be compiled and entered into a matrix system so that they can be classified in numerous ways. The goal of the new documentation approach is to allow for flexibility in identifying work that may contain multiple themes and/or methods — due to an extensive number of contributors who dabbled in multiple professions. The depth of information will now be amplified because overlap is allowed to exist, rather than confine a visualization to one category. Additionally, by documenting works using this system, researchers have a greater chance of identifying similarities and connections across time. Lastly, researchers have the ability to add new themes or adjust the document if additional changes are required for future studies.

## CONCLUSION

In order to accurately determine how Information Design from the 18<sup>th</sup> and 19<sup>th</sup> centuries has impacted modern knowledge and application of this field, a literature review should reveal how much information is presently known about the field from those centuries. That information will then be cross-referenced with data collected via surveys and interviews with present day practitioners, educators, and students. An analysis of the responses from photo elicitation will be used to identify assumptions, reveal an understanding of the field's history, and call attention to fallacies. The collected

data will then be reviewed to determine if cultural networks exist to illustrate how the field expanded and/or narrowed over time based on theories and methods from the originators. This thorough evaluation will either establish support of this research, identify misunderstandings within the field or the research, and/or identify areas of opportunity for further discovery.



## CHAPTER 4

### ANALYSIS

#### INTRODUCTION

A literature review provides insight as to what is known about historic information design today; however, it also reveals areas of opportunity where problems or limited information continue to exist. Examining these issues will further demonstrate why it is important to delve deeper into our roots and overcome barriers that hinder our growth. That said, we cannot rely solely on what has been published in books or online. The design community itself plays a direct role in our collective knowledge, so we must incorporate them into this research process. Connecting with practitioners, educators, and students will uncover when historic education starts, stops, and/or continues. The assumption would be that students learn about information design in school and apply it to their future careers but, if individuals were not exposed to information design in school, then how did they learn about it to practice or teach it today? Are they familiar with its history or do they have a limited story? These are the questions that require answers if we, as a field, are to develop a sense of community to understand where we came from and how it drove us to where we are presently.

By analyzing the literature review, a cultural history analysis was conducted to deepen our understanding of the contributors. Collected responses from participants, administered via surveys and interviews, were documented and patterns started to emerge. Finally, an evaluation of the proposed documentation system used for this research was executed. While the responses represent a small sample of our field, if amplified in the future, it will be interesting to see if the patterns hold or evolve. There are distinct areas of opportunity to be addressed as our field progresses. For the purpose

of this research, the findings will serve as a starting point to guide our community as we establish a suitable, authentic way to present the story of our origins.

## RESULTS OF ANALYSIS

The literature review revealed that visualizations during the 18<sup>th</sup> and 19<sup>th</sup> centuries were produced independently or in collaboration with others. Often, we do not hear about the unsung heroes who ensured that information evolved from written words to visual works. Cartographers, physicians, astronomers, and statisticians are just a few of the people who created visualizations. We should not neglect their contribution, no matter how big or small, because without their talents, the works we take for granted would not live in the books or on the screens we view today.

If we examine the activity of the originators during the 18<sup>th</sup> and 19<sup>th</sup> century, we can see the growth they experienced simply by documenting when works were produced (Figure 65). At once, we see all the years where works were documented, based on content accumulated for this dissertation. The ratio of gray to red indicates that information design was emerging in the 1700s, but it soared in the 1800s due to the escalation of visualizations.

It is also important to identify what years were the most productive. This was accomplished by highlighting the periods when two or more visualizations were produced in one year (Figure 66). We can see, based on the pieces collected for this research, which times were fruitful. The 1800s, without question, had moments when our forebearers thrived. In the previous timeline, we see singular contributions, but these instances of multiple contributions validate that in the 1700s few works were being produced and, when they were, it was toward the middle to end of the century. By the

1800s, multiple works were not only being generated, but they were dispersed more evenly throughout the century.

From this, it became important to uncover how many of the works, whether created in the 18<sup>th</sup> or 19<sup>th</sup> centuries, were produced by the “celebrities” of historic information design. These individuals are well-known and often repeated in print and digital resources. If we look solely at their contributions, we can see there are visualizations, beyond theirs, to discuss (Figure 67). This timeline confirms that these individuals were active but not to the point where we should rest our historic lineage solely on them. While quite a few created numerous works, it was often part of a collection within the same year. Therefore, their activity tends to be limited to a certain time span. Only Playfair and Minard work frequently over multiple years. Priestley and Snow have even less representation in the timeline, yet they are revered for their contributions. Why is this important for us? It is proof that we limit and ignore much of our history. If we focus on a few, we, in turn, get an inaccurate representation of our lineage. Furthermore, it is evidence that design researchers have parroted our history rather than try to decode and preserve the work of our predecessors. Reciting the same names and visualizations is a bad habit — one we need to remedy to broaden our story, solidify our place in history, and observe the connections that tie our past to our present.

A similar probe was conducted to compare the creation of works by gender (Figure 68). This is important since men often receive recognition over women. Whenever work is produced by a man or woman, it is signified. Some shapes display both colors to represent a year when both sexes created work, either independently or in collaboration with one another. What information design enthusiasts may expect to see is a sea of blue. While the hue does dominate, it is peppered with flecks of pink. Women show up in both centuries, but they really take hold in the 19th century — particularly in the early to mid-

1800s. It is vital to inform those in our field how women participated in the development of our discipline. Not only because they earned the right to be respected for their contributions, but because they have been overlooked, undermined, and treated unequally for far too long. As information designers, it falls on us to right this wrong — especially if we are to encourage people of all genders to play a part in the future of information design. They need to see that they won't be silenced or kept hidden as contributors. Therefore, by honoring the work of the women, we set a standard to be modeled for future individuals, no matter their gender identity, to adhere to.

From this overview, we finally obtain a glimpse at the magnitude of our discipline. The richness arises from the depths and starts to introduce us to long suppressed content. As we learn more, and begin to recognize patterns to produce new storylines, we see how significant the 18th and 19th centuries are to our discipline as they guided our field into the 20<sup>th</sup> and 21<sup>st</sup> centuries.

### CONNECTIONS BETWEEN CONTRIBUTORS

We know a multitude of individuals invented and imparted method(s), no matter if their contribution was a success or failure. Yet, we tend to evaluate each pioneer individually instead of looking for associations — whether it be a direct or indirect connection. A few individuals are documented as having met or influenced one another (Figure 69). Knowing about these influences can help connect the dots between contributors and their applied methods or it can aid in sharing how the field grew.

As we learned from Rosenberg and Grafton (2010), Joseph Priestley was directly influenced by Thomas Jefferys. Priestley's method, however, aligned with the uniform timescale, as described by Meirelles (2013), of Jacques Barbeu-Dubourg. According to Davis (2017), both Barbeu-Dubourg and Priestley were friends with Benjamin Franklin.

Based on the findings of Rosenberg and Grafton (2010), Priestley was admired by Franklin and his fellow American Thomas Jefferson. Therefore, when Priestley left England due to “political and religious persecution,” he ended up settling in the United States, specifically in Pennsylvania. This is interesting because we now have a connection between European and American practitioners who influenced each other. Rosenberg and Grafton (2010) found that “Priestley’s career was closely followed in the United States, and many of his works left a substantial mark.” We can speculate that this group of men may be responsible for creating a bridge between two continents as well as encouraging one another to promote their ideas regarding visual representations.

Another documented gathering of like-minded people who may have collaborated and/or contributed to the development of historic information design are members of the Lunar Society. An exclusive group, the Lunar Society was an assembly of English intellectuals who met between 1765–1813 (Johnson, n.d.). It has been documented that William Playfair interacted with a few of the members, specifically James Watt, Matthew Boulton, and Joseph Priestley. The individuals of this group, it is believed, assisted in influencing Playfair’s creations (Spence and Wainer, 2017). However, while the Lunar Society was composed primarily of English men, and at least one known woman, there were peripheral members from the United States; they included Benjamin Franklin and Thomas Jefferson (Johnson, n.d.). Once again, the paths between information design contributors appear to align. As the connections among people grow, so does the exposure to visualization methods.

Alexander von Humboldt, who contributed works during the 19<sup>th</sup> century, was notably inspired by Playfair. Humboldt’s work accentuates the benefits of charts and illustrations by following Playfair’s lead. Humboldt translated data from scientific documentations and transformed them into discernible visualizations. Humboldt was

also influenced by Heinrich Berghaus, “who produced an atlas that accompanied Humboldt's bestselling book *Cosmos*” (Wulf, 2016). These connections demonstrate how individuals from neighboring countries were influenced by one another. Furthermore, it exemplifies how our progenitors actively developed visual content with their fellow contributors in mind. The influences did not stop there as Humboldt himself went on to influence practitioners. As previously mentioned, Princeton University Library’s Thematic Maps Collection (*First X, Then Y, Now Z*, 2012), found that Guerry referenced both William Playfair and Alexander von Humboldt in his published works. Andrews (2019) found that Nightingale used methods originally created by Playfair and her Polar Area chart aligned with visuals by Guerry. Nightingale also collaborated with another forebearer, physician William Farr, as they both strived to develop health-related works. Harvey (2020) points out that Nightingale wasn’t the only woman influenced by her male counterparts. She found that Emma Willard and her sister Almira Phelps were motivated by the work they saw from Humboldt. His visualizations aligned with their goals and desired methods for educating people about history and botany.

Funkhouser (1937) revealed that Charles Joseph Minard, a champion of visualizations who embraced the movement and furthered its progress in France, mentions the work of an Englishman, Layton Cooke. It is said that in the early 19<sup>th</sup> century, Cooke was responsible for producing “large tables of colored curves” when displaying the yearly price of wheat. Regrettably, Funkhouser (1937) was unable to find any writings by Cooke in the early 1800s, but he did find publications from 1828 and 1844. Despite not obtaining hard evidence of Cooke’s graphs and work with smooth curves, there is written acknowledgment of him having existed and potentially influencing Minard.

Toward the end of the 19<sup>th</sup> century, we still see examples of methods being replicated after inspiring another creator. Charles Booth, born in Liverpool, England, became known for his social investigations about British society. Due to his work, he was known to travel between England and the United States. His maps were thematic, color-coded areas based on his research about poverty, trades, and religious influences (Charles Booth's London, n.d.). "Booth was known for his colorful, infographic-like charts that brought data to life" (Blakemore, 2016). Approximately six years after Booth's *Life and Labour of the People in London* was published, the Hull House Maps and Papers were released. Like Booth, they used a thematic map and applied a colored legend to highlight the social conditions of residents living in Chicago, Illinois (*Women in Cartography*, n.d.).

## ISSUES

Modern designers have a litany of grievances regarding gender representation, the origins of methods, terminology, and the elements of visual content used to represent historic information design. Disagreements can be found in books or via digital blogs and forums. Most disputes appear to be based on personal preferences, the type of education the writer received about information design, or how they approach information design. Opinions should not interfere or suppress our historic past.

### **Limited Female Representation**

Recently, Dina Benbrahim's article about feminism in graphic design posed an important question: "Why are women's contributions to society systematically overlooked and obscured?" (Benbrahim, 2020). Presently, researchers are delving into archives and other resources to unearth women's contributions to design. Yet, it is hard to discover details when women were hidden, ignored, and deemed inferior for so long.

This creates an inaccurate impression that women did not have an impact on design, when it is quite the opposite. As Benbrahim also points out, we need to acknowledge that the women, whose work is documented, are most likely a fraction of those who actually contributed because we are noting those who were able to be seen, published, or heard (Benbrahim, 2020). Women of color were most likely not documented and finding them for this research is quite challenging to say the least. A collection of women involved in information design have been addressed, but more must be done. It will take resources beyond the scope of this dissertation, but we would be remiss to overlook the contributions of these trailblazers. We must recognize that they exist as they helped construct information design.

Evergreen (2019) stresses the challenges women face by working in a male dominated field, both past and presently. However, she also underscores how women, Florence Nightingale, in particular, are used as the token woman — to make the field appear inclusive and offer gender diversity. She uses Nightingale as the prime example due to most sources including her as the sole female contributor of historic information design. In reality, while limited documentation may exist, we have seen that women played a much deeper role than what is presented in most writings. Evergreen (2019) points out that history tends to be dictated by white men who "cull these lists of historically important figures and decide whose stories will be remembered, whose work will become 'foundational'." While Nightingale's story has succeeded in being retold, it is still limited to her Polar "Rose" Chart, rather than speaking of other accomplishments she achieved. Present day men still blog about her work and scrutinize her contributions. Some authors are quick to compare Nightingale's visualizations to her male counterparts — to discredit her visualizations and somehow deem them less worthy. Credit should be given to those who contribute to our field, no matter their gender, ethnicity, or



nationality. To be torn down simply because they weren't the originator of that method or the best version of it is nonsensical. Many visualizations have undergone evolutionary changes and that information should be used as an educational tool or inspiration for our personal growth. If we continue to dishonor historic contributors, we are actively eliminating portions of our history and discriminating against people who contributed. Evergreen (2019) states, "When history is written to uphold the dominant power structure time and time again, it's no wonder we get the visualization history that includes cis white men and the token white female."

By the 19<sup>th</sup> century, women began to contribute to the field of information design in a way that was not possible before. The field of education was one that allowed women to share their ideas and pass their knowledge onto the next generation. With the help of Alice Hudson's research, finding documentation about women is now possible, but it still focuses primarily on women in cartography. A few women outside of mapmaking have been identified, but expanding our understanding of female contributions will require more research in the future. Women rightfully staked their claim in history by presenting work that was just as successful as their male counterparts. However, there are only two, if not three women, who tend to be mentioned often, even though, as we saw, more played a significant role in the development of information design. Perhaps this is because many were developing their skills in unassuming ways. Most women developed their methods in school and applied them in the academic realm. These women should be acknowledged and not dismissed because they are the ones who educated the practitioners who advanced the field into the 20<sup>th</sup> century.

## Comparisons and Origins

Many resources recycle the works of specific men. In doing so, we focus on a handful of individuals and use them as a model to judge others. Nightingale's work has been admonished for not presenting an original thought and was, therefore, seen as simply copying the work of another. As previously noted, once methods were invented, they often evolved. Repeatedly, the literature review revealed that contributors tested ideas which led to improvements or unsuccessful attempts to adapt a method. Excluding, overlooking, or pitting forebearers against one another serves no purpose — especially when individuals making such claims are not fully informed about the origins or method.

Schaffzin (2014) wrote an article saluting information designers from the 19<sup>th</sup> and 20<sup>th</sup> centuries for their contributions. He expressed that their work will most likely influence present day practitioners. Interestingly, while acknowledging that only males were listed, he admits the removal of Florence Nightingale. He wrote,

The exclusion of Florence Nightingale from this piece is solely based on the fact that she is neither mentioned in Tufte's work, nor do I consider her to be a guiding figure in the information design field. I do, however, consider her to be extremely important to the world of science and healthcare. It is worth noting that her famous "rose" visualization of causes of death in the Crimean War has been criticized as a rather deceiving (more so, perhaps, than the standard information design) (Schaffzin, 2014).

The reasons for exclusion are weak, to say the least. While Tufte is an authority on historic information design, there are many celebrated works that are not published in his books. We do not ignore their existence nor contributions to the field simply because he has not incorporated them into his writings. While many historic contributors do not hold the title of information designer, that does not mean they go unnoticed.

Cartographers, doctors, statisticians, astronomers, engineers, and many more professions were involved in the construction of this field. To say Nightingale is important to healthcare but not information design, despite doctors being included as historic contributors, is absurd. To then take it a step further and demean her contribution, by highlighting how her work has been perceived as deceiving, is illogical—especially when numerous visualizations have shown signs of being inaccurate, in terms of concept or representation, but are still part of the historic information design lineage.

As historic visualizations are revealed and documented, it's not uncommon to find that their "original" idea wasn't as unique as everyone thought. According to Popova (2017) Caroline Herschel was recognized as "the world's first professional woman astronomer." She is celebrated and it is noted that she came before America's first female astronomer, Maria Mitchell. However, Popova (2019) later found that another woman predated Herschel's work by a century. Maria Clara Eimmart was a German astronomer as well as an artist and engraver. Her painted works diagram visual phases or phenomena related to the moon, sun, and stars. While their work may not be identical, they studied in the same field, both visualized their discoveries, and they most likely had concepts that paralleled one another.

Interestingly, one of the most celebrated individuals, John Snow, who famously detailed the spread of cholera, used a method that was not original. While it may have been new to him and admired for its effectiveness, the truth is that Valentine Seaman used a similar method which predated Snow's work by 50+ years. In fact, the literature review revealed medical mapping was actively being applied during the 18<sup>th</sup> and 19<sup>th</sup> centuries. We know this due to the works of Thomas Shapter in 1849, Williams in 1849, and Heinrich Berghaus in 1852. It is natural to compare analogous things. However, assigning superiority and echoing the same names time and again undermines the

advances we have made and wish to make regarding our history. In doing so, we suppress lessons that may assist future designers in understanding why methods vary and how to make methods more effective.

Many in the field of information design shower William Playfair with numerous accolades for his development of methods. He should be honored for his copious contributions to the field. His visual approaches were groundbreaking. Nevertheless, even Playfair may not be as “original” as we portray him to be. Funkhouser (1937), when discussing early graphic representations, mentions Nicole Oresme, also known as Nicolaus Horen, who was a mathematician that lived during the 14<sup>th</sup> century. Oresme’s work explored variables that, when plotted, “bear a resemblance to a crude form of bar graph.” Funkhouser believed that if Oresme was provided contemporary data, then “we might have had statistical graphs four hundred years before Playfair.” While this obviously did not occur, it does challenge our thinking in terms of origins. Additionally, it requires designers to expand their knowledge into fields outside of our own to understand where and how graphic content has been applied. In addition to Funkhouser’s finding, Spence and Wainer (2017) point out that Playfair’s brother, John, created line graphs but did not publish them. William Playfair would be the one to link economic data with line graphs and publish his creations. Interestingly, William would document the origins of his line and bar charts; however, he did not do the same for his pie charts. “It seems almost certain to have derived inspiration from the logic diagrams of Leibniz and Euler (Spence 2005), but it is likely that pies, circles, and intersecting circles were such simple and familiar forms that Playfair did not think that explanation were necessary” (Spence and Wainer, 2017). Highlighting these discussions about his application of methods is not stated to diminish his contributions; he will remain a

primary developer of historic information design visualizations. Simply, it is to say that even the greatest contributors in our field often had help or were inspired by others.

Learning the lineage of the field is how we can pay homage and memorialize those who made contributions. We shouldn't invalidate work simply because it is not considered original. Instead, works by all contributors aid us in seeing the evolution of methods and provide insight into how those visualizations transformed.

### **Competing Terminology and Approaches**

One of the biggest challenges faced by designers in the field of information design is terminology. Since Information Design is vast and found in an array of disciplines, each claims the movement as their own and with that comes custom terminology. Research has revealed that many of the names have similar meanings, but nuances, pertaining to the field they are derived from, are what make them different. Even Funkhouser (1937), in his writings from the early 20<sup>th</sup> century, observed that “ambiguity and confusion” occurred amongst early practitioners due to their “lack of knowledge of the background of the subject and ignorance of the work of others in the field.” Sadly, this issue has carried forth into the 21<sup>st</sup> century, as Babwahsingh (2010) has noted in his observations. He stated, “What was once an unrecognized field with relatively anonymous and unwitting practitioners is now a diverse constellation of fields brimming with their respective experts, gurus, and evangelists.” Both men reinforce that our heterogeneous field has yet to overcome our limitations regarding the documentation of our progress. Interactions between professionals remain muddled as field-specific terms overlap and cause confusion. Rather than unite to respect our creative invention and understand our heritage, we battle one another. The titles of practice used today include data science, information architecture, data visualization, information systems, and communication design. The work produced from these fields is what defines their

interpretation and contribution to information design. However, another problem exists and that is, for some, these terms aren't seen as different names but rather as subcategories of information design. As practitioners, educators, and enthusiasts continue to grapple with what constitutes information design, we, as a field, will remain inconsistent.

Rather than juggle multiple labels, Gadney (2012), narrows the issue of terms into two camps which he has called Data Visualisation and Information Graphics. The former lends itself more to complex information that will require extra work from the viewer to identify the meaning. The latter is visually engaging and allows users to decipher its content quicker. He also highlights the ongoing debate of how information design is approached. In the 20<sup>th</sup> century, it seems to have begun with Edward Tufte and Nigel Holmes before being carried forth between Stephen Few and David McCandless. Tufte famously deemed unnecessary adornments as “chartjunk” (Tufte, 1990). It's no coincidence that he uses work by Joseph Priestley, from the 18<sup>th</sup> century, to demonstrate how data will leap off the page if unobstructed by décor. He did this knowing that Priestley avoided such embellishments and refrained from producing decorative works, such as the qualitative timeline by Jonathan Cummings in the 19<sup>th</sup> century. The debate carries on into the 21<sup>st</sup> century and shows no end in sight. Cotgreave (2016) believes that the information design community suffers, at times, from having uncompromising views when it comes to how one approaches visualizations. He believes that the field's creativity may be suppressed as the community argues over the right or wrong way to develop their work. Babwahsingh (2012b) notes, “Among blog comments and discussion threads, it isn't hard to find examples along the entire spectrum of online social interaction, from passive ‘likes’ and nods of approval to ‘trolling’ and other forms of aggression.” It is unfortunate that practitioners attack one another rather than learn to

find a balance or areas of commonality. Funkhouser (1937) noted this growing issue when the use of graphs became widespread in statistical presentations. He stated, "...the problems met in trying to classify and standardize graphic forms have been wrestled with for almost a hundred years." Babwahsingh (2010) summarizes our challenges by providing five concerns that contribute to the field's inability to overcome our identity crisis. He believes the absence of a field-wide definition, no clear boundaries, giving prominence to execution over analysis, limited formal education programs, and a lack of quality resources that provide a lasting benefit are what hinder us.

### CULTURAL HISTORY ANALYSIS

When reviewing history, time is often the driving factor. We place works in chronological order to bring meaning to content as it evolved from past to present. However, time can be a hindrance to the advancement of a topic when information is missing. With historic information design, numerous collaborators enter and exit the field with such speed, it's hard to track their contribution on a linear path. Additionally, most contributors were multidisciplinary, so it is challenging to find them when they switch to a new specialty or profession. Lastly, with the focus of this research being on the 18<sup>th</sup> and 19<sup>th</sup> centuries, documentation of content from those eras is often missing details, whether it be dates, names, descriptions, or production information. With that said, a chronological representation of information may be a good start, but it may not reveal as much as one would hope. This is where a cultural analysis can help elaborate on the meaning and accounts of people, places, and artifacts.

Clifford Geertz often reviewed work through an anthropological and ethnographic lens. Natalie Zemon Davis used context analysis to identify what occurred to shape a particular event or time period. Both individuals encourage researchers to find

meaning by uncovering sources that may explain what shaped a culture or social system. If we apply these techniques to further examine the collected content, we can see that our predecessors were driven to appeal to basic human instinct by translating visual information into content viewers can easily understand and internalize. Furthermore, since we have found comparable topics between the 18th and 19th centuries, we can conclude that the works produced aided in sharing discoveries, health, history, religion, and so much more about the world beyond their towns, cities, states, and countries. A cultural analysis also helps us to acknowledge our misguided attempts to develop a history. Geertz once stated that “constructions tend to be based on the constructions of others” (Geertz, 1973). This is an important statement as it explains why regurgitated visualizations occur. We continue to pick up where the last researcher left off and recycle forebearers, such as Priestley, Playfair, and Minard, rather than take the time to explore who predated or followed them. Davis (1975), on the other hand, challenges researchers by suggesting that research is never fully complete. She suggests that questions build upon established findings and lead to more questions being asked. These unlimited inquiries steer researchers to investigate new connections between people and assist in revealing networks. In her research, Davis focused on the communication trail of books, but if we apply that to visualizations, specifically the methods applied, we can see how they evolved. We can also inform ourselves about whether methods were applied to a variety of situations, and, if so, what was the potential effect they had on the public or specific disciplines. For example, we know that many medical-based visualizations, such as ones highlighting the spread of illness, demonstrated that our progenitors were interested in developing methods to identify how sickness was transmitted. By applying Davis’ context analysis to the medical mapping method, the researcher was forced to consider the following: what was the contributors’ occupation? Where were they from?



When was the method first attempted? What lessons were learned from successful/unsuccessful iterations? Whom did the work influence? How often was this method applied over time? The answers create a stronger narrative and encourage connections between forebearers to be made. It is also through the methodology presented by Davis (1975) that impels researchers to question what is already known about historic information design. For example, in asking ourselves who contributed to the field, we've learned to look beyond the dominant male European standard to reveal female practitioners. Additionally, we must acknowledge that information design is a worldwide phenomenon. While Europe may be considered the heart of historic information design, we now know other nations were experimenting with visualizations and applying them prior to, concurrent with, or after the European contributors. This allows us to expose the roots that connect us from our present to our past. It also encourages us to expand our perspective and investigate historic information design found in countries we often omit.

If we delve deeper into our cultural exploration, we may use works produced by Michael Warner and Leora Auslander. These two individuals provide methods used for analyzing a group and determining how those within the group can not only transmit information but use that connection to develop a culture. The groups can work independently but are capable of crossing boundaries to produce change. According to Warner, the world consists of spheres. Using his book *Public and Counterpublics*, specifically his first chapter titled "Public and Private," Warner established that spheres exist to demonstrate how groups of people behave, learn, and share information. Each sphere offered something different as people enter and exit the spheres from their public and private life. He states, "Public and private sometimes compete, sometimes complement each other, and sometimes are merely parts of a larger series of

classifications...” (Warner, 2002). With this in mind, we can see that various spheres exist in historic information design. There are spheres where our progenitors' created works for public and private consumption. Therefore, information is transmitted for large audiences and/or for independent review in a private space. Additionally, we can view the field in spheres. There are the European contributors in one sphere, Americans in another, and additional contributors we have yet to review in various locations around the world. Some of these spheres had our ancestors entering and exiting regularly while others never came into contact but are still part of the information design community. The creation of visualizations through these various spheres proves that historic information design's culture was global. The spread of their beliefs, methods for visualizing content, and application of it through numerous channels indicate how driven the community was to develop a visual system for public consumption. In addition to identifying spheres, Auslander's research on cultural revolutions may help us to identify how contributors engaged with one another and/or how the methods they invented have carried forth to remain effective in the present day. She points out “... history can be made by objects, rituals, and practice” (Auslander, 2009). We know an appreciation for methods and practice existed among some of the field's progenitors. They pushed one another by advancing early methods. This is confirmed by the overwhelming number of artifacts in existence for modern researchers to assess. The inspiration, whether direct or indirect, that is carried from one contributor to the next is what connects them. Auslander's research found that visual images can display the identity and interests of a group (Auslander, 2009). We see this occurring in our historic review. We now know the methods and themes applied are what developed the attitudes and the characteristics we see transmitted from the 18th and 19th centuries. Furthermore, we can argue that gaps in our history remain due to a lack of education,

where researchers are not exploring beyond the established scope, and deficient documentation, which addresses our need for a universal system to record our findings. By educating ourselves, we can develop a process to archive historic visualizations, fill in the gaps, and construct a historic thread that connects us from past to present. Understanding our history means asking questions, studying artifacts, connecting methods, and no longer ignoring contributors or artifacts that limit our understanding of our field. If we actively break through the national and international spheres that continue to limit our understanding of historic information design, then we break the silos that prevent us from working as a community.

Two final ways to examine the culture of historic information design are through the methods of Dror Wahrman and Barbara Rosenwein. Both individuals present methodologies to researchers who may not have concrete evidence for their findings but can find patterns. Those discoveries can act as a starting point and lead to stronger evidentiary support. Historic information design is not often studied in this manner, but by reviewing visualizations themselves, more can be uncovered about the creators and the visual stories their work displayed. As a historian, Wahrman (2004) warns researchers not to fall into the trap of producing a “weak collage”. Instead, he urges researchers to start with “repetition in the first degree”. This is when visualizations can be analyzed to find a trend that can lead to stronger support. For topics such as information design, where it is difficult to find existing historic documentation, this method of “repetition in the first degree” means the researcher can collect findings for examination and produce a hypothesis without it having to be proven accurate from the beginning. There is room for flexibility as one starts down the path to discovery. In terms of historic information design, this can help in two ways: 1) to determine if there is a visual pattern amongst the design methods used to represent the information and 2) to

see if the content, or story, portrayed by the visualization provides insight as to what was occurring in society during that period. Moreover, by examining the data and aesthetic characteristics, it is possible to see what was relevant and how that impacted contributors and the public during that time. This methodology was applied and proved successful for works by unknown ancestors as well as for women and lesser-known practitioners. Their visualizations were compared to known contributors to pinpoint how their work aligned with what was occurring at the time and/or how it evolved an established method. Adding Rosenwein's methodology to this research means we can examine the community of historic information designers. Rosenwein (2006) encourages a thorough review of artifacts and places. In doing so, she models how one can develop connections between place and people by reviewing their writing, terminology, aesthetic application, and geographic trends of that community. In turn, she takes that information and uses it to highlight similarities, differences, and key elements that impact the culture of a society. This methodology is what aids researchers in determining how visualizations are applied on a local and/or global scale. If local, they tend to spotlight topics that influenced (or were important) to that community, while global would represent issues affecting areas outside the direct community. Likewise, it may share what characteristics, topics, methods, and accounts the contributors wished to share. When we examine the context of historic visualizations, we can see that 18<sup>th</sup> century visualizations gravitate toward a geographic and historic narrative, but that transitions to education-driven topics and social issues by the end of the 19<sup>th</sup> century. There is also a shift in seeing dense, written word visuals switch to multilayered systems that intermix methods.

Design research tends to follow a scientific format where a problem is stated, a hypothesis is made, and one sets out to test their theory before obtaining their result.

This approach has value, but it can be inflexible and inhibit a richer understanding when facts (or details regarding practitioners) are not available. Adding a cultural analysis to the process ensures that findings are interpreted from a variety of perspectives and gives researchers permission to seek answers beyond the traditional path.

#### RESULTS FROM SURVEYS, INTERVIEWS, AND PHOTO ELICITATION ACTIVITY

Having completed the literature review and cultural analysis, it's necessary to collect data from present day practitioners, whether they be professionals, educators, or students, to discover what they know about historic information design. Initially, the data collection process was to last approximately four months. Not long after receiving approval from the Institutional Review Board (IRB), toward the end of 2019, it was clear that the collection period would have to be extended — as most individuals were focused on the holidays and end of year business. With the IRB granting continued data collection to take place, numbers began to rise in February 2020. Local, national, and international participants kindly shared their responses with the researcher. However, just as replies were on the rise, the world was impacted by the spread of COVID-19, a coronavirus that rapidly halted the routine of everyday life. Globally, as individuals adjusted to this new way of living, feedback came to a sudden stop. While a diverse group of individuals did participate, and the minimum number of participants from each target audience was met, it was apparent how much the pandemic impacted the momentum of the data collection process.

Data was to be collected from participants via surveys, interviews, and a photo elicitation activity. The goal was to obtain a variety of responses, from local to global participants, in order to develop a heterogeneous, macro snapshot of historic information design, rather than a homogeneous response from a specific region. The

researcher felt it was essential to see if historic information design was viewed similarly by designers throughout the world. Additionally, the respondent's information could reveal how information designers see themselves — in terms of being active or passive participants in sharing historic references about the field. This information would allow for future discussions and collaborations to be developed if we are, in fact, part of the same cloth, simply different threads that piece it together. Unfortunately, midway through the collection process, COVID-19 infiltrated all aspects of life, and the collection of data came to a halt. Understandably so, with priorities shifting and modifications to daily life constantly unfolding, a new plan had to be devised. After being reassured by the IRB that the data collection process could continue, participants were once again sought after by the researcher. A few more responses trickled in, but the momentum, pre-COVID-19, was lost. Therefore, while a good sample of results were collected, it is the researcher's belief that the responses would have been greater had we not been affected by the pandemic. The results from each data collection method were carefully reviewed and documented.

## SURVEYS

Prior to COVID-19, multiple surveys were sent to practitioners, educators, and students. Each survey asked questions that were specific to the target audience. Since information design means different things to different people, each participant was asked to share their type of institution, job title, and location. In doing so, a framework of how they view and use information design may be detected. Practitioners and educators received questions that focused on their knowledge of historic information design, their reference or use of it in their practice or teaching, and what their process was when producing work. The goal was to see how familiar they are with historic

information design and what period(s) of time they consider to be “historic”. They also shared what visualization methods they used most often and if, to their knowledge, they believed women contributed to the field. The student survey mirrored the one created for practitioners and educators. The primary difference was for them to share why, according to their knowledge, information design was developed and what methods were used to produce information design. The results will unearth how students are informed about information design, whether they can make a connection between past and present methods, and if they understand the purpose of our discipline.

#### PRACTITIONER AND EDUCATOR SURVEY RESPONSES

Forty-five surveys were received from information design practitioners and educators. One survey was removed from the collected set as it was filled out by a person who did not meet the participation requirements. That said, 44 surveys remained valid and were examined for this study. Of the received responses, 16 came from individuals who worked at a design firm/studio/agency, 15 from a university/college setting, eight were from corporate, in-house designers, three were self-employed, one identified as non-profit, and one from a museum designer. In terms of job titles, there were an array of experience levels: Founders, Partners, Directors, Principals, Associate Professors, Assistant Professors, Lecturers, Instructors, Designers, Production Designers, Design Strategists, Multimedia Developers, UI/UX Designers, and an Innovation Executive. This group of creatives came from various places, both locally and internationally. In the United States, they hailed from: Arizona, California, Colorado, Illinois, Massachusetts, Missouri, New York, North Carolina, Ohio, Oregon, Texas, Washington, and the District of Columbia. Internationally, a few were submitted from London, England and Alberta, Canada. Additional practitioners and educators from various locations around the world

were contacted, but they either ignored the researcher's request to participate or graciously declined to take the survey. TABLE 1 displays the results of this survey.

Practitioners and educators were first asked to identify what time period comes to mind when they think of historic information design. Interestingly, 43.18%, identified the 1900s as the start of historic information design. Only 25% of the respondents felt the 1800s represented a historic time frame for the field. The remaining respondents were divided as 15.91% stated the 1700s, 13.64% recognized the 1600s, and, understandably last, 2.27% indicated the 2000s as historic. These responses indicate that most practitioners and educators are not considering information designs that predate the 1900s as historic. It isn't clear why this is the case, yet, but it does imply that works produced by designers in the 1900s had a greater influence on them and their knowledge. It's possible that respondents were thinking of works by individuals such as W.E.B. Du Bois and Willard Cope Brinton, as both men published works in the early 1900s. If not, responders could have more modern information design influencers such as Edward Tufte and Nigel Holmes in mind. Nevertheless, the crucial factor here is to see that, despite historic information design having ties back to the 16<sup>th</sup> century, practicing designers and educators are overlooking the early works for more recent visualizations.

The survey then asked the participants to identify all the ways in which they search for information design — whether they are looking for examples or inspiration. Professionals stated that Google, at 75%, is their go-to in searching for models of information design. However, it is their second highest response of “Other”, at 59.09%, that received 26 alternatives for finding samples of information design. When the “Other” replies were assembled into groups, it was discovered that most searched: books, libraries (physical and online), databases, Behance, Dribbble, Papers/Magazines (*The New York Times*, *National Geographic*), People (Edward Tufte, W.E.B. DuBois,



Johanna Drucker, William Playfair, Florence Nightingale, David McCandless) and branches of information design (wayfinding, iconography, letterform, science design, diagrams, big data, etc.) were listed as influences. That said, it appears professionals seek information design from more established sources, like books and journals, or search for contributors whom they are already familiar with. Half of the respondents turn to design firms that are known for producing information design. Slightly less than half of the respondents turn their attention to Pinterest. Social media received the least number of votes with only 29.55% referencing it as a source. These responses will demonstrate a primary difference between professionals and students.

When asked how many historic information designers the professionals felt they could name, the majority stated 1–5 historic information designers, at 65.91%. After that, the percentages shift dramatically with the second highest response being 5-10, at 15.91%. Several professionals stated that they could not name any historic information designers, at 13.64%. This is troubling as we often think of practitioners and educators as maintaining a basic understanding of what they practice, which would have had them voting for the 1–5 option, rather than stating “None”. Only 4.55%, which equates to two participants, stated that they could list 10–20 historic contributors. Upon further review, it was found that both design practitioners, who are capable of naming this many, are from England.

The survey next questions whether practitioners and educators feel there is a connection between historic information design and present-day infographics. Overwhelmingly, all but two individuals feel that infographics has a connection to historic works. When examined more closely, it was an educator and corporate practitioner who, in their opinion, does not believe the two have a direct relation. Perhaps, in the future, additional inquiries can be made to determine the strength of the

connection between past to present. Then we can determine if the association between the two is weak, strong, or absolute.

As participants proceeded to the next question, it was requested that they identify when they first heard/learned about information design. In reviewing the responses, it is extremely clear that school plays a massive role in exposing individuals to information design. It's unclear, due to an inability to follow-up to the anonymous survey, whether they were exposed in a minor way, such as through a lesson/assignment, or if this subject matter was their major. Either way, 84.09% confirmed their first encounter with information design comes from the realm of academia. The percentages then drop significantly, and it is found that 18.18% learned of information design through their job. Interestingly, 15.91% stated "Other". These individuals were given the opportunity to expand on their responses. In doing so, they shared that they were exposed to information design through books, newspapers, design conferences, and workshops. One participant stated that they attended a university in Mexico and, for no particular reason, began to follow an emerging major: Information Design. This person found themselves traveling to another city just to attend the workshops offered by information design practitioners. Lastly, 6.82% stated that they first heard of information design through social media. For this small percentage, it's possible that they are new to the field; otherwise, they would have been exposed to work prior to what they encountered on social media.

Next, the survey sought to understand who the respondents feel is/are the contributors of historic information design. Not surprisingly, more than half of the participants felt that men and women contributed to the development of information design. That comes to approximately two-thirds of the professionals agreeing that both genders played a role in creating visualizations in the prior centuries. The remaining

third of respondents selected “Men” as the prevalent practitioners who created historic works. None of the participants selected “Women” as a dominant contributor. While it is not the goal of this question to state a right or wrong answer, it does demonstrate a few things. First, did the participants select “Both men and women” because they assumed women played a role or did they know this to be a fact? Second, did they select “Both men and women” because they truly see them as equals in a historic context? Possibly. Yet, if that is the case, why were the responses to the prior question, when asked how many designers they can identify, there wasn't a larger “1–5” response? Thirdly, since “Men” was selected, do these individuals not know about women contributors or do they believe women truly did not play a role in historic information design? These are questions that will require further research in the future.

To understand the respondent’s recognition and usage of historic methods, they were asked which were most effective that they use today. They were asked to select all that apply. As predicted, many of the methods listed were selected by participants as being used in their present day works. However, what was unforeseen was the informal ranking of the methods. When this question was formulated, it was meant to identify if historic methods are still being used by practitioners — to establish a link from past to present, if you will. That said, discovering that a preference for specific methods exists was eye-opening. A large portion of the participants, 81.82%, found Maps to be the most effective method used today. Then the preferences drop, low to mid 60%, claiming diagrams and line charts to be effective methods for present day works. Bar charts follow at 52.27% with pie charts receiving the lowest ranking of 36.36%. The selection of “Other” comes in at 18.18%, but respondents were given the option of elaboration on their response. Here are their thoughts:

**Participant:** “Effectiveness can only really be measured against purpose. Which methods have a lot of use cases, or have we found a lot of situations for which they were effective? Scatterplots and Aluvial/Sankey Diagrams come to mind as methods we have used a lot.”

**Participant:** “It’s more primal — it’s a reductive modernist way if thinking common to all practitioners — focusing on what serves the information with aesthetics that follow.”

**Participant:** “Human marks”

**Participant:** “All of the above listed options are just forms, none are inherently more or less effective than any other. Most information or data can be presented in a variety of forms, depending on what the designer wants to convey. Their effectiveness will be wholly dependent on the combination of the material being presented, the context, and the audience.”

**Participant:** “Whatever gets the job done.”

**Participant:** “Pictographic and large numbers for emphasis/narrative.”

**Participant:** “if it gets the information across in a clear and concise way — it works for me!”

**Participant:** “I think effective information design methods also include more complex and interactive digital visualizations, including animation bubble charts or scatterplots, 3D line charts, etc.”

Seeing the vast difference in purpose, from those who selected “Other” as well as what drove them to their response, certainly highlights the discordance that exists in the field. There are varying levels of depth when considering what constitutes an “effective method,” such as what is considered a method vs. an option and the application of the methods. As previously stated, the intention of this question was to determine if

professionals use historic methods in their present work and, if so, which seemed to be effective for them despite being created centuries ago. Clearly, the question struck a deeper chord and, if researched in the future, will need more care when being formulated.

Moving forward, participants were asked, based on their knowledge, how historic information design pieces were displayed. They were given choices and could select all that applied. A sizable number, 90.91%, of respondents selected maps as the dominant deliverable for historic information design works. This was closely followed by books, at 86.36%, and then by posters/scrolls, at 63.64%. Paintings and puzzles/games both fall below 50%. Referring to their earlier responses, these numbers come as no surprise. The results coincide with what professionals and educators would encounter, based on the resources they use to seek examples of information design.

Professionals were next asked what their process is when planning to produce a new information design piece. They were given options and asked to select all that apply. Professionals, whether practitioners or educators, unanimously agree that research is part of their process. This is important in that it means they delve into their topics to uncover content that will assist them with context and representation, rather than just grabbing data haphazardly. Sketching follows with 90.91% of respondents including it in their routine for creating visuals. The numbers take a dip but more than 50% use computer software and prototyping as part of their regimen. Twenty-five percent of participants selected “Other”. They were given a chance to elaborate on what they include in their information design process. They stated:

**Participant:** “Goals & Audience - What do we want to achieve Who are we targeting? User Stories - A better understanding of the audience, the decisions they are trying to make, the use cases we wish to fulfill. Data Exploration -

Understanding, validating, mining, and modeling with the data? Design - Sketching, mockups, wireframes, prototypes Development - Coding the interface, setting up the infrastructure. Feedback and Iteration - Adjustments from the team and actual users. Polish & Performance”

**Participant:** “coding, interaction, motion, user testing”

**Participant:** “collaborative ideation”

**Participant:** “Input into computer software” is both a little narrow and too general. All of the previous options can be done on a computer or by hand (with paper and pen, on a whiteboard, etc.). Additionally, conversation and workshops are often part of the process”

**Participant:** “Arranging the items on my desk to make everything feel good and in place for a work environment”

**Participant:** “Iterating the narrative of the infographic with the client usually before much drawing / computer.”

**Participant:** “Collect all the data and analyze. Find ways to group (quants vs quals). Identify the audience is VERY important.”

**Participant:** “User testing on primary audience”

**Participant:** “Research, lots of sketching.”

A variety of responses were shared, but it can be argued that while there may be slight deviations in process, most seem to incorporate similar practices. A few, depending on the type of information design being produced, will lean toward software. It is great to see the incorporation of the audience, or client, in the process to ensure the storytelling and context of the visualization are appropriate for the final deliverable.

Finally, the professionals were asked to identify the type of information design pieces they create. They were given three choices. Quite a few respondents, 65.91%,

produce visualizations that are both qualitative and quantitative. Unexpectedly, the percentage decreases drastically and we find that 22.73% create primarily quantitative work. That number is then cut in half when we discover 11.36% produce mainly qualitative work. For those who selected one or the other, it may indicate that qualitative works are valued less than quantitative. If not, it can be argued that the responses simply reflect a sign of the times, in that modern designers may align more with the popular branch of data visualizations, which are more quantitative.

Professional information designers and educators have demonstrated that they possess some sense of historic ties to the field. Their preferred resources, whether published or professional works, support their ability to recognize and/or identify historic visualizations. However, there are areas of opportunity where practitioners can expand their proficiency and educators can strengthen their lessons. It would be ideal for professionals to know that historic information design dates back hundreds of years, not just to the 1900s. Understanding that our field was built by men and women, while possessing the ability to connect their contributions to the work we output today, will enliven support for our profession. This is particularly true as experimentations using AR/VR are growing, which means we're entering a new frontier of digital information design and we can learn from our ancestors' successes and failures. As practitioners and educators, we should work in tandem to ensure resources are being implemented from the academic realm into the professional world, so future designers are challenged to elevate the field. It is our duty to provide a framework and spotlight the field's effectiveness for solving problems and supplying solutions. If we fail to do this, future students and employees will seek erroneous lessons about information design from unsuitable sources, such as posts on social media, instead of from educators and/or practitioners.

## STUDENT SURVEY RESPONSES

Seventy-six survey responses were received from students studying information design. All were from a collegiate level, specifically attending universities rather than community colleges or technical/specialty schools. Fifty-four of the respondents were undergraduate students while 22 were graduate students. Seventy-one of the responses came from Arizona, while three came from Raleigh, North Carolina and two from Kansas City, Missouri. Educators from various schools were contacted requesting that they include their students in this study; some ignored the researcher's request to participate while others, for whatever reason, graciously declined to involve their students in the survey. With that said, while the results are highly region specific, they still revealed an array of issues when discussing information design. TABLE 2 displays the results of this survey.

When asked what time period comes to mind when they think of historic information design, the students overwhelmingly thought of the 19<sup>th</sup> century. This is interesting in that it reveals students understand that historic information design was prominent in the 1800s — the time of Playfair, Minard, and Snow, the “celebrity” designers previously mentioned — more so than the professionals surveyed. Surprisingly, quite a few also denote the 1600s and 1700s, which is accurate as it indicates they understand that some contributors predate the “celebrity” designers. Curiously, a combined 11.85% of undergraduate students feel “historic information design” is more of a present-day issue by selecting the 1900s and 2000s.

In terms of searching for information design, whether to find examples or search for inspiration, respondents (who were asked to select all that apply) provided their top resources. A substantial percentage of respondents, at 82.89%, rely on Google search to find examples and inspiration of information design. The result mimics what we saw



with the professionals surveyed. However, that is where their likeness ends. Creative social sites dominate as primary resources and then the numbers drop below 50% when selecting design firms as a resource. Regarding the selection of “Other”, respondents listed (in no particular order): Behance, Dribbble, AIGA, GD Guild, YouTube, Reddit, books, prints, and design portfolios. This confirms that students frequently resort to the internet and social media sites to find content about information design. Surprisingly, they do this before they seek answers from firms who specialize in the field. Additionally, most do not seek information from published books. The fact that students are overwhelmingly obtaining their content from online sources means that they are not necessarily being exposed to accurate information. Assuming they are given any historic facts about the visualizations they seek, many sites, such as Pinterest and other social media platforms, where visuals are the draw, tend to have limited to no information about the original creator or source of the visualization. Searching for visualizations at random gives power of the content over to the individual posting the images, not the researchers or professionals who can supply accurate historic context.

When asked if they could name historic information designers, students were prompted to select a range that reflected their knowledge level. Seventy-five individuals responded to this question while one chose to skip it. It is alarming to see that most participants can only name 1–5 historic information designers or none at all. With zero individuals stating they can name 5–10 historic information designers, this could mean that the “celebrity” designers, from the 1800s, are the 1–5 they are familiar with. However, to determine if the students are limited to the well-known forebearers, a future study should require them to provide the names to check the accuracy of their responses. Nevertheless, their answers indicate that students are not retaining or being exposed to many historic information designers. Interestingly, only one individual, an

undergraduate, stated they could name 10–20 historic designers. When looking at the results, two-thirds of undergraduates were confident in naming 1–5, but the remaining third were unable to name any. The graduate students had a similar outcome to that of the undergraduates. Despite the inability to name more than five historic contributors, the encouraging news is that the percentage of undergraduates and graduates who can name an ancestor outweighs those who cannot. The results also imply that as designers move from academics into the professional realm, they appear to learn about more historic information design, as their ability to name historic contributors increases a bit.

Students were asked if they believe a connection exists between historic information design and present-day infographics. Students absolutely see a connection, with 94.74% stating “yes”. This indicates that a predominant number of participants, like the professionals surveyed, understand there is a connection to the past. While this is exceptional, we cannot assume they can identify the connections as readily as they portray in this response — as demonstrated in the photo elicitation activity discussed later in this chapter. While only 5.26% of respondents, one graduate and three undergraduate students, do not make a connection, we should still be concerned that they do not see a link between past and present information design works.

With respect to learning about information design, students were asked where they first heard or learned about this subject. They were asked to select all options that applied. Based on the feedback, it appears information design is introduced predominantly through their education, which is what we saw with the professionals surveyed. It is surprising that only 18.42% stated “through social media”, when that is one of the first places they turn to in order to find examples or inspiration of information design. Of the respondents who marked “other”, they had the option to elaborate on their answer. They cited printed works, such as books and magazines. For those who stated,

"at an internship", it can be argued that this number is low because not all students have had an internship yet. With education providing the introduction to information design, it is apparent that any limited knowledge regarding the field falls heavily on educators.

Since information design visualizations contain a variety of visual layers, students were asked to identify what layers they see most often. They were asked to select all that apply. While more than half of the respondents identified that information design is a culmination of the options provided, it is quite interesting to see how the percentages drop by half when participants decide to select one method over another. Graphs, Diagrams and Text all fell in the 30% range, while Illustrations and Images/Photographs received less than 30%. This could indicate that most visualizations seen are from the Data Visualization branch of information design. Those types of visuals have layers that tend to exclude illustrations and images/photographs. With diagrams not far behind graphs, one would think illustrations would have rated higher, as those two often complement one another — as seen when applied to infographics. In some ways, it is unexpected to see illustrations and images/photographs ranking low. In terms of historic information design, illustrations were used in both the 18<sup>th</sup> and 19<sup>th</sup> centuries, but by the 19<sup>th</sup> century, a mix of methods were combined to create rich layers of content. Until we explore the resources students expose themselves to, we won't have a complete understanding of why they responded this way. However, we can see that most of our sampled participants understand that various layers work jointly to convey data in a way that is inventive and informative.

Next, the survey asked participants to identify which gender played a role in producing historic information design visualizations. They were given the option of men, women, or both men and women. It is not surprising to see students state that men and women played a role in historic information design. Given that option on the survey, it

seems to be the “safe” response — particularly if you’re not sure. However, let’s assume for a moment that the students are aware of women who contributed to the field. If that is the case, then one would think that they would have responded differently to Question 4 of this survey — when they were asked how many historic information designers they felt they could name. Surely once they identify the “celebrity” males, they could list a few of the women contributors. As we proceed to the remaining responses, it revealed that a little over 42% stated “Men”. This makes sense as most examples shared in a variety of resources continue to focus on males rather than females. Only one participant, an undergraduate student, listed “Women” as active contributors of historic information design. Sadly, this is further proof of how female contributors remain hidden, overlooked, and undocumented in resources.

It is not enough to ask students about the layers and contributors of historic information design. We need to determine if students understand, or are aware of, what topics were popular and documented. Themes portrayed in visualizations convey what was occurring or what the historic contributor was encountering in their world. Participants were given a list of topics and asked to select all that they believed to be the most popular in historic information design. Based on the collected data, respondents heavily believe that geography/travel and medical/science were dominant themes of early practitioners. Perhaps this is because they have been exposed to Playfair’s import/export graphs or medical visualizations by Snow and Nightingale. Either way, over 50% of the students felt these topics outweighed the rest. However, the most striking aspect of this is how low religion scored, with a mere 25% of participants believing that this was a popular subject. Additional research is required to determine why this is the case, because in actuality, quite a few works from the 18th and 19th centuries portrayed religious themes. Another possibility is that students, based on their

answers to Question 7, do not associate graphs and diagrams with religious topics. Without the ability to conjure a mental image of visualizations intermixing with religious content, students would naturally overlook that subject for more familiar themes.

To understand the participants' knowledge of information design, we must learn why they believe the field was developed. They were given potential reasons and asked to select all that apply. Incredibly, participants feel that information design exists to help explain problems and/or solutions in a visual way. They believe this branch of graphic design was developed to translate complex information into visualizations. A smaller percentage, 31.58% believe that the field existed to bring about the creation of graphs, diagrams, and charts. Curiously, 5.26% stated "Other". They expanded their reasoning, and they felt the purpose was even deeper. Two of them felt information design was developed to improve storytelling — specifically the story behind the collection of data being represented. Another individual believed the field stemmed from a desire to put data into a format that would be easily understood by the masses. The last individual felt information design came to be so that ideas could be communicated in an intuitive way to overcome language barriers. These responses make sense based on what is known of the field. They also remind us that, perhaps, too much emphasis is put on the "how" and not the "why" when discussing information design. Unexpectedly, one individual felt none of the provided responses were appropriate and they didn't select "Other" to elaborate. Clearly, this individual has a different viewpoint of why information design exists; unfortunately, we will not know why.

The last question of the survey asks participants to share how they have seen information design works displayed. Once again, students were given options and asked to select all that apply. This question is meant to uncover what formats students have seen when they consider all the information design visualizations they have encountered.

Books, maps, and posters/scrolls garnered the highest percentages. Interestingly, if we recall the responses to Questions 2 and 5, we reveal a strange dichotomy. On one hand, respondents stated that examples they had seen were works primarily in book format. This makes sense when we know, from Question 5, that they learn about information design mainly in school. Yet, based on the dominant response to Question 2, we also know that most participants find examples and inspiration of information design from Google, Pinterest, and social media — where visualizations are seldom shown in book format. Therefore, this question may have either been misinterpreted, which led to the 92.11% response, or it is accurate in that they have seen books, such as Playfair’s and Brinton’s which displayed visualizations in texts. As for maps and posters/scrolls, the results are expected, as these are formats often shared online and as part of curricula in schools. While it was expected that paintings and puzzles/games would most likely rank low, it is surprising to see them at a respective 36.84% and 17.11%. Double digit responses were not anticipated since there are fewer visualizations formatted using these techniques.

The desire to have a broader scope of participants from various locations did not transpire; however, a snapshot of what students understand about the field was produced. Undergraduate and graduate level students studying information design understand that the field has existed for centuries. Based on their responses, they do believe there is a connection from past to present and most feel they can name a few ancestors. While they seem eager to learn more about historic information design, it is the resources they are exposed to that misleads them — particularly social media sites that often provide inaccurate facts, if any content at all about the visualizations displayed. Educators and practitioners can help the next generation of designers by providing students with credible resources. Moreover, they can encourage students to

analyze the work they produce by asking what lessons have been learned from historic practitioners. Challenging students to produce visualizations that embrace the lessons from the past will aid them in strengthening the field in the future.

## INTERVIEWS

Interviews were initially meant to be conducted in-person, via phone, or through video conferencing. When COVID-19 forced a social distancing policy to take effect, interviews had to adapt by moving solely to via phone or video conference. Even though the two options were viable, the recruitment of interviewees was impacted, and potential participants quickly vanished. In order to try and regain traction, since it seemed most people were suffering from too much time online due to most companies and universities switching to video format, the interview questions remained the same but took the form of a questionnaire. This allowed participants to provide their responses at a time convenient for them, APPENDIX E. Streamlining the process was the first step to overcoming the challenge of the pandemic. However, recruiting still proved to be difficult. Once the “stay at home” restrictions lightened, recruitment efforts restarted. Initially, ten professional information designers and ten information design educators, with over 15 years’ experience, were contacted. Most requests went unanswered, but three responses were submitted. One professional and two educators chose to participate; regrettably, one of the educators started to input content but never completed any fields beyond identifying themselves, so it had to be removed from consideration.

The first respondent has over 20 years’ experience in a studio setting. This individual is located on the east coast of the United States, where this person develops print and digital displays, along with presentations and other documents. The second

respondent has 24 years' experience teaching design at a college and/or university. This individual is also located on the east coast of the United States but has been an educator abroad, specifically in Europe. Both individuals were asked to share their knowledge of historic information design. With diverse backgrounds and a deep understanding of the subject, these responses were sought to shed additional light on why information design's history remains elusive to so many present-day designers. While the questions they were presented with are similar, they eventually diverge to talk about historic information design based on their specific profession.

The professional participant is extremely knowledgeable about information design. This person actively reads information design books, articles, and journal papers. From those sources, the interviewee uses that information to remain informed about the field. Additionally, the individual relies heavily on these materials to identify methods or to seek inspiration. It was made clear that other popular forms of documentation, such as websites, blogs, and social media are solely used "as a means of monitoring current developments in the field." On average, this person produces 15 to 20 information design works annually. When asked about historic information design, this person acknowledged reviewing 18<sup>th</sup> to 19<sup>th</sup> century works but also engaged in seeking visualizations that predate these centuries – specifically from non-western authors. When tasked to identify contributors who would be considered historic information designers, the interviewee provided a robust list of over 20 names. However, most of the individuals mentioned were 20<sup>th</sup> century contributors and male. A follow-up question encouraged the participant to name historic female contributors; the interviewee provided four names, two from the 19<sup>th</sup> century and two from the 20<sup>th</sup> century. To further identify their understanding of the field, the interviewee was then asked to name what field of study, or disciplines, contributed to information design. Several fields were listed



with communication being the foremost followed by graphic design, psychology, information science, statistics, and scientific illustration to name a few. Based on the responses given, it was no surprise to see that this individual believes that historic information design examples connect to work they've produced in the present day. Furthermore, this person felt that the field would benefit from more resources that share collections of historic information design works – whether they be used to share methods, develop analysis, or simply to inspire. In closing, the interviewee was asked to mention anything else that they felt would help this research. The following is their response:

Information design history is probably more a product of one's own curiosity and experience, as well as one's own ability to find connections and strands of influence across time and geography than it is of reading literature that spells out key figures and important milestones. Historical texts have only recently begun to emerge, since Tufte's first books came out (Friendly's "Milestones in the History of Thematic Cartography" has also been influential). Also, we don't know what we don't know: much influential work has not been properly documented or credited, and the boundaries of information design aren't well defined, which makes it hard to see the bigger picture of information design and the different contributors over time.

The design educator is exceptionally knowledgeable about the field of information design. Not only does this individual use their own collection of digital resources (digitized images, articles, and books), but this person also teaches an Information Design History course with a pre-20<sup>th</sup> century focus. The interviewee urges students (interested in information design) to use books in the library. Throughout the interview, there was no mention of websites, social media, or blogs to be used as

references or inspiration. When asked to identify contributors who would be considered historic information designers, the interviewee provided an impressive list of over 40 names. The names were a mix of males and females from the pre-20<sup>th</sup> and 20<sup>th</sup> centuries. It was this individual's response to the inquiry about female practitioners that stood out. The participant said,

Willard, Nightingale, and O'Brien are women. There is no cultural space for women in the professions that related to information design practice before the 19<sup>th</sup> century. The three examples I cite are each related to a profession in which women had social permission to achieve prominence: education (Willard), nursing (Nightingale), clothing (O'Brien). The recognition of women as design partners (Ray Eames, Marie Neurath) is late 20<sup>th</sup> century. Perhaps your research will explore this phenomenon.

When asked, in their opinion, why we hear the same names repeated in historic information design, the interviewee stated it was because most design historians read the same sources. To expand on this, the individual was asked why they think historic information design is ignored or overlooked. They replied, "because information design is broad and abstract. It is overshadowed by the aesthetic appeal of graphic design and the computational appeal of data visualization. By comparison, information design is invisible and not easily reproduced." The next three questions focused on the connection between historic information design education and their students. Based on their response, it is apparent this person believes historic information design is important for students to learn. They believe that not only will students understand where our current visual language comes from, but also feel that the students can make the connection between past works and what is produced in the present day. Furthermore, this individual believes that making those connections will aid their students in becoming

better designers. They stated, “18<sup>th</sup> and 19<sup>th</sup> century examples from European/Western cultures are very useful, but so are examples from other centuries found throughout other parts of human cultures.” When asked if there is a key lesson about information design that is missing from today's understanding of it, the interviewee stated, “Information design is functional. It is collective problem solving. It has always been a requirement of human experience. It develops over time as human needs change.” The concluding question asked the interviewee to mention anything else that they felt would help this research. The following was their response:

Information design includes both quantitative and qualitative information. Many objects created by women include an informational dimension that we rarely try to appreciate. I am thinking of quilts, rugs, basketry, pottery, clothing. Often the information is very culture-specific and not appreciated by those who collect these objects because of their aesthetic quality and cultural significance. Good luck.

These interviews support the need for additional research and understanding of historic information design. It does not matter whether historic information design is used for professional purposes or educational ones, these responses highlight the desire for a comprehensive understanding of the field. The benefits of such knowledge will only strengthen the direction of the field as it continues to grow and evolve into the 21<sup>st</sup> century.

#### PHOTO ELICITATION ACTIVITY

With the COVID-19 pandemic in full swing, education transitioned from in-person to online. In order to recruit people, the researcher was limited to working locally due to class availability, time constraints, and limitations of technology (since some

students had limited Wi-Fi access or other issues with online interaction). Despite the encountered barriers, ten individuals agreed to participate in the photo elicitation activity. The research pool consisted of four junior level students, three senior level students and three graduate students. At the time of the activity, seven were actively learning about information design and three had previously studied this subject. Nine of the participants were graphic design majors and one was an industrial design major. Additionally, the works selected for this activity were a mix of well-known and unfamiliar visualizations, so that students would not be biased or swayed — had they recognized the more familiar works.

A few modifications to this process had to occur since in-person interaction was no longer possible. First, the activity was conducted over Zoom, a video and audio-conferencing platform that was available for all participants to use. Second, due to limited availability, the exercise was performed three times — once as a group of eight and twice one-on-one. Third, so that participants did not influence one another with verbal responses, they were asked to document their thoughts using a word processing software. Finally, they were instructed to send their responses to the researcher, where they would be coded to preserve confidentiality and reviewed so that their feedback would be incorporated into the research.

The participants were shown four information design works from various years, within the 18th and 19th centuries, APPENDIX F. The first was Joseph Priestley's A Specimen of a Chart of Biography. Next, they saw Florence Kelley's work for Hull House, an information design piece that highlighted the socio-economic conditions of immigrants living in Chicago. The third image was of William Farr's Temperature and Mortality of London as it aimed to identify how cholera was spread by "bad air." The fourth, and final piece, was Joseph Priestley's A New Chart of History that displayed

empires, rulers, and the overall history of civilization. The works were selected because they are diverse in appearance and display different methods. The participants were informed that there were no correct or incorrect responses. They simply had to document what they thought, saw, and felt as they reviewed these works. A few general questions were answered before the activity began and the entire process took an hour for the group session and 30–45 minutes for the one-on-one sessions.

Ultimately, the results were quite interesting. The first visualization presented to the students was a timeline by Joseph Priestley. The students unanimously agreed that the content was arranged to document time. While not all of them recognized seeing this piece before, they accurately identified the method. However, that is where the similarities stopped. A few students dissected the visual by layer. Some commented on elements such as title, lines, names, years, borders, and dots. Others seemed to focus on the content and what the piece was trying to say. The students spent time not only assessing the work but made comments about distracting aesthetic elements and how the work could be improved. Another standout was their attempt to identify what year this piece was created. Some based their creation date on the content seen within the timeline while others estimated it being produced in the early 18th century or late 19th century.

Kelley's work garnered responses that varied greater than the ones initially shared about Priestley. The undisputed fact was that color played a significant role in this piece. Every participant made a remark about the color, how it appeared to be used, what each color means, and the intensity of the hues. The second most prominent characteristic was the use of maps. For some of the students, the maps were clearly identifiable, and they quickly realized this piece was comparing something related to the locations or "spaces." Their responses diverged from one another as they discussed the

type of location they felt was being represented. Some believed they were looking at homes or apartments. However, others said it seemed like a military complex or land for zoning. In fact, despite the visuals being a bit challenging to read, due to an issue with Zoom, ultimately, many participants felt this was a thematic map of sorts. More than half stated that the colored compartments were used to identify a status. Others focused less on if it was a house and more on the other elements, such as dashed lines, which they felt depicted public transportation routes. While this piece was unfamiliar, quite a few related it to modern designs they have seen. At least two people said it was reminiscent of political maps. Others compared it to data you find using Google Sheets, transit routes, or a county project for documenting permits. In terms of its creation date, all but one of the students stated that the work appeared to be from the early to mid-20th century. The outlier response stated that the work appeared to be from the 1700s. This raised the question of “what influenced the participants to have them believe this work was from the 20th century?” Upon reviewing their responses more closely, a few stated that the work felt familiar to them because they recognized and/or understood its content. Seeing a colored legend, for example, is something they have used when developing information design work. Maps are another element they are experienced in seeing and using, so they feel connected to the piece. The ability to recognize a specific place, in this case, Chicago, a city some have visited or are at least knowledgeable of, is another item that allowed them to feel acquainted with the visualization. One participant stated, “It doesn’t look too old but not very modern either.” From these remarks one can begin to argue that students base their knowledge primarily on what is familiar to them.

Regarding Farr’s work, the participants seemed most fascinated by his visual representations. In fact, one participant proclaimed, “...this is much more graphic than the previous two we looked at.” The repetition of circles, colors, organization of data, and

the layout all caught their attention. Right away, the participants spent time discussing what the circles meant to them. Their initial impressions, before evaluating the work, were to share their thoughts regarding the simplicity of the circles and the containment of the data. Others concentrated on what a circle with data means, such as having cyclical behavior, while the rest appreciated the organic formation of data. At first glance, five participants commented that they felt as though they were looking at a birds-eye view of the world — a hemispheric snapshot. However, as they further examined the piece, beyond their preliminary impression, they quickly acknowledged that the circles represented the passing of time. They read the title of the piece and shifted their viewpoint to that of a calendar, where they pointed out the weeks, months, and years depicted on the page. As the participants delved deeper into the piece, they stated an appreciation for how accessible the information was, and many felt they had encountered this method of data representation before. One person said it reminded them of work they once saw on Behance, a digital portfolio site for designers. Another said they saw a similar method used for mapping systems. Recalling images from Tufte's *Envisioning Information*, one student said it reminded them of the lesson on Small Multiples. A fourth individual stated that they recognized this method being used to measure waves. From comments like these, it is apparent that the students seem invested due to the awareness of this visualization method. The issue they cannot seem to agree on is the time period. The participants have varied opinions as to when they felt this work was produced, despite visual hints such as: the topic, written script, and years. A few participants stated that the work was from the 1800s, which is in line with when it was produced. Shockingly, others have it as having been produced in 1900, 1960, and 1978. Considering it is a piece from the mid 1800s, it was surprising to see how some individuals felt it was created 100 years later. Once again, this begs the question "why

did a few of the participants feel this piece was generated in recent times rather than a century and a half ago?” The clues to answering this question tie back to familiarity. It appears that the more the students recognize the visual content — whether it be the visualization method or location — the more they believe it to be a modern construct.

Finally, we return to Joseph Priestley to examine his chart of history. Students did not realize that two visualizations they reviewed were created by the same man. After reading the responses for the prior visualizations, it was not surprising to see that the participants immediately commented on the color and layout of this chart. As they digested the work, they began to discuss the arrangement of the chart. One individual pointed out, “The marked areas look quite geometric.” Most understood that this piece has a visual system in place, but they struggled to identify what type of visualization this work should be considered. One participant stated, “...it seems confusing and convoluted at first, but when I started looking around, it did have a lot of order to it.” Another stated, “this looks like another timeline, I can see a clear title and country names.” A third participant added, “this looks like a colonization map.” With so much visual content to take in at once, it seemed the participants were wanting to define the method. The participants began to turn their attention to the details in order to better understand what they were looking at. Layers were rattled off like lists, which included: title, colors, locations, people, years, etc. The Zoom software blurred some of the smaller details, so not all of the chart was readable. In the end, most of the students seemed intrigued by this work. All but two stated that they have not seen visualizations like this in modern day. However, with a few participants stating the work felt somewhat familiar to them, they added that the work is something they believe they would find in history books. Another person stated it has a “war map vibe.” One individual was adamant that this work “...resembles contemporary timelines that indicate when historical events occurred



in context to the rest of the world.” With that said, what followed were observations regarding the color used and written content. A few of the participants were wanting to know the meaning behind the colors — since some countries were painted and some were not, while others were painted with the same hue. In terms of the written content, some pondered why the labels (for the various empires) change from large to small. They seem to desire consistency and a clear hierarchy. However, rather than continue to rationalize the meaning, the students moved on and it is their discussion regarding the creation of this work that was most compelling. As with the prior works, the participants did not agree on a year when the design was produced. The students provided a time span that ranged from the 1600s to the 1960s. Puzzled by these responses, further exploration into their answers revealed that some selected the year based on characteristics they noticed, such as handwritten type and the use of watercolors. Others felt the year was dictated more so by the method used. The final group of individuals based it off their perceived familiarity of content and method.

The photo elicitation activity provided insight into how students observe, interact, and evaluate visualizations. It appears they internalize and draw from their personal knowledge bank to help them in translating what their eyes see, what their brain tells them, and how their sources of influence — whether from education or their own self-taught resources — guide them. For some of these works, students could make connections between past methods and their use in present day information design. Others did not make connections, but they were able to decipher layers of the visualizations they saw and relate that to how they rationalize modern works. Furthermore, while the participants were not capable of naming the contributors who created the work, they considered them to be exemplary visuals of historic information design. Since students were not given the opportunity to research the visualizations

before or during the activity, they were not influenced by opinions or viewpoints to discredit the work. Instead, participants validated what they saw based on their knowledge of design and what was familiar to them. Finally, what this activity revealed was how important it is for design educators to ensure the following: that students are taught when various visualizations were produced, discuss the progenitors who produced the works, and share how the visualizations of the past still resonate in the works we see today.

### DOCUMENTATION SYSTEM

Developing a new documentation technique meant examining how other disciplines record their findings. Since historic visualizations are physical works, each with layers of context, it made sense to explore the field of Archaeology. Renfrew and Bahn (2008) discuss the methods and practices of archaeologists. In their book, they share an example of a context sheet which is used to record details about excavated artifacts. The form allows archaeologists to accurately document their field notes by allowing them to record their location, apply codes, share their interpretations, identify their findings, and add visuals, if needed. For the purposes of this research, the form was adapted to meet the needs of analyzing historic information design. The document aided in identifying the various topics found throughout the 18<sup>th</sup> and 19<sup>th</sup> centuries, while highlighting unique details and opportunities for future investigations.

Often, visualizations are documented chronologically or by method. While these categorizations have proven to be effective, they can also be limiting. As previously mentioned, our predecessors, with their diverse backgrounds, contributed works from a variety of perspectives. Initially, methods were applied singularly, where a map would focus on geographic content. As time progressed, methods were intermixed and themes,

or topics, became more complex. This meant that contributors, their works, and the subject matter cannot fit into one category. We need a system that is flexible and allows documented data to be sorted in a variety of ways. This historic information design context sheet, APPENDIX G, is used to record data that can then be entered into a matrix and sorted based on creator, year, topics, visuals, and notations (listing similar works or unique details). This allows the documented visualizations to be studied so that relationships can be identified. The same goes for themes within a visualization. If a design has multiple topics, each is designated and works can be sorted by theme, if necessary. A list of topics was generated during the literature review. They were selected because they appeared multiple times when sorting through historic visualizations. As more work was discovered, it became clear that additional topics may be required in the future, but for now, these groupings address quite a few of the historic information design visualizations that were analyzed for this research (Figure 70).

### **Economy**

It is understandable that we see visualizations focusing on economic growth. Bar charts, timelines, and pie charts were developed to show the expansion of empires as their wealth and territorial growth increased. Statistics visualizing the import and export of commodities allowed countries to track their wealth and losses. In some instances, we can also pinpoint the causes of their success and/or downfall. This topic was a particular favorite of statisticians, government officials, and those invested in social reform.

### **Geography**

The collected works from the 18th and 19th centuries revealed that many visualizations came from the field of cartography. Charting a new location or documenting the import/export of goods with allied countries meant understanding how to get something from point A to point B. Additionally, since maps were a familiar

method to people, using it as a device to share other pertinent information proved successful. We saw that medical mapping helped trace the spread of diseases, comparative maps educated viewers about mountain ranges around the world, population maps demonstrated growth/loss, and predictive maps aided in determining when events could occur. Everyone from scientists to educators used geography to enhance their understanding of people and places.

### **History**

Many of the visualizations that focus on history did so in conjunction with another topic. It can be considered a collaborative element used to improve the narrative of a particular method. Religious themes, depicting the story of creation, often aligned themselves with historic details, such as the telling of civilizations and leaders. Narratives, connecting history with geographic locations, were used to share stories of descendants or to highlight tribes (where they once lived). Many of the visualizations collected during the literature review contain historic details, some provide just a hint for context, while others use it to corroborate the data they are sharing.

### **Medical**

The spread of illnesses, in the 18<sup>th</sup> and 19<sup>th</sup> centuries, often led to the development of visualizations. Many contributors used methods that helped pinpoint potential causes of sickness or identified areas where illness was prevalent. Others produced visuals to aid them in making sense of their theories — to determine whether they were accurate or inaccurate. In some cases, diagrams were produced to reveal specifics about the human body. That said, unless the contributor was a doctor or a nurse, most medical visualizations were combined with other themes, such as science related findings or social stories.

## **Politics**

Whether it be to spotlight reigning royals or compare empires, visualizations with political accounts allowed viewers to learn about dominating figures (or countries). Political leanings were highlighted to illustrate parties or standings in some countries. Like many of the other themes, political stories were often told in conjunction with other topics. We have seen them used to highlight political power over commodities (such as materials or products) as well as to call attention to political differences, such as when slavery was tied to political groups. Statisticians, government officials, and geographers often shared political narratives to sway, educate, or amplify their portrayals.

## **Science**

Visualizations often aided explorers in identifying flora and fauna. They translated their findings into works that depicted mountains, rivers, vegetation, and animals from around the world. Additionally, countries and continents were studied to share their development, temperatures, atmosphere, and the migration patterns of inhabitants. Science was also implemented to depict inventions or processes. Some contributors turned to science to educate society about theories or to provide lessons about our world. A few contributors had us looking to the sky to share discoveries about the atmosphere, planets, and stars. Science was prevalent and often used by astronomers, inventors, naturalists, educators, and those in the medical profession.

## **Social**

Quite a few visualizations are used to underscore the impacts on society. Everything from inequalities between social classes to crime rates to slavery. Some topics address society regarding other significant issues, such as trade and illness. Population growth is a key topic, particularly when discussing new lands or expansion due to urban development. As with the themes already mentioned, social narratives were often used in

conjunction with other topics. One could find social visualizations aligned closely with education, as these two subjects emphasized the effects of decisions made by politicians, scientists, medical figures, and military personnel. From these visualizations, we sometimes saw changes to laws and policies.

### **Warfare**

There never seems to be a shortage of battles between nations. Numerous visualizations represent the successes and failures of warfare. They also reveal the impact of war, whether fighting an opponent for land or fighting against an unfamiliar illness that is having a devastating impact on soldiers. While there are numerous occasions where we see visuals feature this narrative, surprisingly, fewer than expected were found from the literature review. The individuals that documented battles include a scholar, engineer, nurse, and scientist. Their investigations into warfare remind us of the ever-shifting tide of politics, the effects of war on people, the opportunities through combat, and the price soldiers pay based on a leader's decision.

### **Other**

Once the literature review was complete, a few visualizations did not fit into the aforementioned categories. While they may have ties to other themes, the information they share pushes them into a group of their own. This individuality could be due to the method they implemented or the subject matter itself. Quite a few educational pieces fell into this category as they are not solely to share historic or scientific findings, but lessons as well. There are also examples where educational pieces were presented in the form of games or puzzles, which makes them quite unique. Timelines that break with traditional chronological representations for bold illustrative imagery fall into this group. A visualization depicting a dance was placed in this category due to its instructive nature. An abstract visualization was also placed in this group, as it depicts the life of a character

from a story, so it's symbolic in nature versus the more fact-based or theory-based works we've encountered. Contributors placed into this category included a choreographer, writers, students, religious individuals, and educators.

This documentation system offers a deeper understanding of what historic contributors were trying to achieve with their visualizations. Since the format is flexible, it can be modified to include overlooked themes (or other modifications) in the future. The historic information design context sheet is not perfect, but it is a starting point as to how researchers can document their findings, analyze them, and sort them to reveal patterns or relationships. This form allows researchers to break away from traditional documentation methods by permitting works to be recorded even if pertinent information is missing or unavailable. This is possible because the researcher is documenting everything that is known or seen, when examining the artifact. It is now possible to index details without having to assign the visualization to one method or one dominant theme.

## CHAPTER 5

### CONCLUSIONS

#### INTRODUCTION

Historic visualizations have been disregarded on numerous levels. Despite being mentioned in textbooks or through online sources, many designers continue to overlook the historic content in favor of what they are exposed to in the present day, which tend to be modern works via digital mediums. Social sites such as Pinterest, Instagram, Dribbble, and other platforms are favored by students and moderately used by professionals for finding examples of information design. Those of us who understand the importance of historic information design aren't surprised by this fact, but we should not allow it to remain the norm. If we do not actively develop a more accurate resource for students and practitioners to engage with, visualizations will continue to exist in a muddled state. Visualizations are inconsistent across platforms, where information is missing, content is incorrectly labeled, opinions are injected as facts, and visualization tools reign over the visual content. Design researchers and educators need to elevate their exposure to pre-20<sup>th</sup> century visualizations to rise above the published works that recapitulate the limited narrative of historic information design. While modern researchers aim to connect the field's past and present, the lack of a historic visual narrative has perpetuated the idea that historic information design does not play a role in today's world. The field is tangled with misinformation and misrepresentation. Rather than exacerbate the problem, it is time to act by acknowledging our mistakes and putting forth a plan to do better.



## IMPLICATIONS OF THIS RESEARCH

### **Commonalities to Modern Information Design**

Through the literature review, surveys, interviews, and photo elicitation activity, it was demonstrated that historic works undisputedly connect to the works we found in the present day. Charts, diagrams, timelines, graphics, and maps are methods that have endured time. We see proof of them evolving from 2D representations into the digital realm of today. These methods continue to mold information and provide the necessary structure to inform, translate, and share ideas, both simple and complex. Across time, it was echoed by the practitioners themselves how important visualizations are for conveying information. Each reiterated how visualizations offer accessible content via natural human instincts. It is no wonder that it continues to resonate with audiences today and, unlike the past, it is a format that is widely accepted. Technology may have adapted what designers can do with data, but the primal purpose remains as viewers are accustomed to its benefits and capabilities.

### **Spotlighting Historic Information Design**

Historic information design is overshadowed by the technological prowess of today. Young designers know just enough history to state a few facts, but they cannot reflect on what they've stored in their minds. Ask them specifics and it's clear they will most likely provide an incorrect response. The surveys showed that most participants fail to notice the benefits of historic information design because they are not diving deeper into our past. Unless educators place a variety of works in front of students to expand their knowledge, they will not take the initiative to discover more about the field. Even practitioners fall short of listing the names of contributors or acknowledging works pre-20<sup>th</sup> century. Not until students were asked, as part of the photo elicitation activity, to closely examine historic visualizations did they begin to make connections. They felt

related to the work when they decided the method, story, or aesthetics were familiar to them. This is proof that researchers and educators, in particular, need to place historic works in front of enthusiasts, practitioners, and students if we want them to bond with the field's past. We need to show them how historic information design was used to represent diversity, develop reform, show growth, and test theories. Perhaps then they will see the diverse application of methods and themes from the past connect to our present.

### **Expanding Our Historic Narrative**

It has been established that, for far too long, this field has perpetuated a limited record of contributors and visualizations. It is necessary to actively seek individuals who imparted their design methods but remain lost in the void; whether due to purposeful omission or limited information, their story must be addressed if we are to develop an interconnected network of participants. We have acknowledged the meager amount of recognition given to women. However, we must consider other marginalized groups, such as visualizations from international progenitors, as well as those who may have been instrumental in conjuring up methods or actively developed works, only to have their name erased (or minimized) by those in power.

## FINDINGS AND OPPORTUNITIES

### **Establishing a Foundation**

While design researchers are actively piecing together who contributed to the field, we can't connect the dots alone. This discipline was created by individuals from a variety of fields; therefore, we need to dip into each other's disciplines and search for the threads of commonality that bind us. As we find more connections between people, methods, and visualizations, we will develop a thorough understanding of historic

information design. Ideally, we would collect visualizations, record our findings (with the proposed historic context sheets or something comparable), analyze them and fact check the recorded information. This would require a panel of professionals to arrange the visuals in a myriad of ways, such as chronologically, by method, theme, contributor, resource, and discipline. The documentation of works must remain flexible to account for contributors who held a variety of occupations, as well as those who were marginalized, such as women and people of color, and the works of the unknown. Incorporating the findings into a database that could be shared among educators and researchers would grant access to the latest discoveries and exhibit connections. Additionally, documenting our findings would correct the inaccuracies that exist. Quite a few works are mislabeled with wrong dates, incorrect titles, and no mention of how they were originally displayed. Getting researchers to agree on logistics is the true obstacle, but it is better we collaborate to develop a system; otherwise, we will remain in our current state of flux.

### **Terminology**

The confusion of terms may be reduced if we position ourselves as collaborators rather than individualists vying for control over the field. The specialty-centric terms will not go away unless we collectively choose to develop a set of guidelines for information design. Therefore, for now, we should concede that we all possess the power to work with information and can sculpt it for various applications. We can discuss the various branches that exist and recognize their contributions while still understanding that our output adds to the greater whole. Developing our own lexicon is an idea that has been shared for decades. Perhaps we finally put the terms to rest by producing a glossary that will be considered industry standard. It can then be adopted by researchers and

educators to pass onto students. Eventually, the terms, when put into practice, will find their way through the discipline so everyone is speaking the same language.

### **Professional**

Based on the surveyed responses, professionals need to expand their understanding of historic information design. Too often we see the “historic” telling of our field begin with the 20<sup>th</sup> century. This limits our recognition of predecessors, and from the surveyed responses, we know that modern practitioners can only name 1–5 people, when we should be able to identify 20 or more. It is not suggested that each professional memorizes practitioners or be forced to provide a thorough historic record. Instead, we should ask them to acknowledge their role in information design. Their influence has a direct impact on the next generation of professionals.

While professionals are aware of historic methods, as they turn to more reliable sources when seeking inspiration or knowledge, they appear to favor modern interpretations and practices. Perhaps they feel the historic works are outdated, but if that were true, then we would not see the resurgence of diagrams, charts, and illustrations as tools of communication. What they know matters because the work they output is a model for what the field can create. Additionally, they hire interns and employees who may, or may not, have some knowledge of historic information design. If professional designers ignore the lessons offered by our progenitors, then their interns and employees will mimic their attitude about the profession’s past. If practitioners are encouraged to experiment with methods, learn about historic contributors, and not be so quick to focus on aesthetics or digital translations, then they may begin to connect with the historic lessons. Adjusting their approach to design problems will enable them to draw inspiration from individuals who faced the same challenges centuries before us. In turn, they can educate their interns and employees. The fact is we have a lot in common

with our historic contributors. They faced pandemics, political discord, environmental issues, and social reforms. If we're reminded of how similar we are, then maybe practitioners will acknowledge there is value in our history.

### **Educational**

The collected data tells us that educators are the primary source for teaching historic information design to the next generation. Practitioners and students both stated that their introduction to this discipline came from their time in college. With that knowledge, we need to pay attention to our curriculum. It falls into the hands of the instructors to present historic information design in a way that demonstrates how visualizations from centuries ago are still relevant today. There are already several practitioners and educators who are presenting models for teaching information design, but a historic aspect should be added to ensure designers are given an accurate portrayal of the field rather than a disproportionate representation.

Educators play a vital role in teaching the history of our field. As one interviewee stated, "we don't know what we don't know." That stands true for students. If educators leave students to their own devices, they will seek information from inadequate resources. Some details of historic information design are finding their way into the minds of our students, but it does not appear to be retained or expanded on. Students are graduating without being able to name contributors. They are aware of men and women producing visualizations, but they cannot identify the creator. Furthermore, they seem to understand that the past connects to the present, but they are unable to articulate why or share examples. A few key ways educators can improve their curriculum of historic information design includes the following:

1. Create an overview of both the 18<sup>th</sup> and 19<sup>th</sup> centuries. This is a place to start, but ideally, you'd expose students to more centuries.

2. Provide students with a list of resources that will aid in their understanding of historic information design. This can be published books, journals, websites (reputable ones that provide context).
3. For each century, identify the contributors (men, women, and the “unknown”), their place of origin, their profession(s), and years they practiced.
4. Highlight the major themes/topics from each century.
5. Introduce students to visualizations from around the world.
6. Discuss what the visualizations say about the culture and climate of the time.
7. Ask students which methods they felt were successful or unsuccessful and why.
8. Connect the dots by comparing visualizations that use the same methods or have similar themes over time.
9. Emphasize the similarities in subject matter from the past to present day.
10. Assign the students the task of researching contributors from each century. Do this after you’ve provided them with examples and context. The search will not appear daunting because they’ll be familiar with the methods.

Providing an overview of historic information design will ensure students are exposed to the field’s past and allow them to add those lessons to their knowledge bank. They will be able to recognize works, provide assessments of why certain visualizations are more effective than others, and articulate how our past has shaped our future.

Educators need to break bad habits. We must broaden our students’ minds by exposing them to historic contributors that are not mentioned in most textbooks. They need to understand that social platforms are not an ideal resource and how they can combat the misuse of information design — which is when works do not convey information but are instead treated as art. These lessons will empower them as they

progress through their professional careers and assist them in the future because information is always evolving.

#### FINAL THOUGHTS

Information design is a discipline that includes numerous people from various places. Many possess knowledge from a variety of occupations and perspectives. It is imperative that we unite to construct a more authentic and inclusive history of our field. While origins are challenging to pinpoint, a macro representation of the community's history of originators, methods, themes, and visualizations can be produced. Stories of the underrepresented and international contributors must finally be woven into the European, male-dominated narrative. Researchers and educators should feel compelled to avoid placing emphasis on particular contributors over others. We should strengthen our historic narrative by asking questions and developing a curriculum that supports a holistic view. Rather than feud over which field maintains control over information design, we need to remind ourselves that the discipline was shaped by a heterogeneous group of individuals seeking a common goal. We are no different from them. As long as society continues generating information, it is up to us to demonstrate how our discipline can solve the visual problems of the world. It is time for us to unite by connecting the dots to present our remarkable history.

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APPENDIX A

TABLES

**Table 1****The Practitioner and Educator Survey Responses**

Q1	When you think of historic information design, what time period comes to mind?	Percent %
	1600s	13.64
	1700s	15.91
	1800s	25.00
	1900s	43.18
	2000s	2.27
Q2	How do you search for information design (for examples or inspiration)? Select all that apply.	Percent %
	Google search	75.00
	Pinterest	47.73
	Social media	29.55
	Design firms	50.00
	Other (please specify)	59.09
Q3	If you had to name historic information designers, how many do you feel you can provide?	Percent %
	None	13.64
	1-5	65.91
	5-10	15.91
	10-20	4.55
Q4	Do you feel there is a connection between historic information design and present-day infographics?	Percent %
	Yes	95.45
	No	4.55
Q5	How did you first hear/learn about information design? Select all that apply.	Percent %
	At school	84.09
	At work	18.18
	Through social media	6.82
	Other (please specify where you learned about information design)	15.91
Q6	To your knowledge, most historic information design pieces were created by:	Percent %
	Men	34.09
	Women	0.00
	Both men and women	65.91
Q7	In your opinion, which are the most effective historic information design methods that you use today? Select all that apply.	Percent %
	Bar charts	52.27
	Line charts	61.36
	Pie charts	36.36
	Diagrams	65.91
	Maps	81.82
	Other, please list a specific method	18.18
Q8	How do you believe historic information design pieces were displayed? Select all that apply.	Percent %
	In books	86.36
	Posters/scrolls	63.64
	Puzzles/games	20.45
	Paintings	43.18
	Maps	90.91
Q9	When planning to produce a new information design piece, what is your process? Select all that apply.	Percent %
	Researching	100.00
	Sketching	90.91
	Prototyping	68.18
	Input into computer software	77.27
	Other, please provide the other ways you plan	25.00
Q10	When creating information design works, they tend to be which?	Percent %
	Heavily qualitative	11.36
	Heavily quantitative	22.73
	A mix of both	65.91



**Table 2****The Student Survey Responses**

Q1	When you think of historic information design, what time period do you believe it dates back to?	Percent %
	1600s	30.26
	1700s	17.11
	1800s	40.79
	1900s	10.53
	2000s	1.32
Q2	How do you search for information design (for examples or inspiration)? Select all that apply.	Percent %
	Google search	82.89
	Pinterest	56.58
	Social media	52.63
	Design firms	47.37
	Other (please specify)	39.47
Q3	If you had to name historic information designers, how many do you feel you can provide?	Percent %
	None	32.00
	1-5	66.67
	5-10	0.00
	10-20	1.33
Q4	Do you feel there is a connection between historic information design and present-day infographics?	Percent %
	Yes	94.74
	No	5.26
Q5	How did you first hear/learn about information design? Select all that apply.	Percent %
	At school	94.74
	At work	6.58
	At an internship	2.63
	Through social media	18.42
	Other (please specify where you learned about information design)	2.63
Q6	Information design pieces you have seen normally have which of the following? Select all that apply.	Percent %
	Graphs	39.47
	Text	34.21
	Images/photographs	17.11
	Diagrams	38.16
	Illustrations	28.95
	All of the above	69.74
Q7	To your knowledge, most historic information design pieces were created by:	Percent %
	Men	42.11
	Women	1.32
	Both men and women	56.58
Q8	In your opinion, which topic(s) do you believe were most popular in historic information design? Select all that apply.	Percent %
	Geography/travel	71.05
	History/social	39.47
	Medical/Science	64.47
	Warfare	35.53
	Religion	25.00
Q9	Based on your knowledge, why do you believe information design was developed?	Percent %
	To help translate complex data	84.21
	To explain problems/solutions in a visual way	86.84
	To create graphs/diagrams/charts	31.58
	Other (please specify)	5.26
	None of the above	1.32
Q10	How do you believe historic information design pieces were displayed? Select all that apply.	Percent %
	In books	92.11
	Posters/scrolls	75.00
	Puzzles/games	17.11
	Paintings	36.84
	Maps	84.21

APPENDIX B  
FIGURES

**Figure 1**

*Edmond Halley*

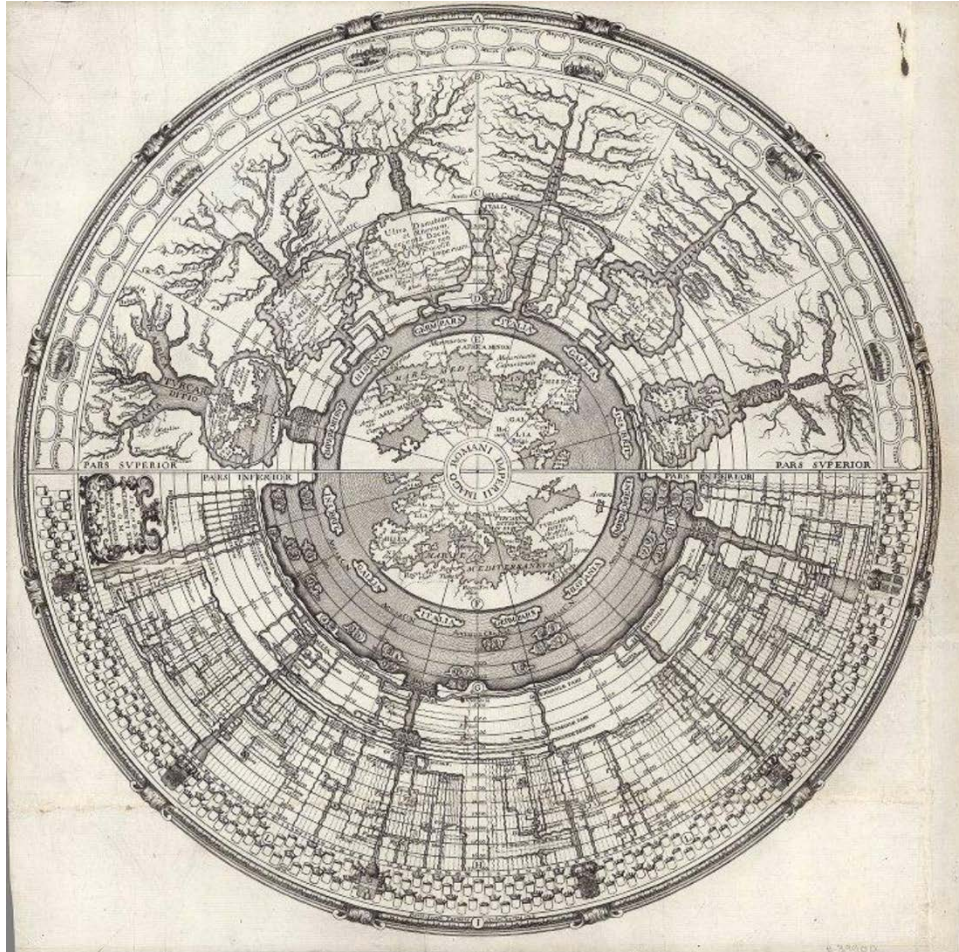


*Note. Halley, E. (1701). A new and correct chart shewing the variations of the compass in the western & southern oceans as observed in ye year 1700 by his Maties. Map.*

Princeton University Library, Historic Maps Collection, Department of Rare Books and Special Collections.

**Figure 2**

*Girolamo Andrea Martignoni*



*Note.* Martignoni, Girolamo Andrea. (1721). *Imago Romanii Imperli*. David Rumsey Map Collection, David Rumsey Map Center, Stanford Libraries.

**Figure 3**

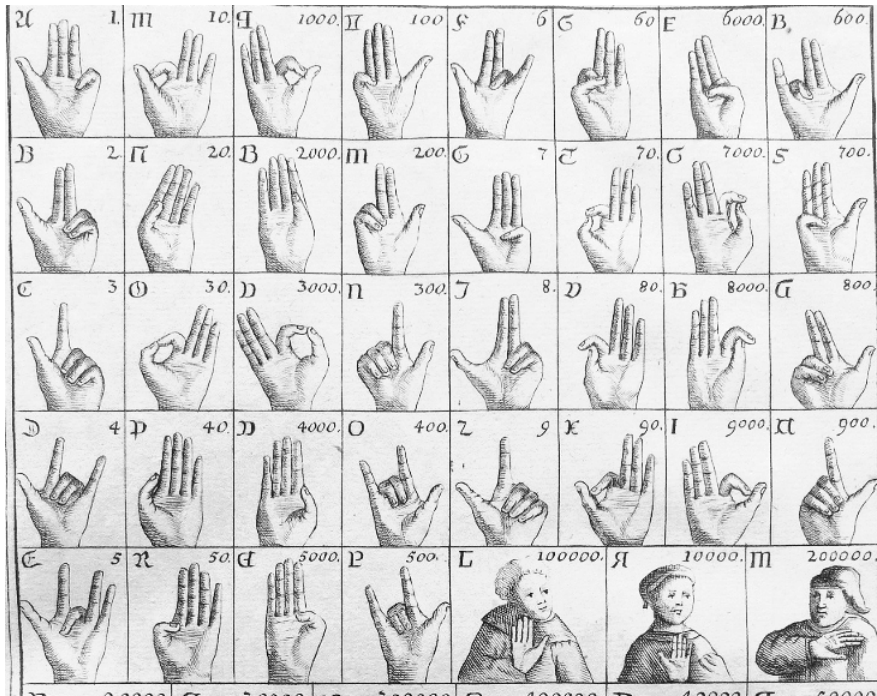
*Benjamin Franklin*

TEMPERANCE.							
EAT NOT TO DULLNESS; DRINK NOT TO ELEVATION.							
	S.	M.	T.	W.	T.	F.	S.
T[emperance]							
S[ilence]	*	*		*		*	
O[rder]	**	*	*		*	*	*
R[esolution]			*			*	
F[rugality]		*			*		
I[ndustry]			*				
S[incerity]							
J[ustice]							
M[oderation]							
C[leanliness]							
T[ranquillity]							
C[hastity]							
H[umility]							

*Note.* Franklin, Benjamin. (1869). *The Autobiography of Benjamin Franklin*. New York, Cincinnati, Chicago: American Book Company.

**Figure 4**

*Jacob Leupold*



*Note: Leupold, Jacob. (1727). Theatrum Arithmetico-Geometricum. Leipzig: Gleditsch.*

[7] Bl., 200 p., [2] Bl., Tab. I – XLIII: Ill.

**Figure 5**

*Nicolas Lenglet du Fresnoy*

Source gallica.bnf.fr / Bibliothèque nationale de France

*Note.* Lenglet du Fresnoy, Nicolas. (1733). *Tables Chronologiques de L'histoire*

*Universelle.* Paris: P. Gaudouin. National Library of France

<http://ark.bnf.fr/ark:/12148/cb40617251v>

**Figure 6**

*Henry Popple*

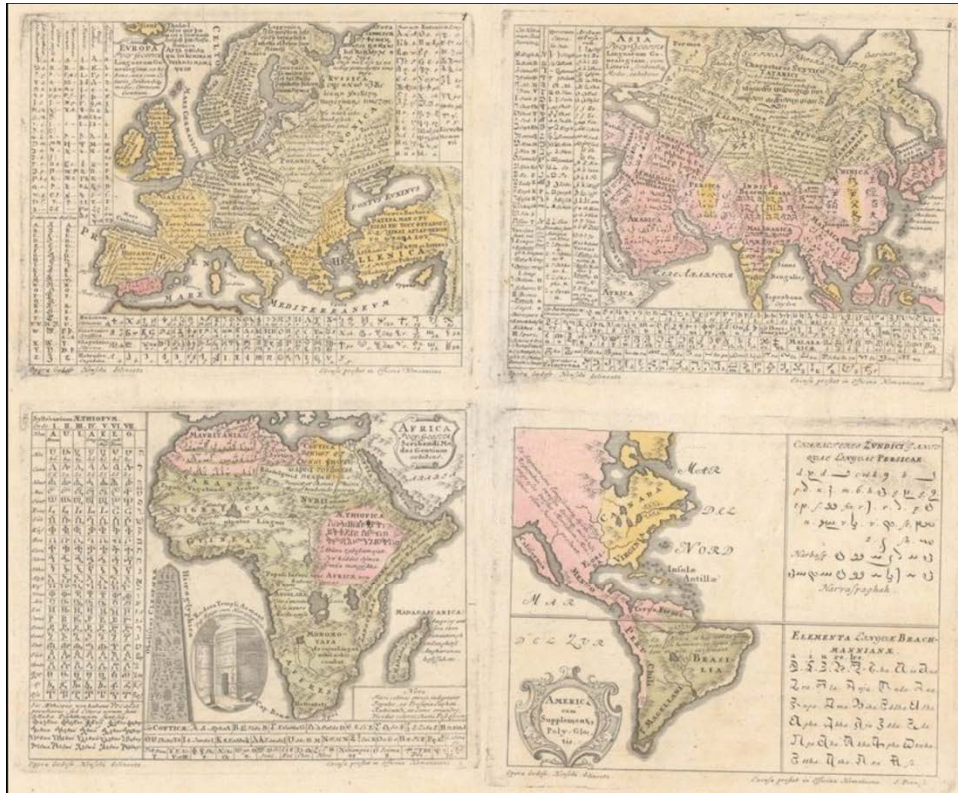


*Note. Popple, Henry. (1733). A Map of the British Empire in America with the French and Spanish Settlements adjacent to thereto. David Rumsey Map Collection, David Rumsey Map Center, Stanford Libraries.*



**Figure 7**

Gottfried Hensel



Note. Hensel, G., & Dorn, S. (1741). *Europa poly glotta: linguarum genealogiam exhibens, una cum literis, scribendiq[ue] modis, omnium gentium*. Princeton University Library, Historic Maps Collection, Department of Rare Books and Special Collections.

## Figure 8

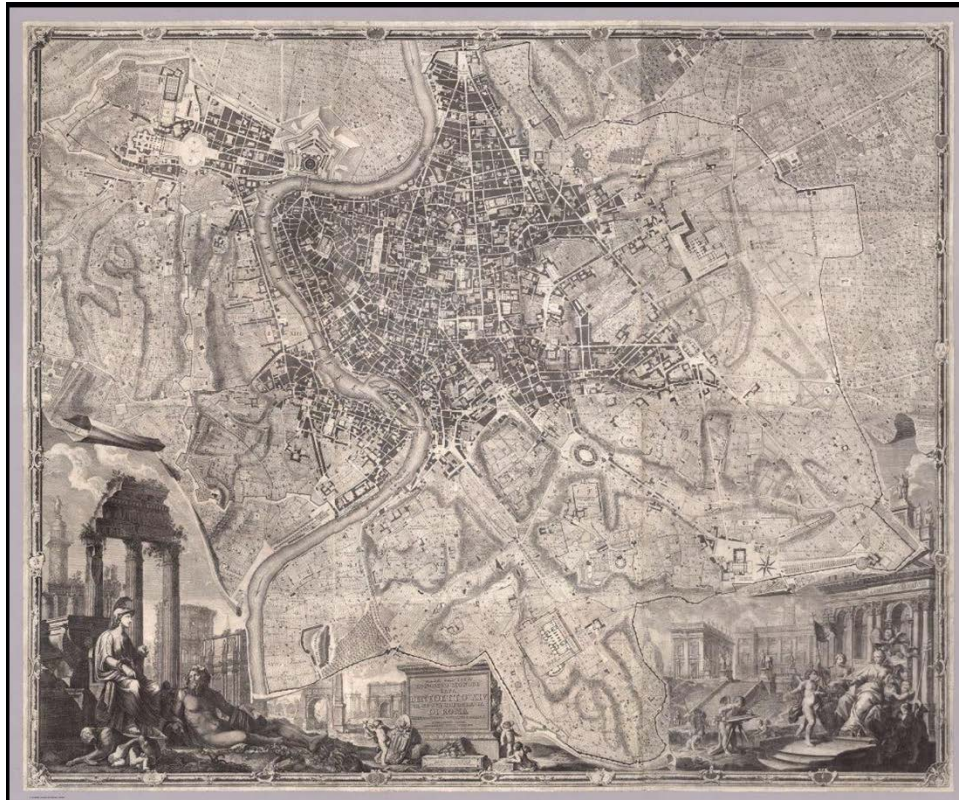
William Price



Note. Price, William. (1743). *A new plan of ye great town of Boston in New England in America with the many additionall buildings & new streets to the year.* Map. Library of Congress, Geography and Map Division. [www.loc.gov/item/73691790/](http://www.loc.gov/item/73691790/)

**Figure 9**

*Giovanni Battista Nolli*

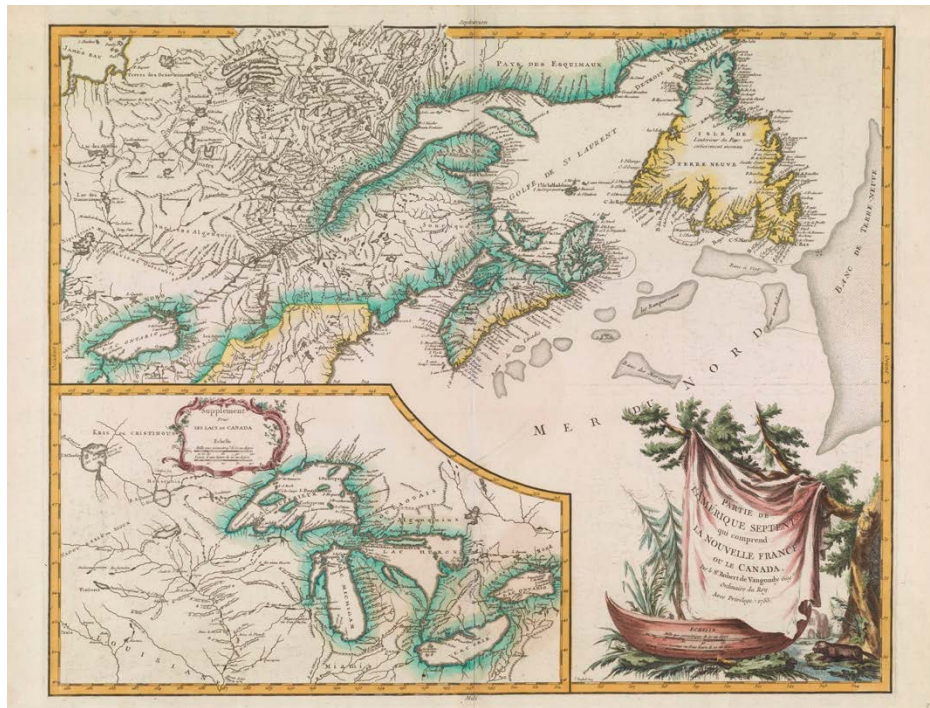


*Note.* Nolli, Giovanni Battista and Pozzi, Stefano. (1748). *Nuova Topografia Di Roma*.

David Rumsey Map Collection, David Rumsey Map Center, Stanford Libraries.

**Figure 10**

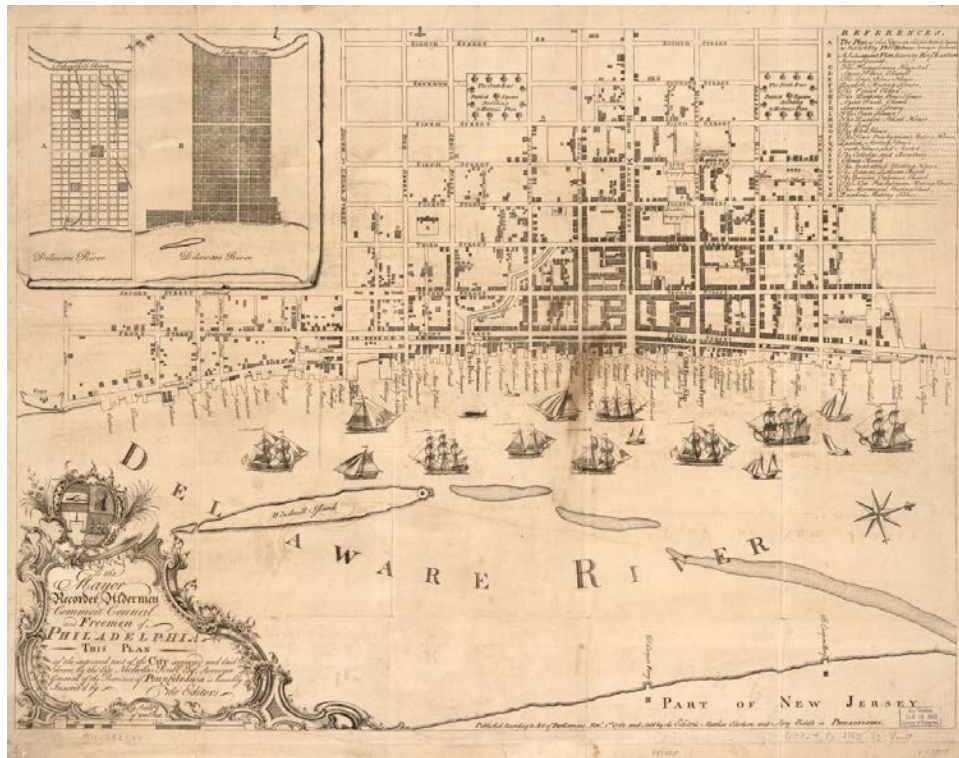
*Gilles Robert de Vaugondy*



*Note. Robert de Vaugondy, Gilles. (1755). Partie de L'Amerique Septent. qui comprend La Nouvelle France Ou Le Canada, Par le Sr. Robert de Vaugondy Géog Ordinaire du Roy. Avec Privilege. Map. Osher Map Library, Smith Center for Cartographic Education*

**Figure 11**

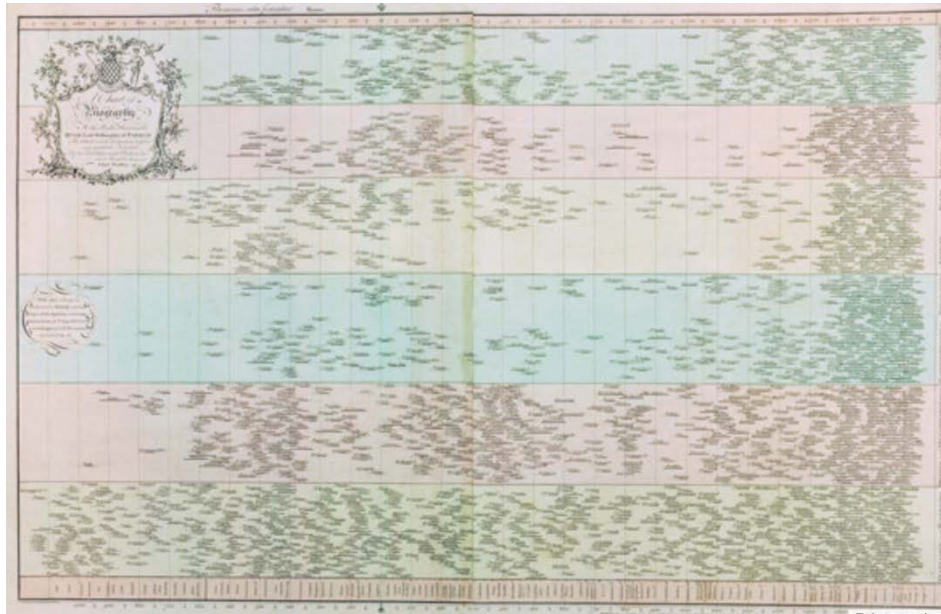
*Nicholas Scull, Matthew Clarkson, and Mary Biddle*



*Note. Scull, N., Clarkson, M. & Biddle, M. (1762). To the Mayor, Recorder, Aldermen, Common Council, and Freemen of Philadelphia this Plan of the Improved Part of the City Surveyed and Laid Down by the Late Nicholas Scull. Map. Library of Congress, Geography and Map Division.*

**Figure 12**

*Joseph Priestley*

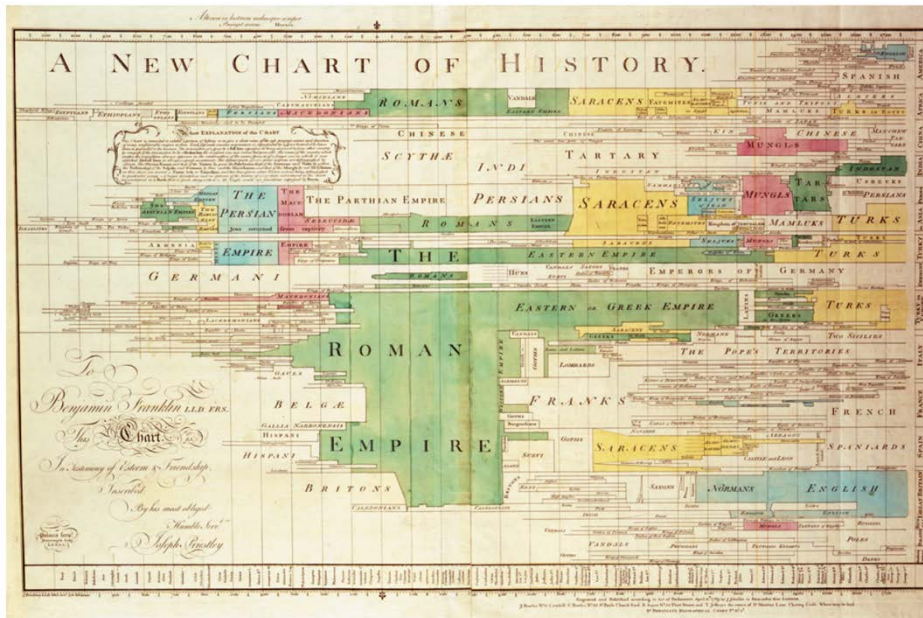


*Note.* Priestley, Joseph. (1765). *A Specimen of a Chart of Biography*. Timeline.

Public Domain/Wikimedia Commons

**Figure 13**

*Joseph Priestley*

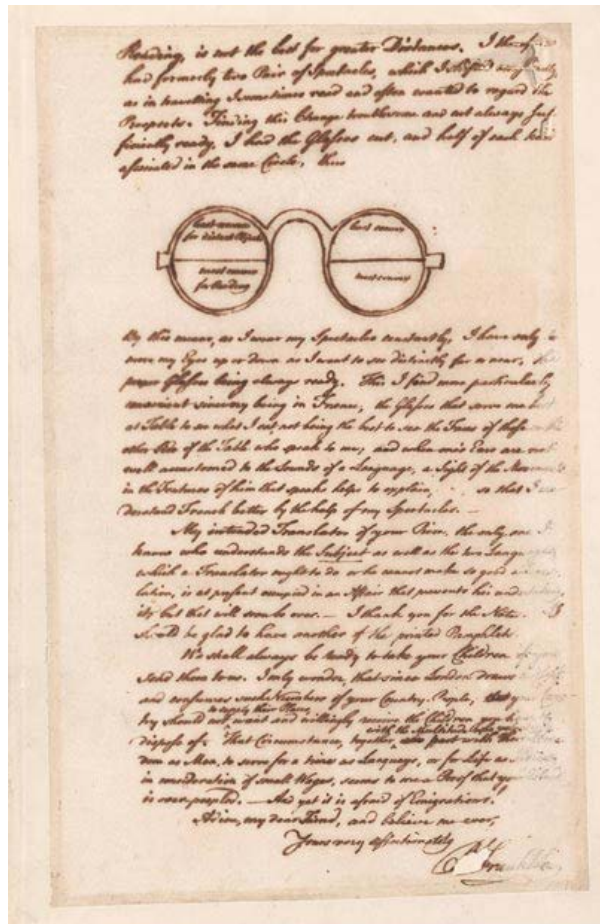


*Note. Priestley, Joseph. (1769). A New Chart of History. Timeline.*

Public Domain/Wikimedia Commons

Figure 14

Benjamin Franklin

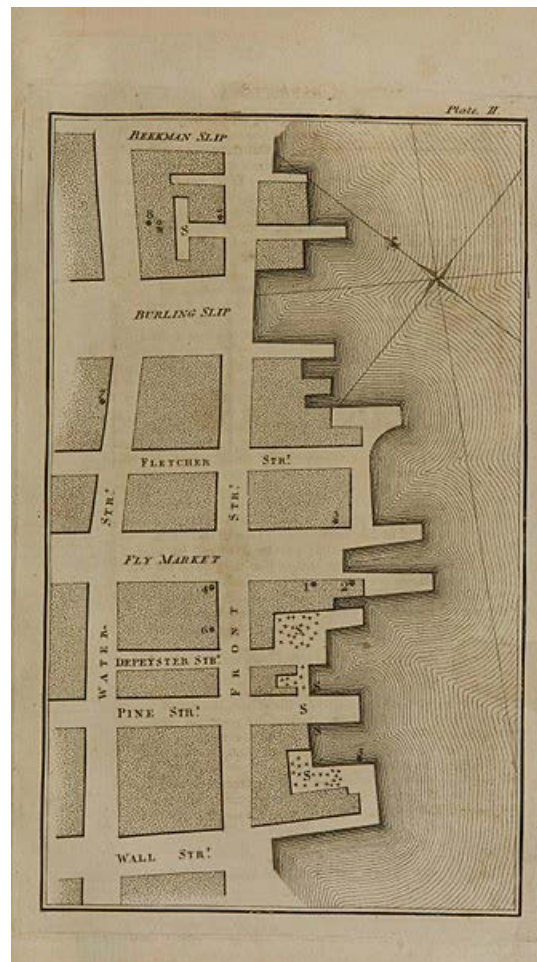


Note. Franklin, Benjamin. (1785). Benjamin Franklin to George Whatley (ca. 1709–1791), May 23, 1785. Letterpress manuscript. Library of Congress, Manuscript Division. <https://www.loc.gov/exhibits/franklin/franklin-scientist.html#36>



**Figure 15**

*Valentine Seaman*

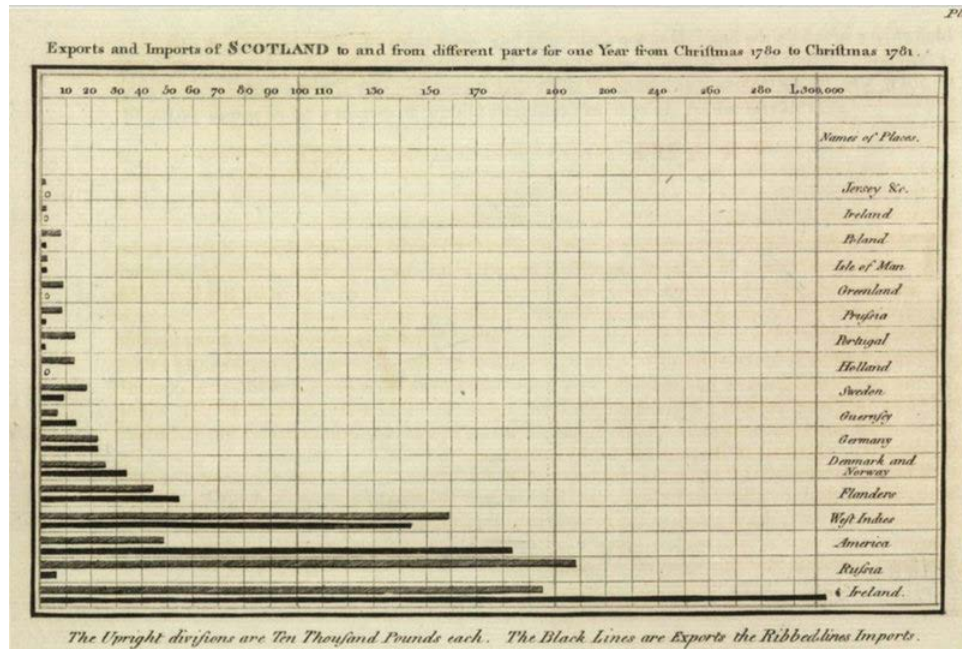


*Note. Seaman, Valentine. (1795). Map of Yellow Fever Epidemic in New York City.*

Plate. Public Domain/Wikimedia Commons

**Figure 16**

*William Playfair*

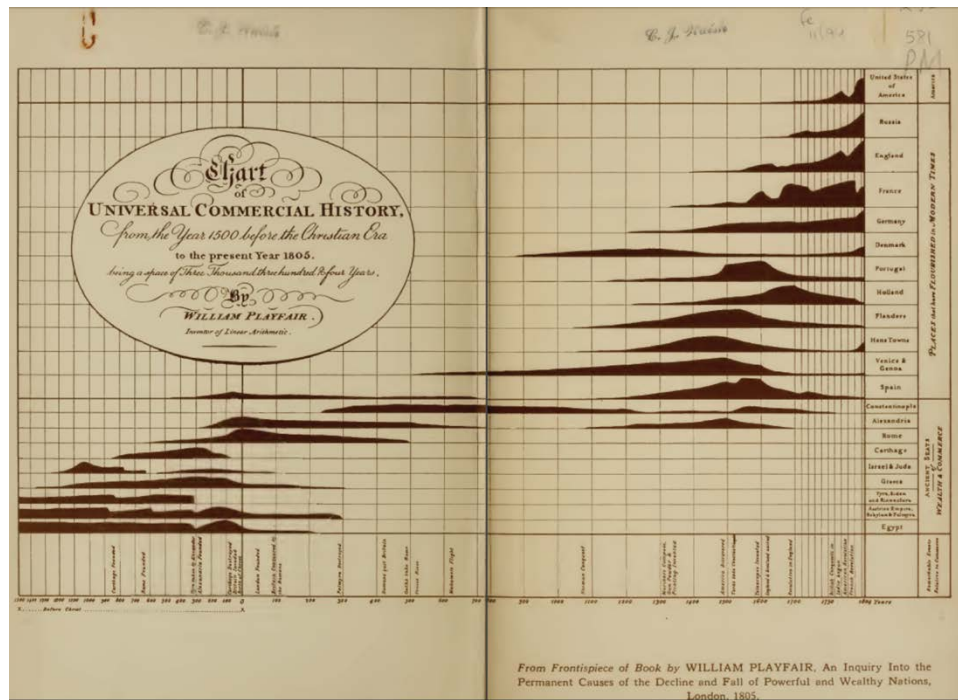


Note. Playfair, W. (1786). *Exports and Imports of Scotland to and from Different Parts for one Year from Christmas 1780 to Christmas 1781*. Bar Chart.

Public Domain/Wikimedia Commons

**Figure 17**

*William Playfair*

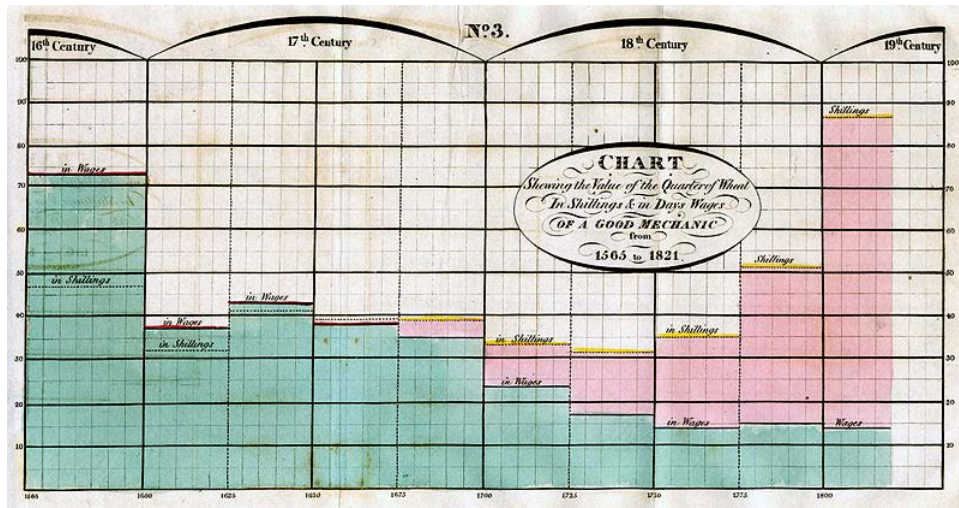


*Note. Playfair, William. (1805). Chart of Universal Commercial History from the Year 1500 before the Christian Era to the present Year 1805. Chart.*

Public Domain/Wikimedia Commons

**Figure 18**

*William Playfair*

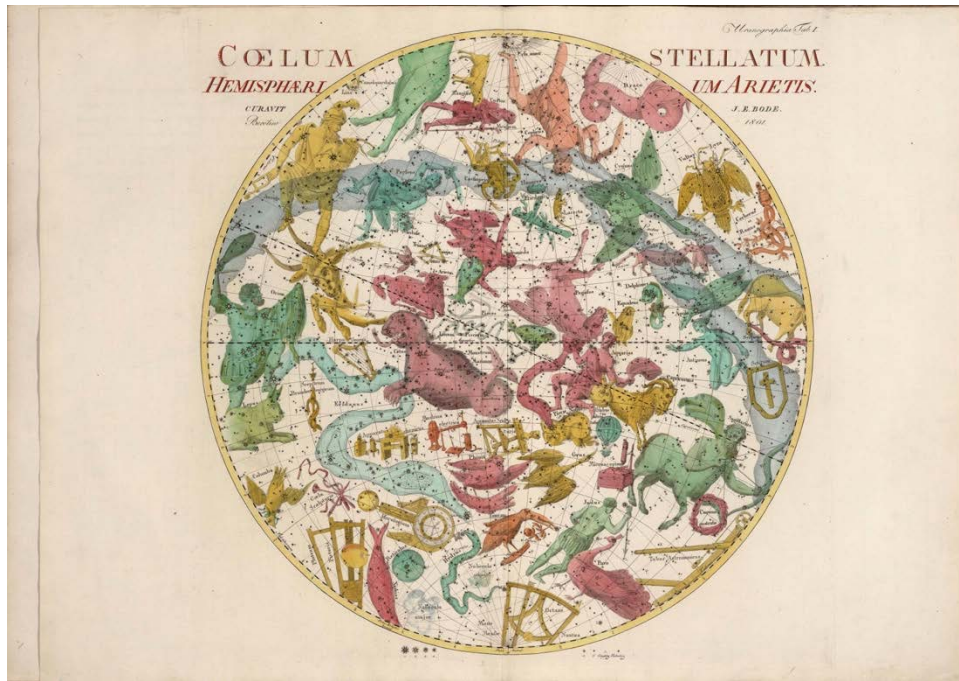


*Note.* Playfair, William. (1821). *Shewing the Value of the Quarter of Wheat in Shillings & in Days Wages of a Good Mechanic from 1565 to 1821.* Chart.

Public Domain/Wikimedia Commons

**Figure 19**

*Johann Elert Bode*



*Note.* Bode, Johann Elert. (1801). *Coelum Stellatum Hemisphaerium Arietis*. David Rumsey Map Collection, David Rumsey Map Center, Stanford Libraries.

**Figure 20**

*Mary Hall*



*Note. Hall, Mary. (1814). Map of the United States and the Southern Part of the Canadas. Map. Osher Map Library, Smith Center for Cartographic Education*

**Figure 21**

*Emily Hill*



*Note. Hill, Emily. (1820). A Map of the United States of America by Emily Hill. Map.*

Osher Map Library, Smith Center for Cartographic Education

**Figure 22**

Robert Wilkinson

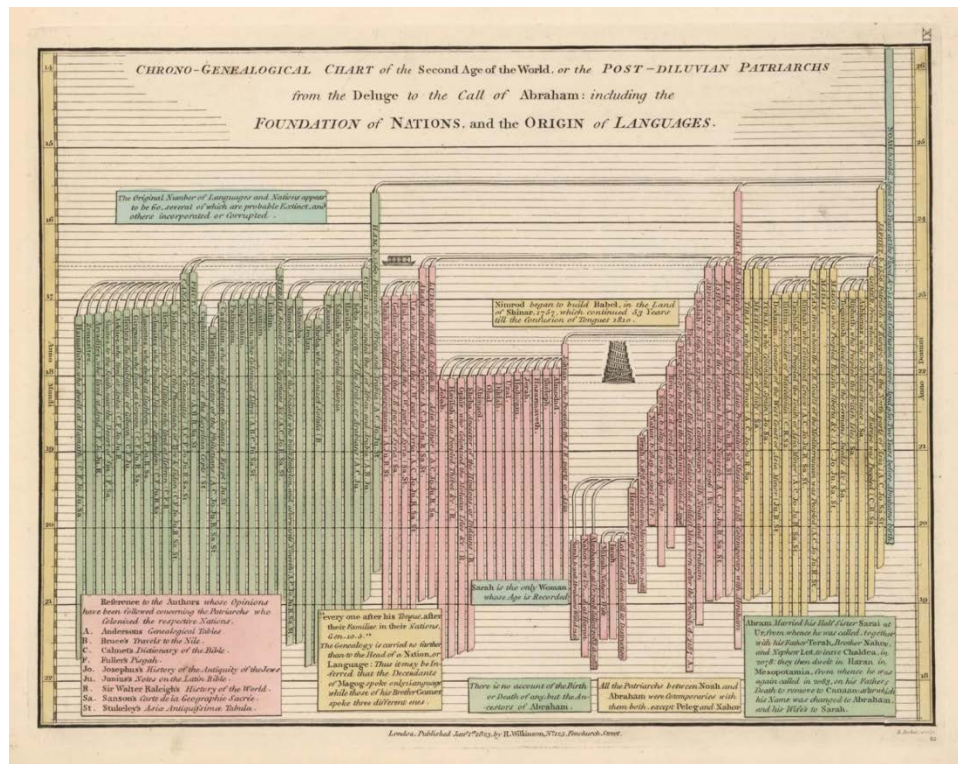


Note. Wilkinson, Robert. (1821). *Imperiorum Antiquorum*. David Rumsey Map Collection, David Rumsey Map Center, Stanford Libraries.



Figure 23

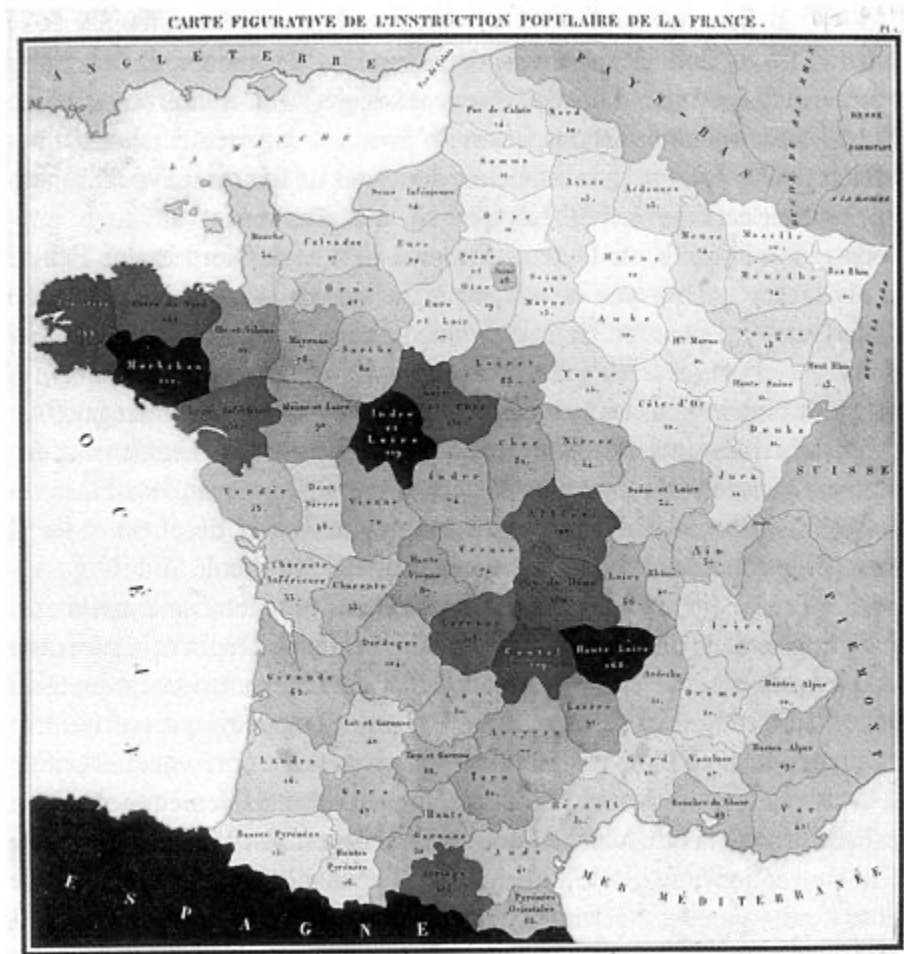
Robert Wilkinson



Note. Wilkinson, Robert. (1823). *Chrono-Genealogical Chart of the Second Age of the World, or the Post-Diluvian Patriarchs from the Deluge to the Call of Abraham: including the Foundation of Nations, and the Origin of Languages*. David Rumsey Map Collection, David Rumsey Map Center, Stanford Libraries.

**Figure 24**

*Charles Dupin*

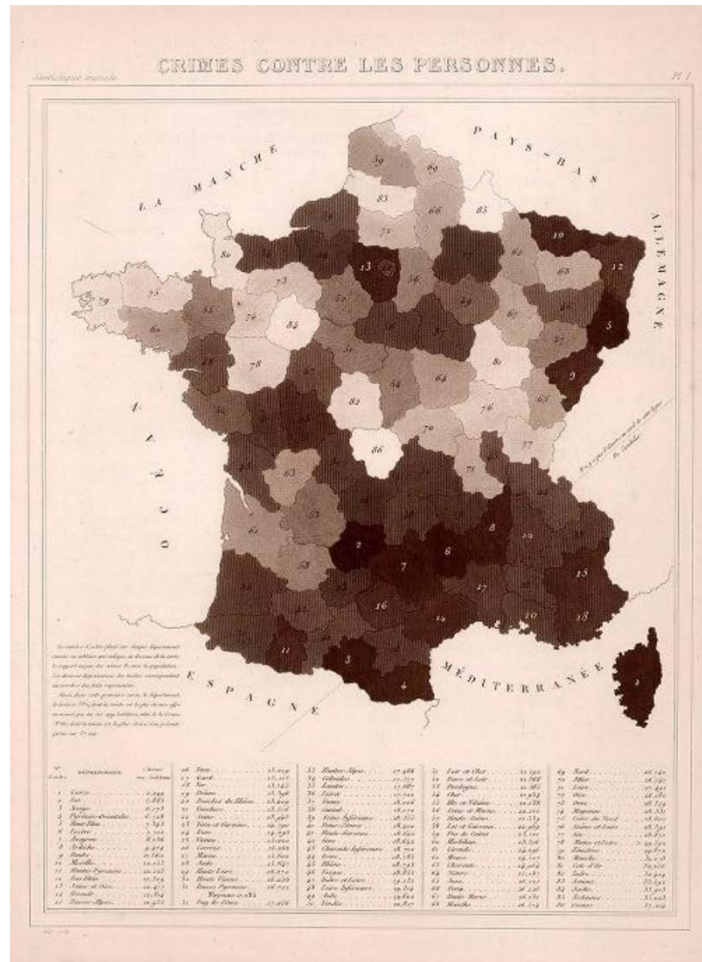


*Note.* Dupin, Charles. (1826). *Carte Figurative de L'instruction Populaire de la France.*

Choropleth map. Public Domain/Wikimedia Commons

Figure 25

André-Michel Guerry



Note. Guerry, André-Michel. (1833). *Crimes Contre Les Personnes*. David Rumsey Map Collection, David Rumsey Map Center, Stanford Libraries.

**Figure 26**

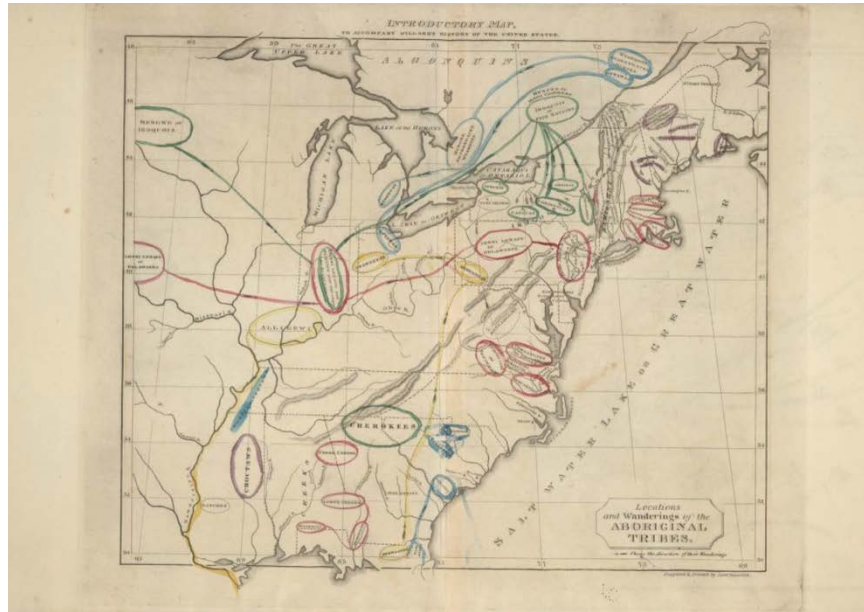
*Emma Willard and William Woodbridge*



*Note. Willard, E. and Woodbridge, W. (1827). Map No. II. The World as Known to the Ancients. Map. Osher Map Library, Smith Center for Cartographic Education*

**Figure 27**

*Emma Willard*

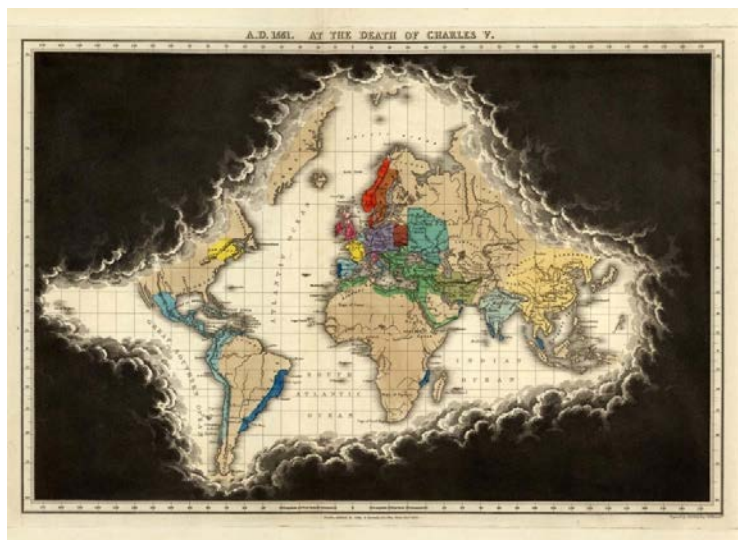
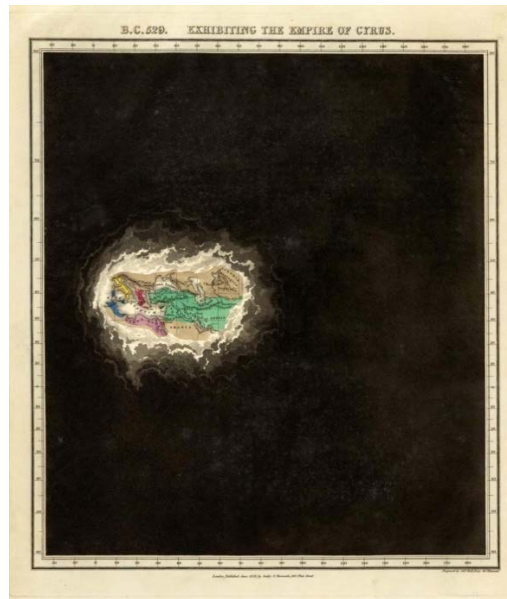


*Note.* Willard, Emma. (1828) *Locations and Wanderings of the Aboriginal Tribes.*

Map. Library of Congress, Geography and Map Division.

**Figure 28**

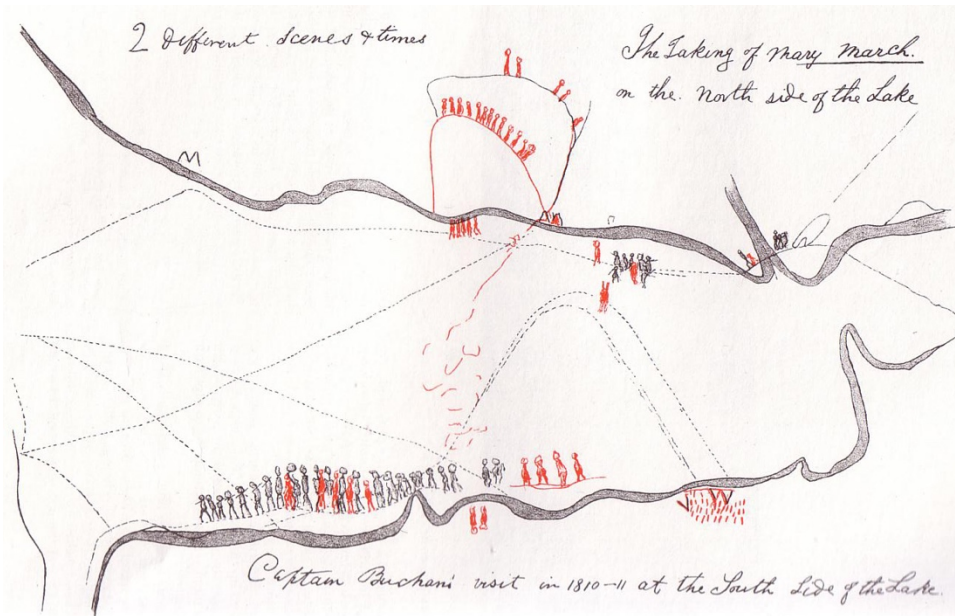
*Edward Quin*



*Note.* Quin, Edward. (1830). *An Historical Atlas: In a Series of Maps of the World as Known at Different Periods.* David Rumsey Map Collection, David Rumsey Map Center, Stanford Libraries.

**Figure 29**

*Shanawdithit*

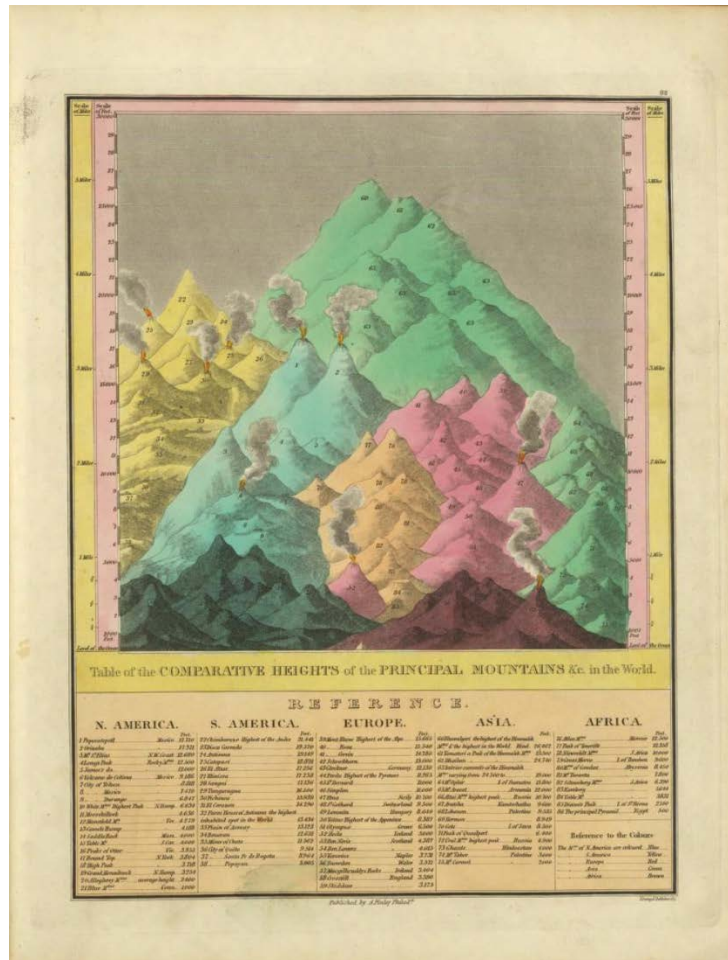


*Note. Shanawdithit. (1829). The Taking of Mary March on the North Side of the Lake.*

Map. Public Domain/Wikimedia Commons

**Figure 30**

Anthony Finley

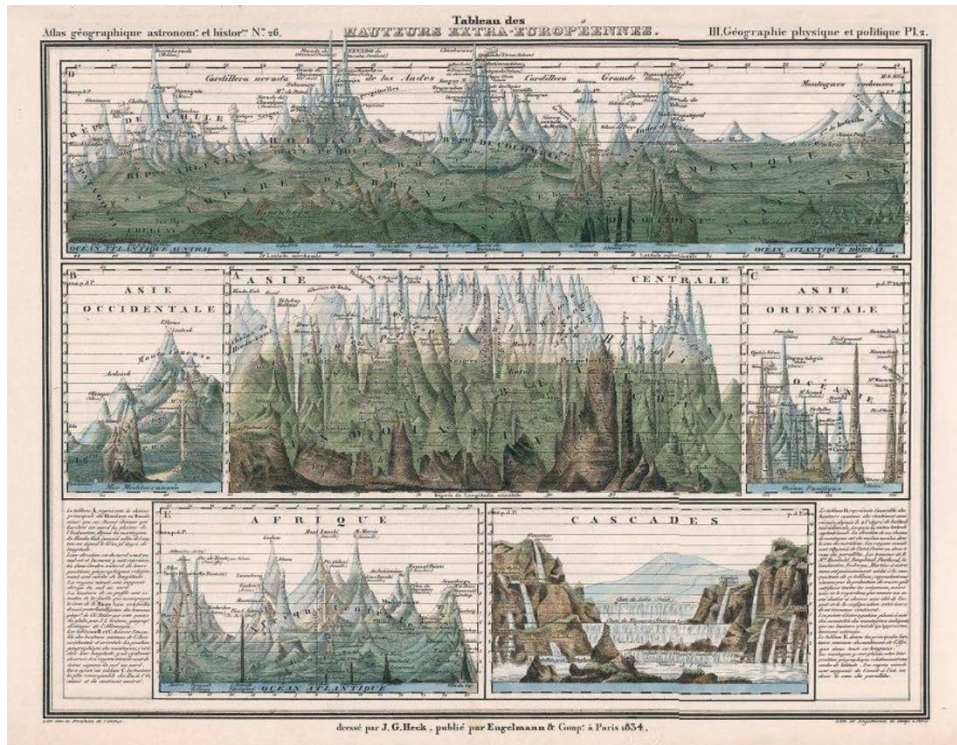


Note. Finley, Anthony. (1831). *Table of the Comparative Heights of the Principal Mountains &c in the World*. David Rumsey Map Collection, David Rumsey Map Center, Stanford Libraries.



**Figure 31**

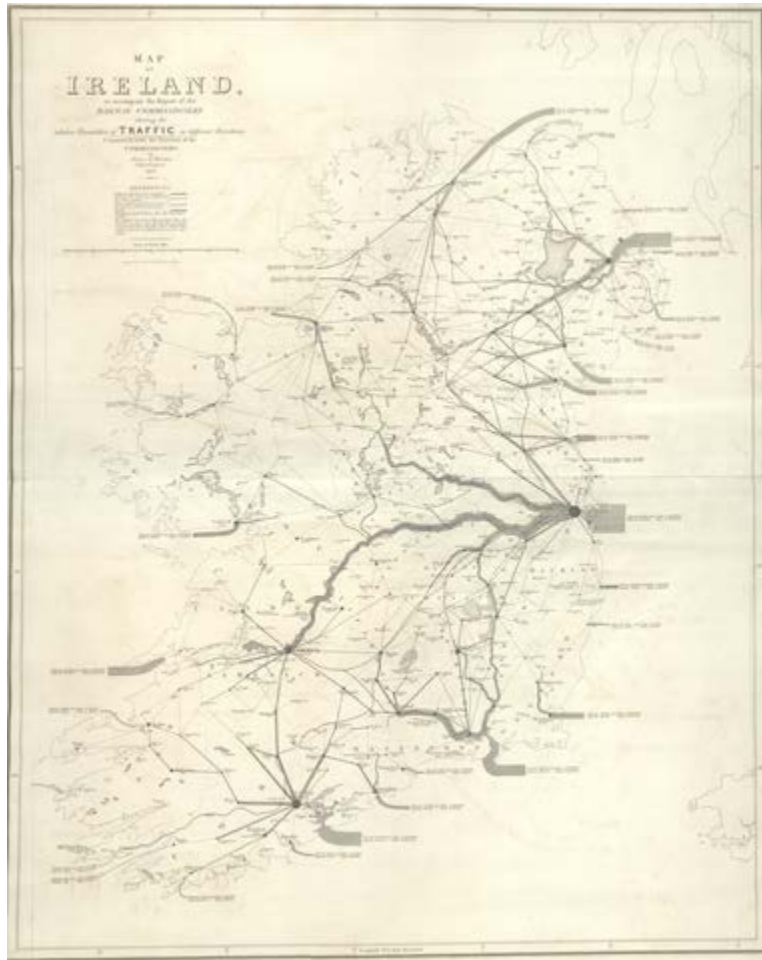
*Johann Georg Heck*



*Note.* Heck, Johann Georg. (1834). *Tableau des Hauteurs Extra-Europeennes*. David Rumsey Map Collection, David Rumsey Map Center, Stanford Libraries

**Figure 32**

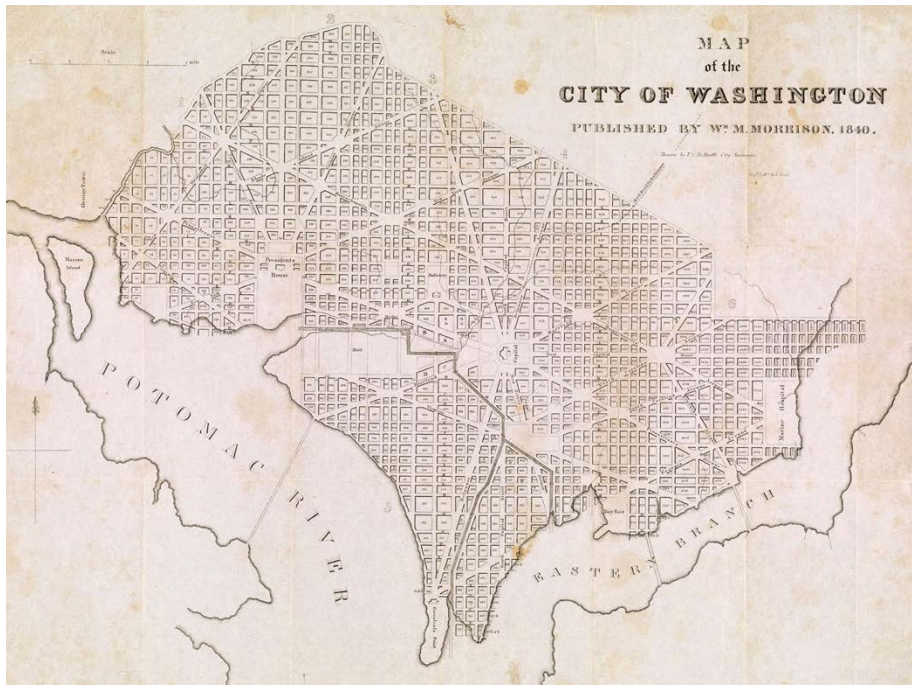
*Henry Drury Harness*



*Note. Harness, Henry Drury. (1837). Map of Ireland to Accompany the Report of the Railway Commissioners Shewing the Relative Quantities of Traffic in Different Directions. Choropleth map. Public Domain/Wikimedia Commons*

**Figure 33**

*F. C. De Krafft and William M. Morrison*

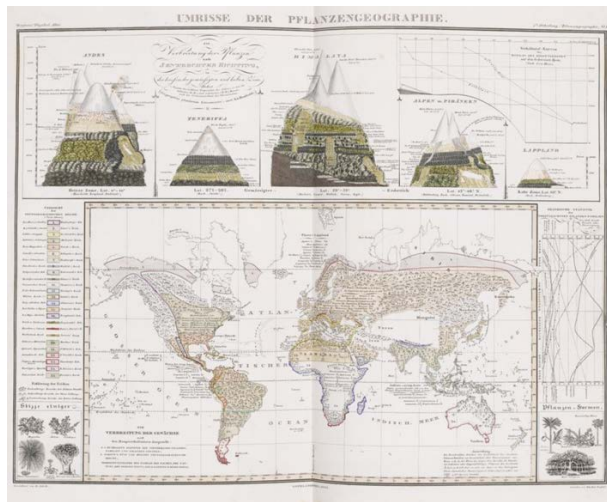
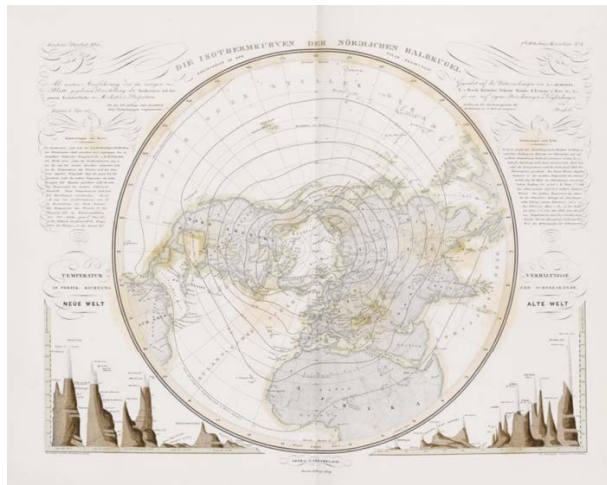


*Note. De Krafft, F. C. and Morrison, William, M. (1840). Map of the City of Washington.*

Map. Osher Map Library, Smith Center for Cartographic Education

**Figure 34**

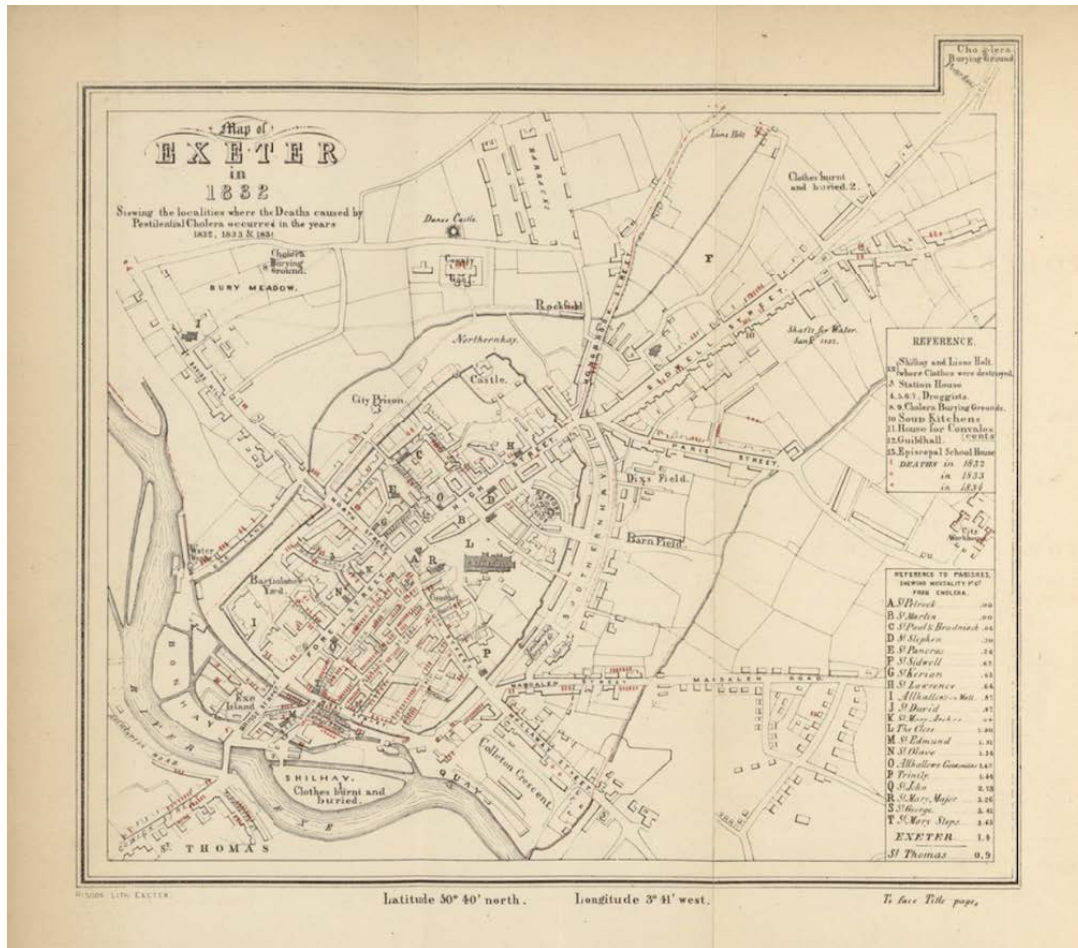
*Heinrich Berghaus*



*Note.* Berghaus, Heinrich. (1845). *Physikalischer Atlas*. Princeton University Library, Special Collections, Rare Books Historic Map Collection.

Figure 35

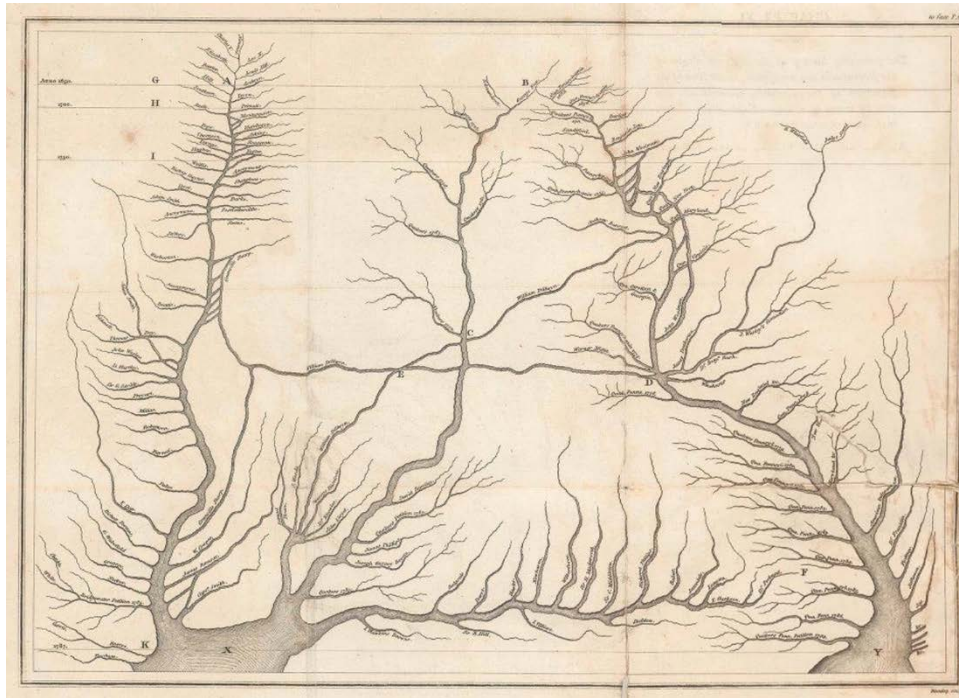
Thomas Shapter



Note. Shapter, Thomas. (1849). *The History of the Cholera in Exeter in 1832*. London: John Churchill. National Institute of Health, The National Library of Medicine.

**Figure 36**

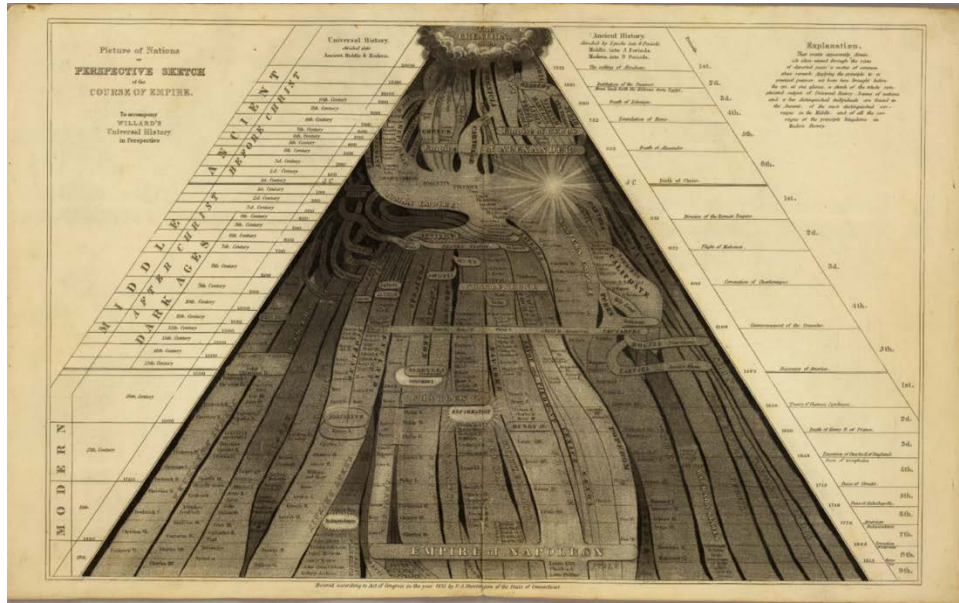
*Thomas Clarkson*



*Note. Clarkson, Thomas. (1808). Timeline Showing the Evolution of the Abolitionist Movement Against the Slave Trade. David Rumsey Map Collection, David Rumsey Map Center, Stanford Libraries.*

**Figure 37**

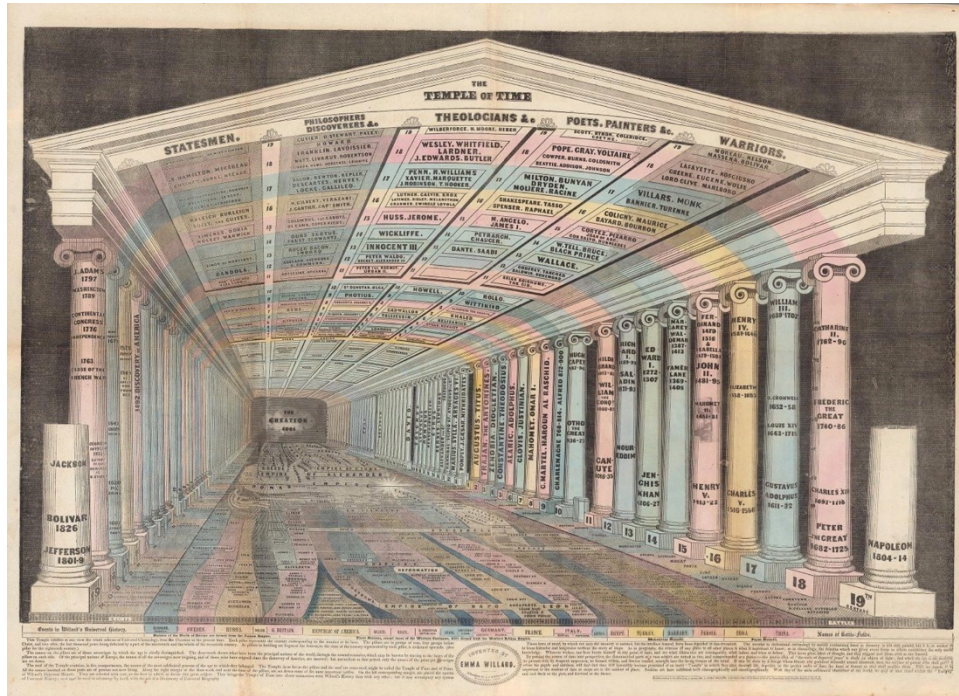
*Emma Willard*



*Note.* Willard, Emma. (1836). *Picture of Nations or Perspective Sketch of the Course of Empire*. David Rumsey Map Collection, David Rumsey Map Center, Stanford Libraries.

Figure 38

Emma Willard

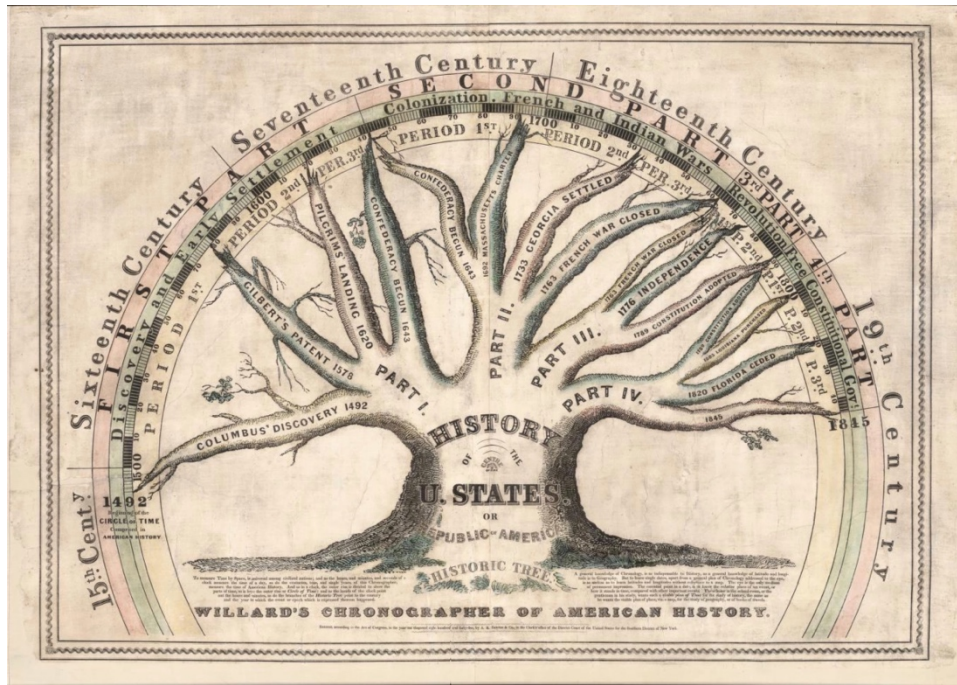


Note. Willard, Emma. (1846). *The Temple of Time*. David Rumsey Map Collection, David Rumsey Map Center, Stanford Libraries.



**Figure 39**

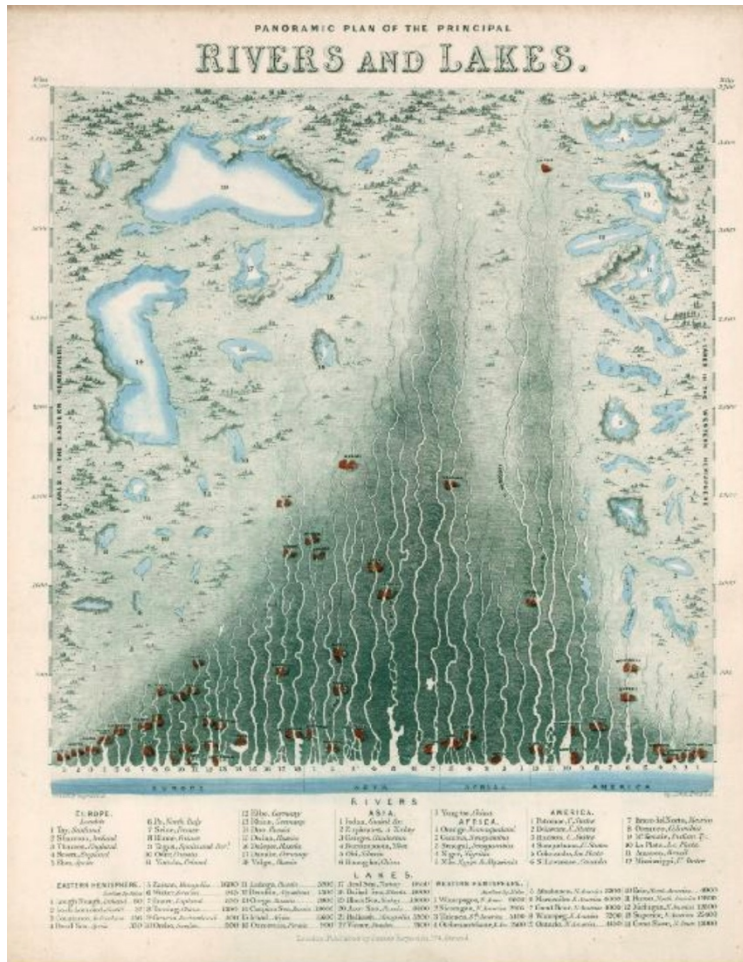
*Emma Willard*



*Note.* Willard, Emma. (1845). *History of the U. States or Republic of America Historic Tree*. David Rumsey Map Collection, David Rumsey Map Center, Stanford Libraries.

**Figure 40**

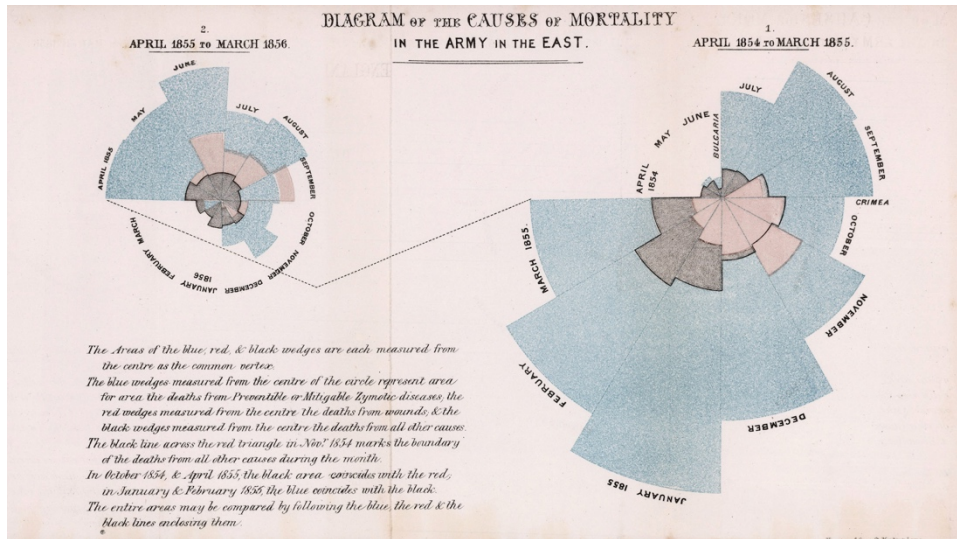
*James Reynolds and John Emslie*



*Note.* Reynolds, J. and Emslie, J. (1851). *Panoramic Plan of the Principal Rivers and Lakes.* David Rumsey Map Collection, David Rumsey Map Center, Stanford Libraries.

**Figure 41**

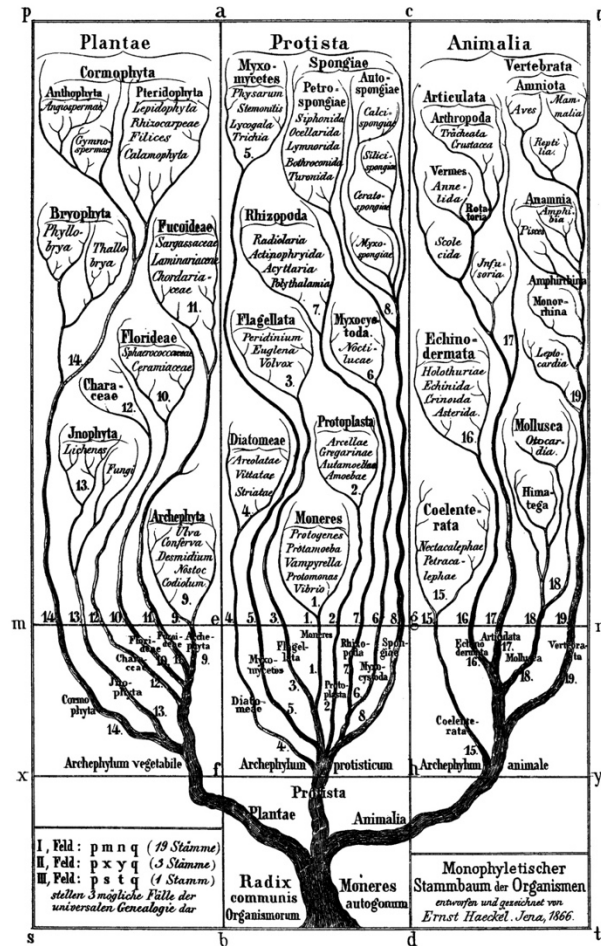
*Florence Nightingale*



*Note.* Nightingale, Florence. (1858). *Diagram of the Causes of Mortality in the Army in the East*. Chart. Public Domain/Wikimedia Commons

Figure 42

Ernst Haeckel

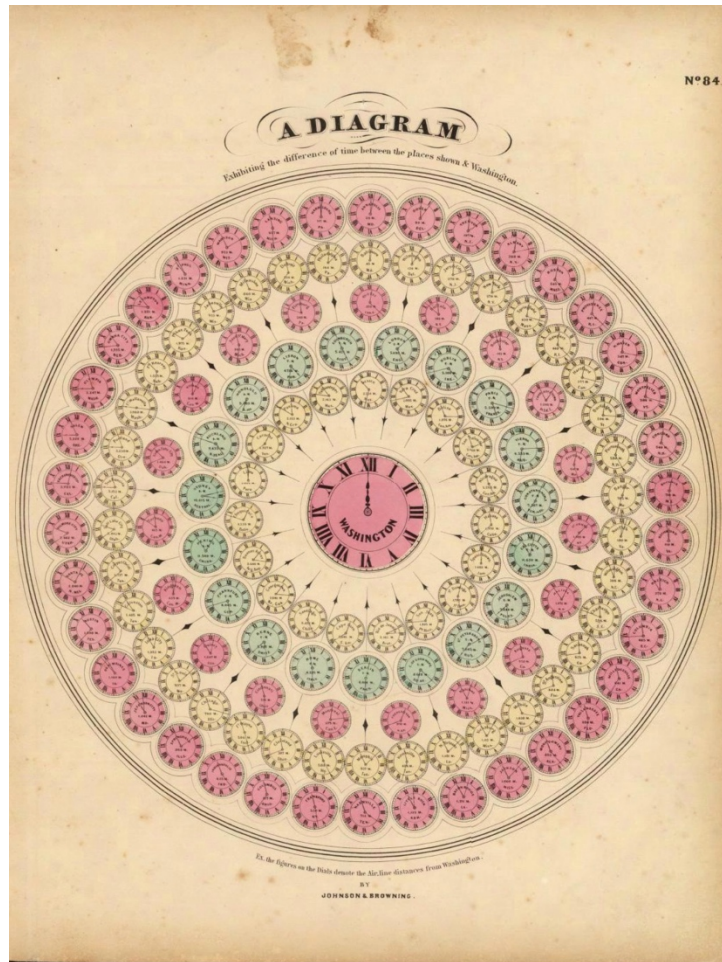


Note. Haeckel, Ernst. (1866). *Monophyletischer Stammbaum der Organismen*. Chart.

Public Domain/Wikimedia Commons

**Figure 43**

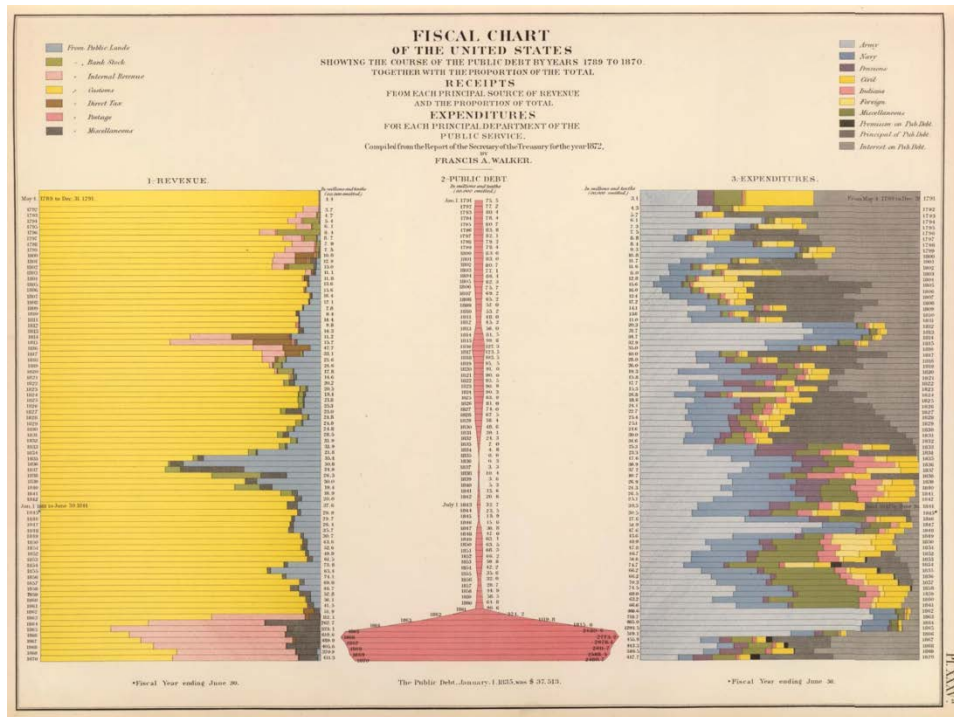
Alvin Jewett Johnson



*Note.* Johnson, Alvin Jewett. (1860). *A Diagram Exhibiting the Difference of Time Between the Places Shown & Washington.* David Rumsey Map Collection, David Rumsey Map Center, Stanford Libraries.

**Figure 44**

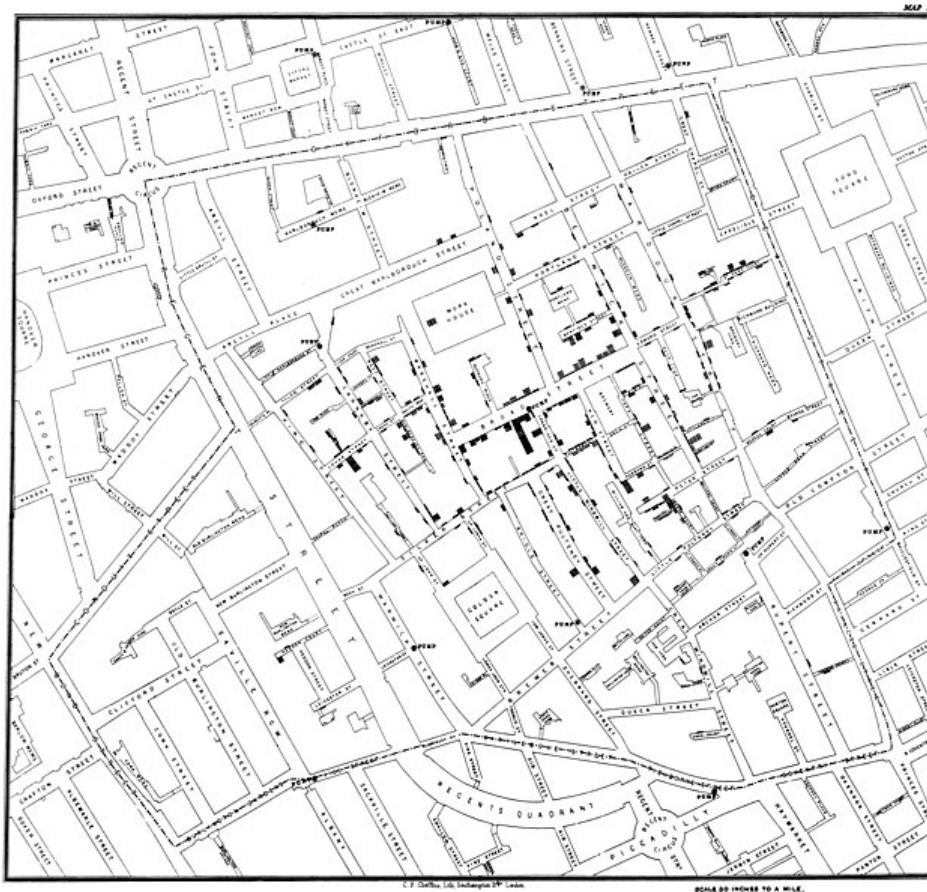
*Francis A. Walker*



Note. Walker, Francis A. (1874). *Fiscal Chart of the United States Showing the Course of the Public Debt by Years 1789 to 1870*. David Rumsey Map Collection, David Rumsey Map Center, Stanford Libraries.

# Figure 45

John Snow

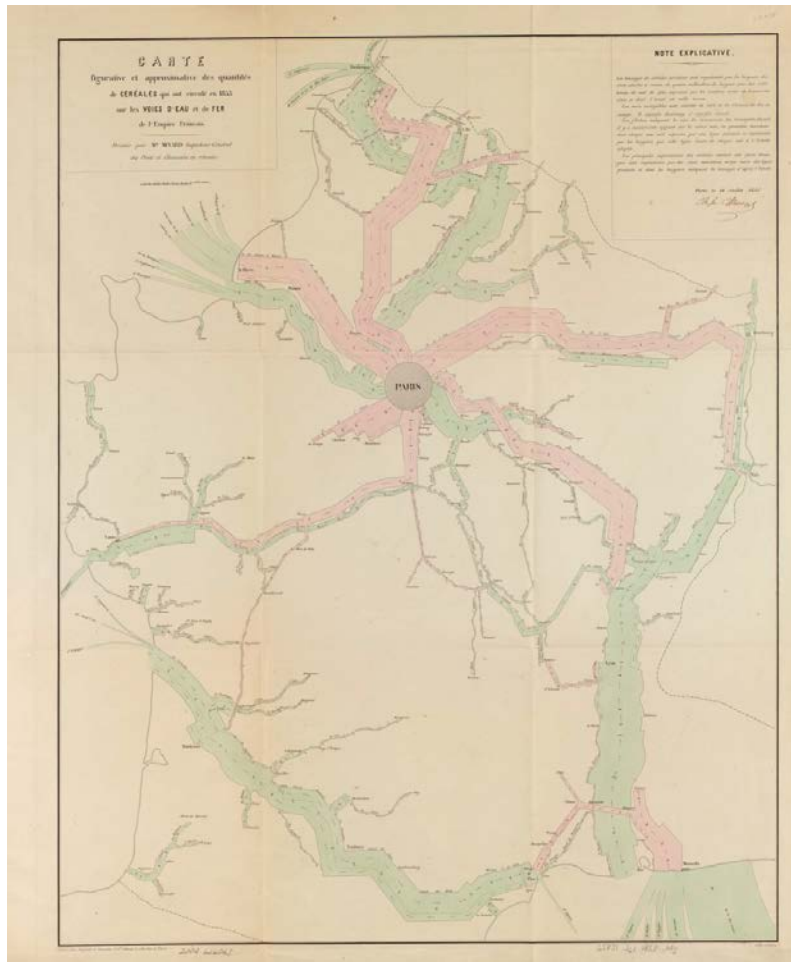


Note. Snow, John. (1854). *Cholera in the South of London*. Map.

Public Domain/Wikimedia Commons

## Figure 46

Charles Joseph Minard



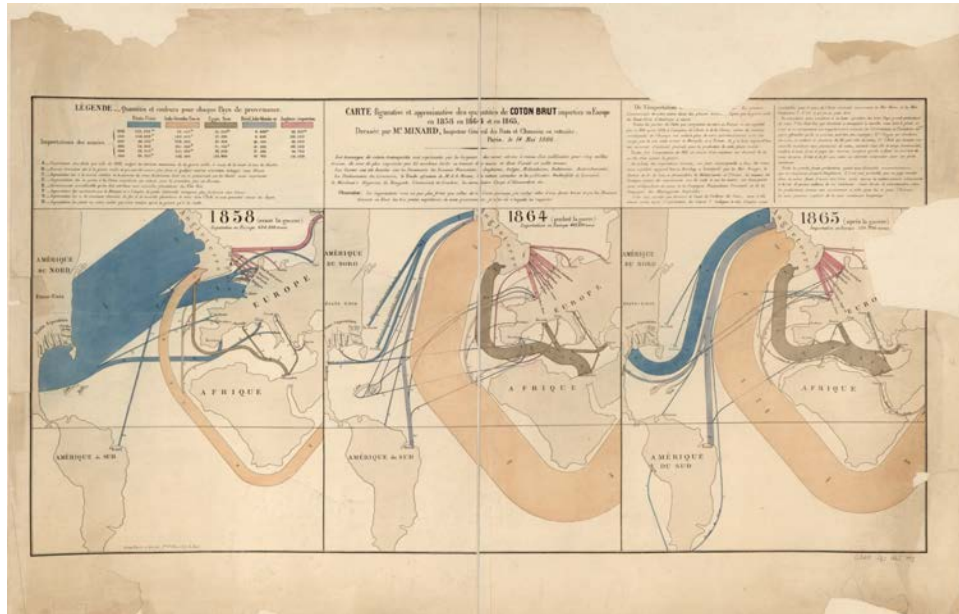
Note. Minard, Charles Joseph. (1855). *Carte Figurative et Approximative des Quantités de Céréales qui ont Circulé en 1853 sur les Voies d'eau et de fer de l'Empire Français.*

Map. Public Domain/Wikimedia Commons



**Figure 47**

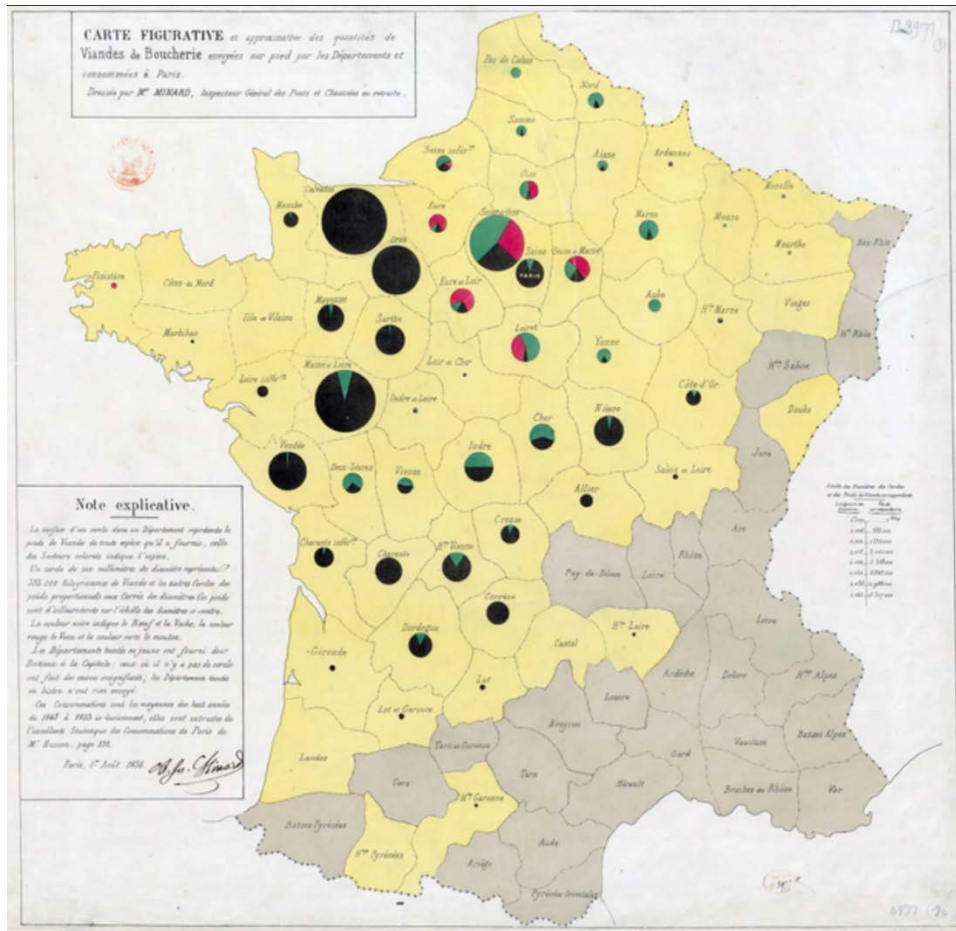
*Charles Joseph Minard*



*Note. Minard, Charles Joseph. (1866) Carte Figurative et Approximative des Quantités de Coton Brut Importées en Europe en 1858, 1864, 1865. Map. Library of Congress, Geography and Map Division.*

**Figure 48**

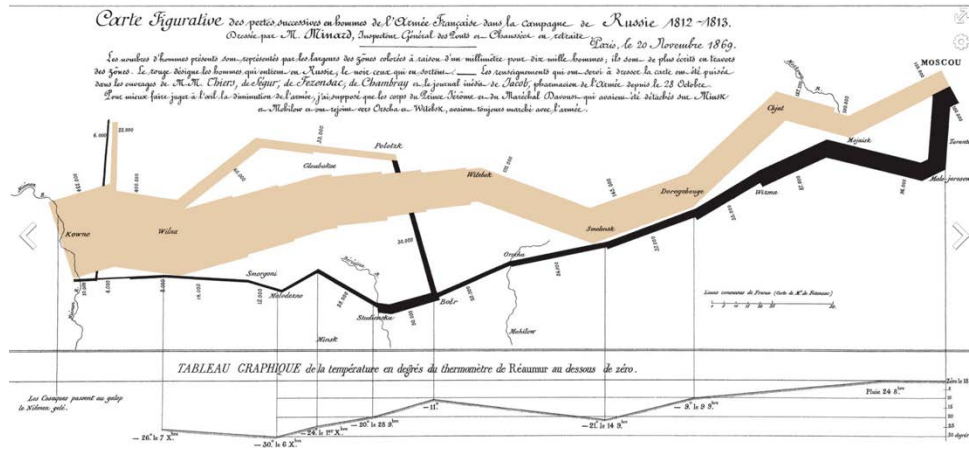
*Charles Joseph Minard*



*Note. Minard, Charles Joseph. (1858). Carte Figurative et Approximative des Quantités de Viandes de Boucherie Envoyées sur Pied par les Départements et Consommateurs à Paris. Chart. Public Domain/Wikimedia Commons*

Figure 49

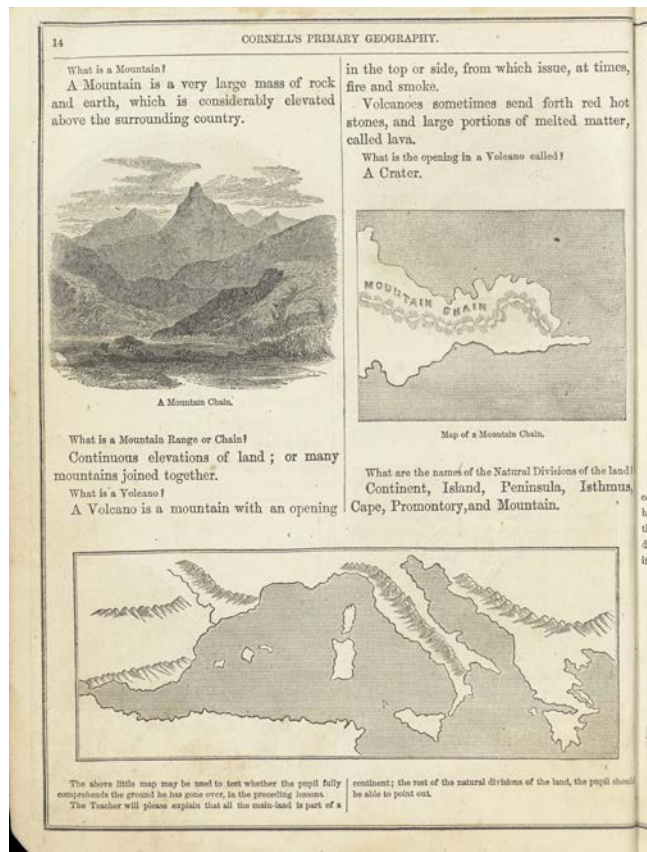
Charles Joseph Minard



Note. Minard, Charles Joseph. (1869). *Napoleon March to and from Russia 1812–1813*.  
Chart. Public Domain/Wikimedia Commons

**Figure 50**

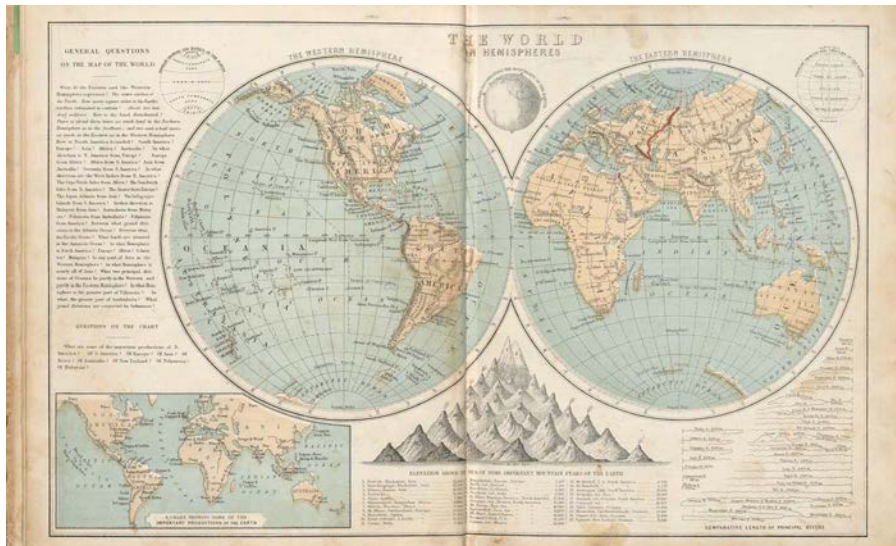
*Sarah Sophia Cornell*



*Note.* Cornell, Sarah S. (1857). *Cornell's Primary Geography Forming Part First of a Systematic Series of School Geographies [A Mountain Chain]*. Textbook. Osher Map Library, Smith Center for Cartographic Education

**Figure 51**

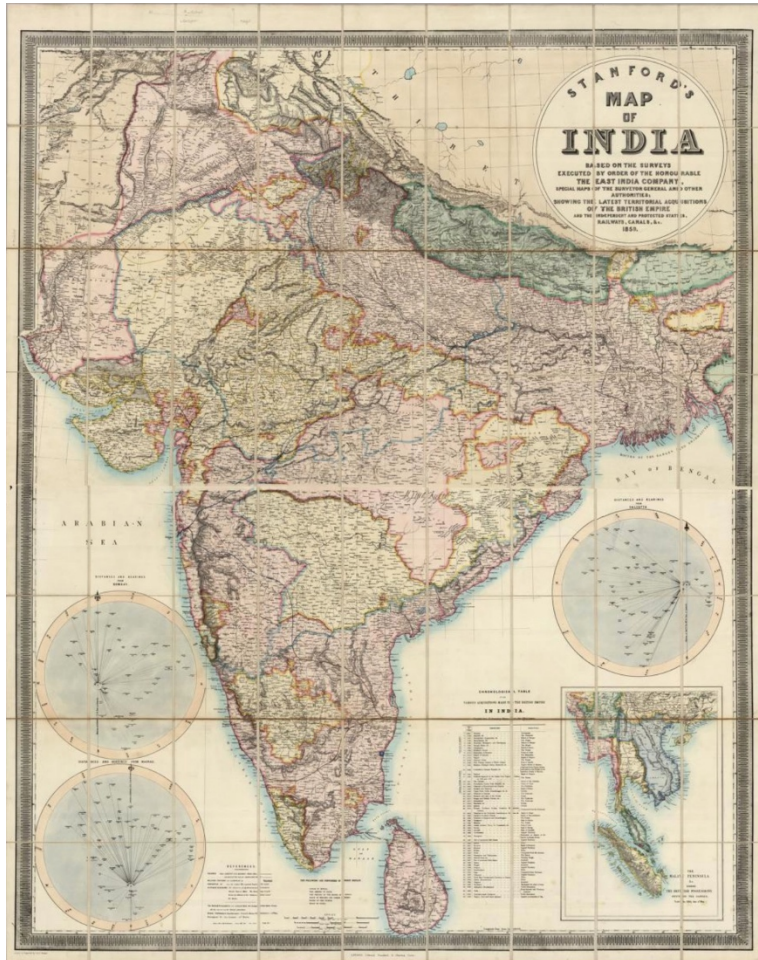
*Sarah Sophia Cornell*



*Note. Cornell, Sarah S. (1869). Cornell's Intermediate Geography: Forming Part Second of a Systematic Series of School Geographies. Textbook. Osher Map Library, Smith Center for Cartographic Education*

**Figure 52**

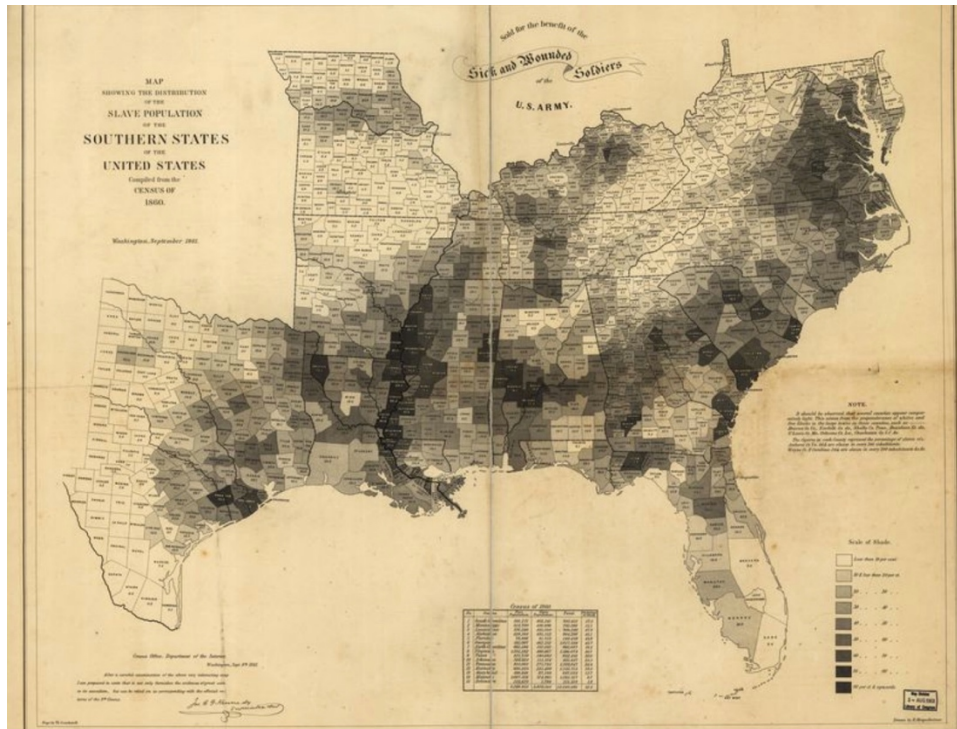
*Edward Stanford*



*Note.* Stanford, Edward. (1859). *Stanford's Map of India*. David Rumsey Map Collection, David Rumsey Map Center, Stanford Libraries.

**Figure 53**

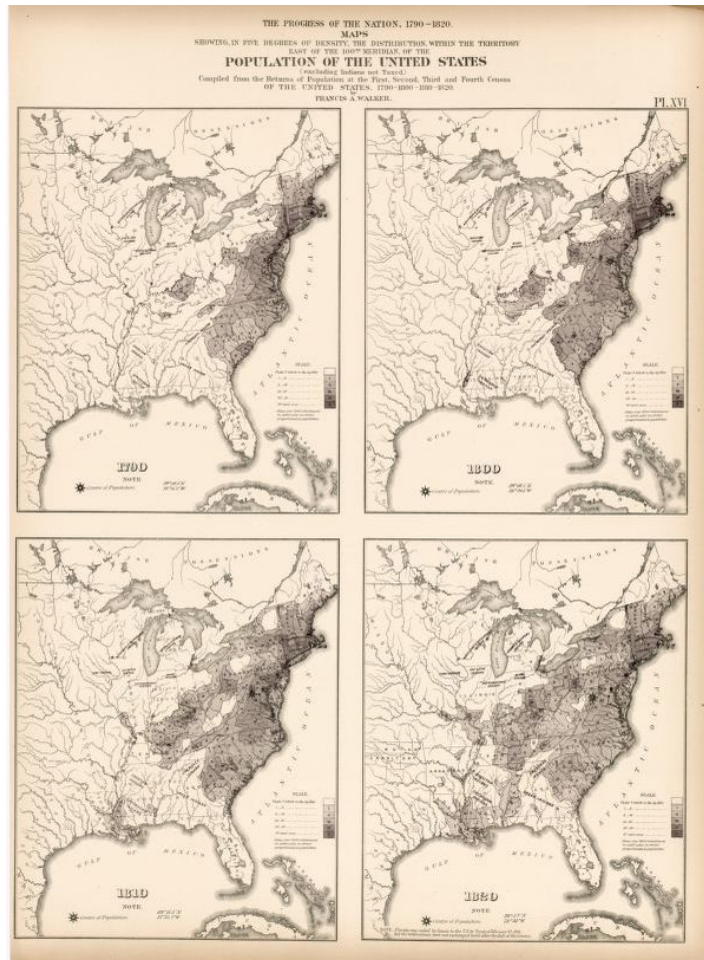
*Edwin Hergesheimer*



*Note. Hergesheimer, Edwin. (1861) Map Showing the Distribution of the Slave Population of the Southern States of the United States. Compiled from the Census of 1860. Map. Library of Congress, Geography and Map Division.*

**Figure 54**

*Francis A. Walker*

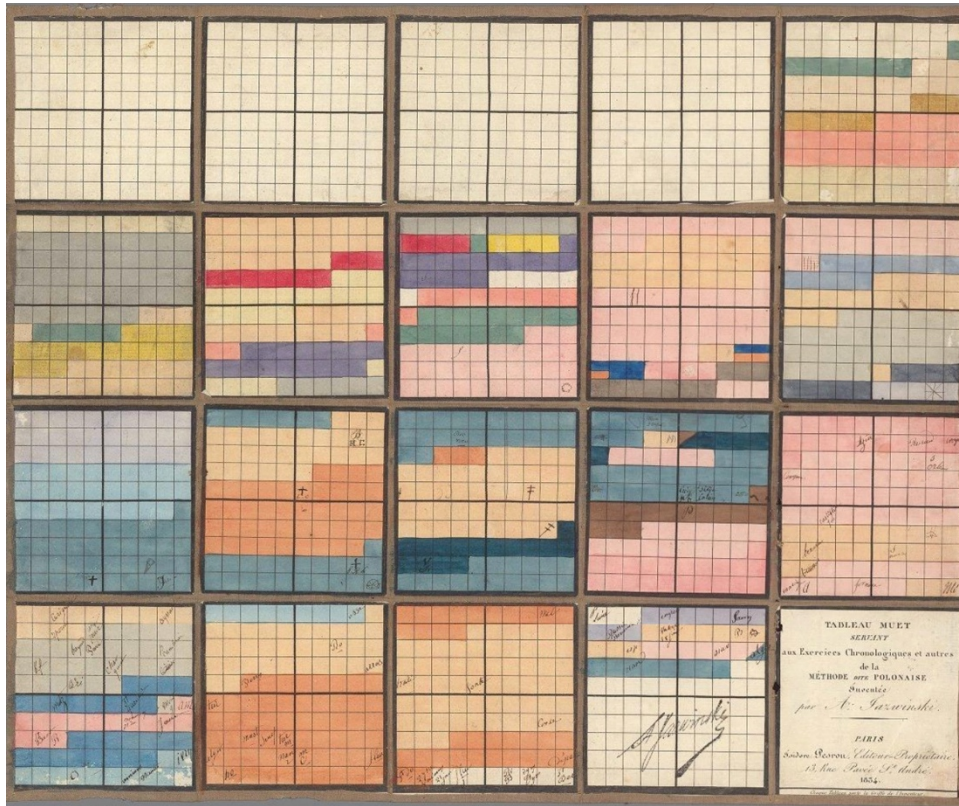


*Note. Walker, Francis A. (1874) Statistical Atlas of the United States Based on the Results of the Ninth Census 1870 with Contributions from Many Eminent Men of Science and Several Departments of the Government. Map. Library of Congress, Geography and Map Division.*



**Figure 55**

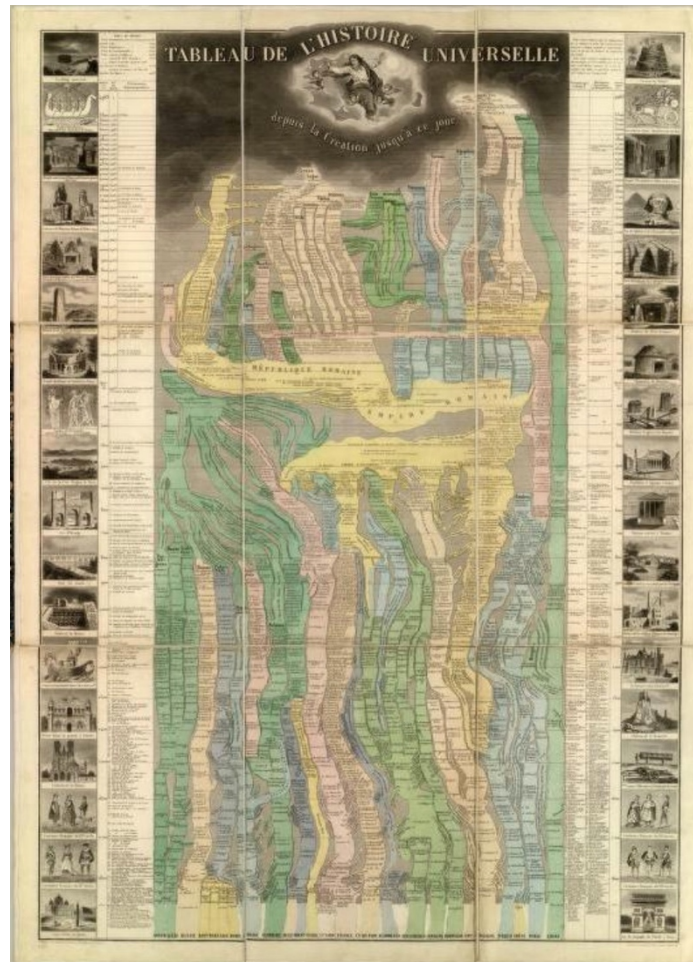
*Antoni Jazwinski*



*Note. Jazwinski, Antoni (1834). Tableau Muet Servant aux Exercices Chronologiques et autres de la Methode dite Polonaise Inventée par A. Jazwinski. David Rumsey Map Collection, David Rumsey Map Center, Stanford Libraries.*

**Figure 56**

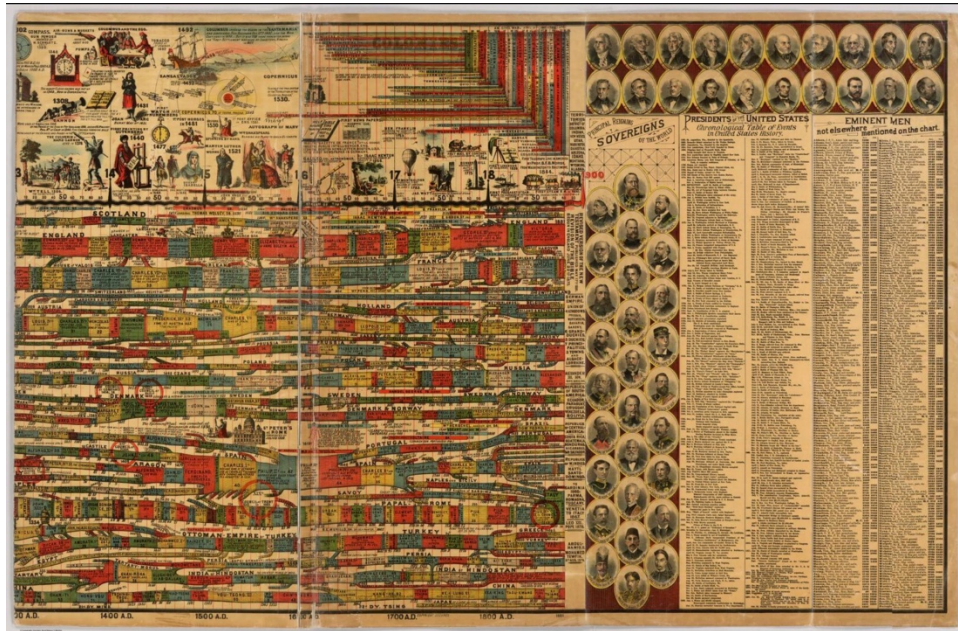
*Eugene Pick*



*Note.* Pick, Eugene. (1858). *Tableau De L'Histoire Universelle*. David Rumsey Map Collection, David Rumsey Map Center, Stanford Libraries.

**Figure 57**

*Sebastian C. Adams*



*Note.* Adams, Sebastian C. (1881). *Adams' Synchronological Chart*. David Rumsey Map Collection, David Rumsey Map Center, Stanford Libraries.

**Figure 58**

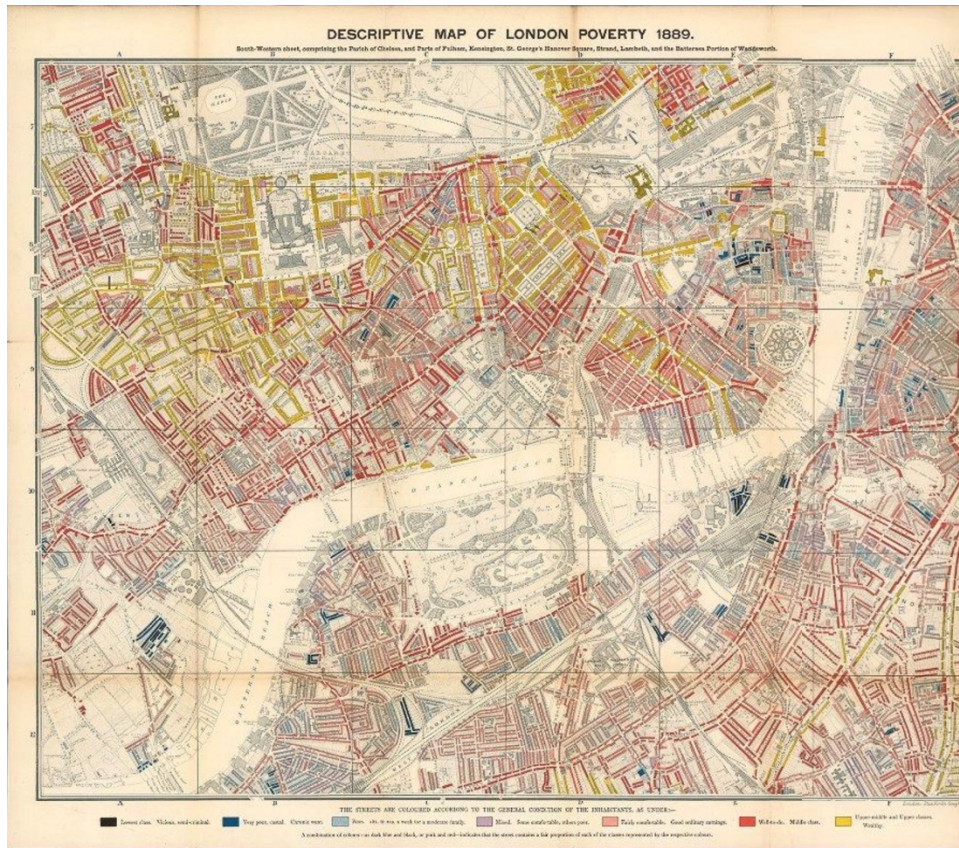
*E. McD. Johnstone*



*Note.* Johnstone, E. McD. (1885). *The Unique Map of California*. David Rumsey Map Collection, David Rumsey Map Center, Stanford Libraries.

**Figure 59**

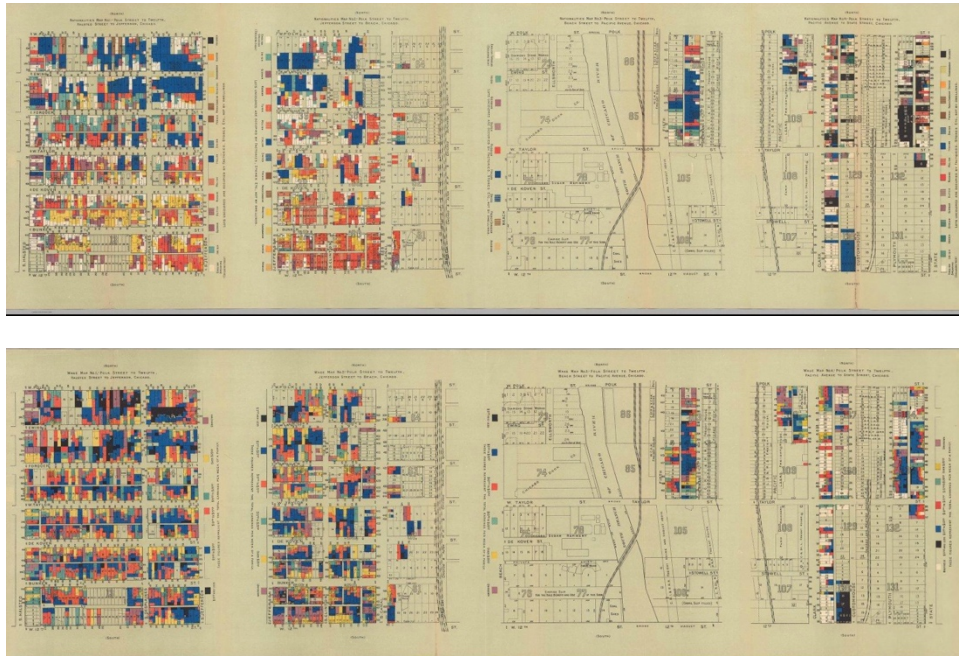
*Charles Booth*



*Note.* Booth, Charles. (1889). *Descriptive Map of London Poverty 1889*. David Rumsey Map Collection, David Rumsey Map Center, Stanford Libraries.

**Figure 60**

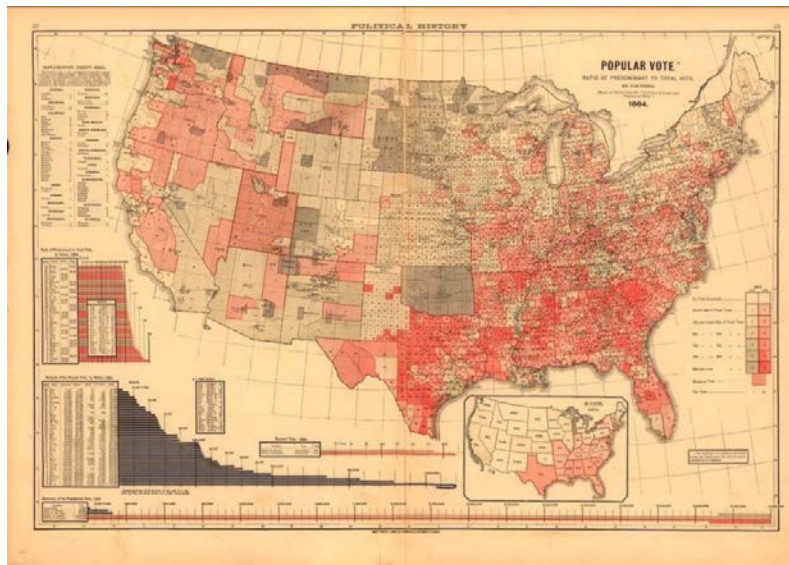
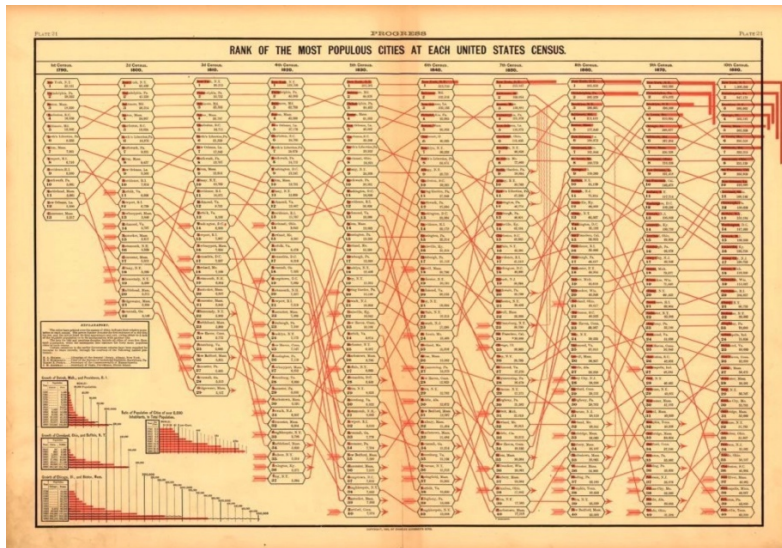
*Jane Addams and Florence Kelley*



*Note.* Addams, Jane and Kelley, Florence. (1895). *Nationalities and Wage Maps*.  
David Rumsey Map Collection, David Rumsey Map Center, Stanford Libraries.

**Figure 61**

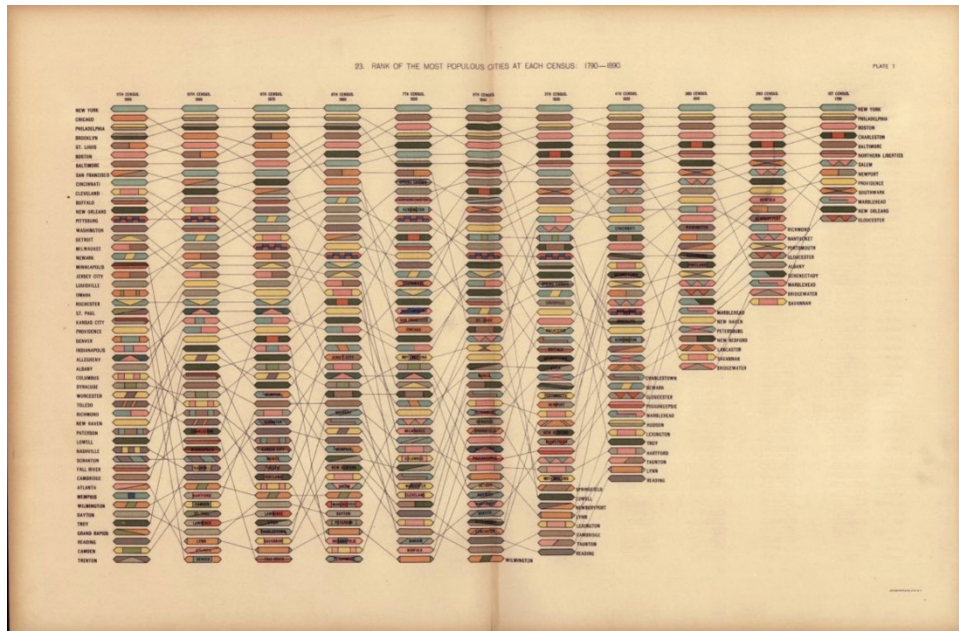
*Fletcher Hewes and Henry Gannett*



*Note.* Hewes, Fletcher and Gannett, Henry. (1883) *Scribner's Statistical Atlas of the United States, Showing by Graphic Methods their Present Condition and their Political, Social, and Industrial Development.* Map. Library of Congress, Geography and Map Division.

**Figure 62**

Henry Gannett

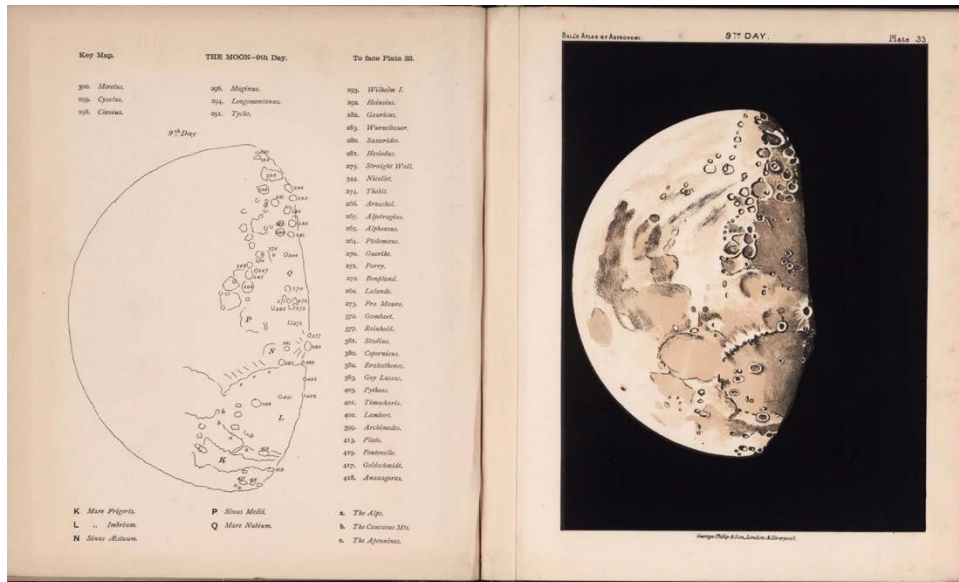


*Note.* Gannett, Henry. (1898) *Statistical Atlas of the United States, Based Upon the Results of the Eleventh Census. Map.* Library of Congress, Geography and Map Division.



# Figure 63

Robert Stawell Ball



Note. Ball, Robert Stawell. (1892). *The Moon - 9<sup>th</sup> Day*. David Rumsey Map Collection, David Rumsey Map Center, Stanford Libraries.

**Figure 64**

*Levi Walter Yaggy*



*Note.* Yaggy, Levi Walter. (1893). *Geological Chart*. David Rumsey Map Collection, David Rumsey Map Center, Stanford Libraries.

# Figure 65

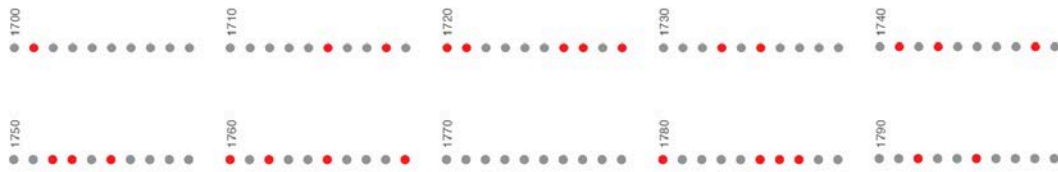
## The Collected Works

### Collected Works

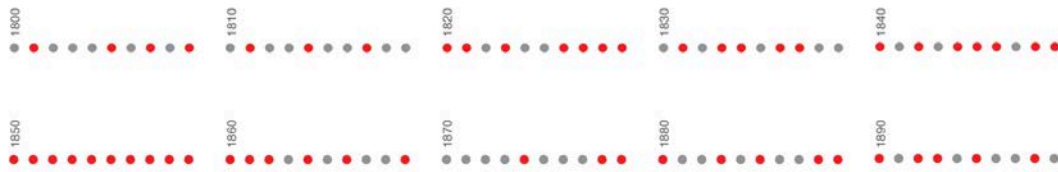
This demonstrates the number of works collected by the researcher from the 18th and 19th centuries

- No examples collected for this year
- One or more examples collected for this year

### 18th Century



### 19th Century



# Figure 66

## The Most Productive Years

### Most Productive Years

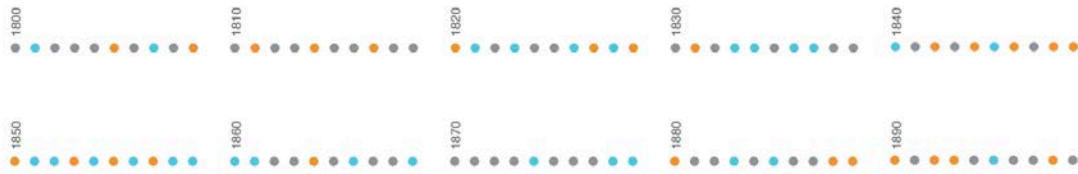
This visualization highlights the years when two or more visualizations were developed during the same period

- No examples collected for this year
- One example uncovered for that year
- Two or more examples uncovered for that year

### 18th Century



### 19th Century



**Figure 67**

*The Celebrated Works by Well-Known Men*

**Celebrated Works by Well-Known Men**

This illustrates the amount of work that is overlooked when we focus on a few contributors

● No examples collected for this year

○ Contributors

● Joseph Priestley

● William Playfair

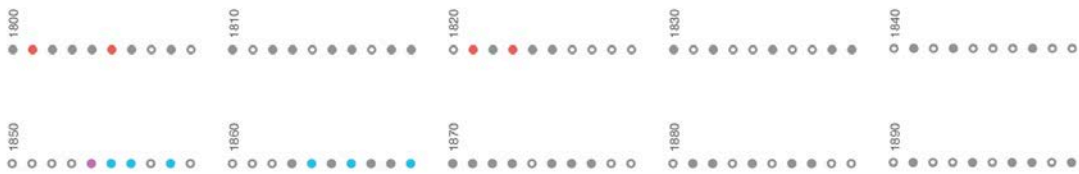
● John Snow

● Charles Joseph Minard

**18th Century**



**19th Century**



## Figure 68

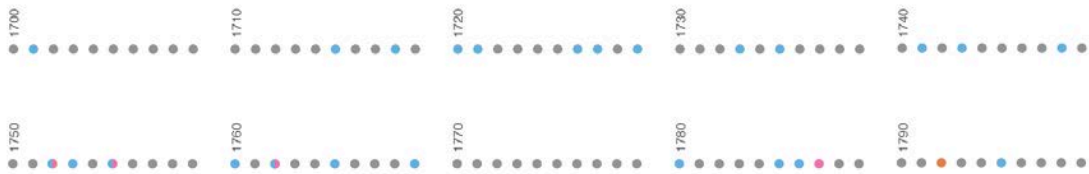
### *The Works by Gender*

#### Works by Gender

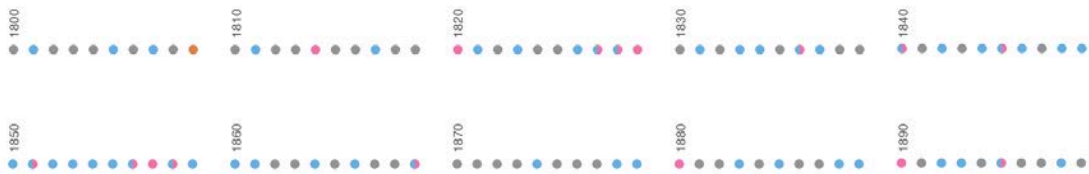
While the field is male-dominated, this shows the contributions of women and their growing presence

● No examples collected for this year   ● Works created by men   ● Works created by women   ● Collaboration or individual works produced that year   ● Unknown

#### 18th Century



#### 19th Century



# Figure 69

## Connections

### Connections and Influences

Contributors were directly or indirectly connected to one another. Some individuals are documented as having met while other displayed their influence through methods or themes

● Year of Influencer's work ● Year of Influenced

#### Edmond Halley



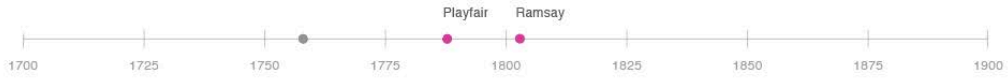
#### Thomas Jefferys



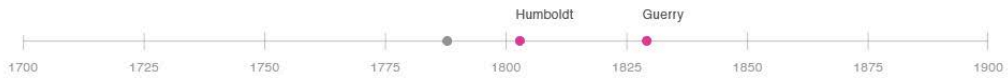
#### Jacques Barbeu-Dubourg



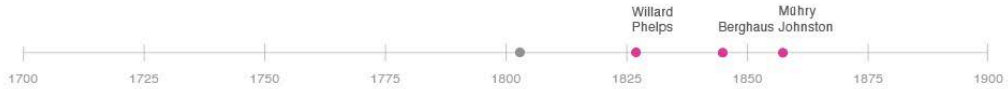
#### Joseph Priestley



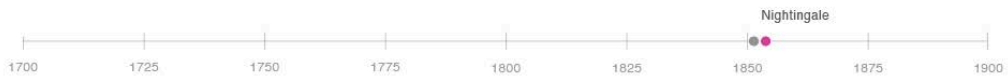
#### William Playfair



#### Alexander von Humboldt



#### William Farr

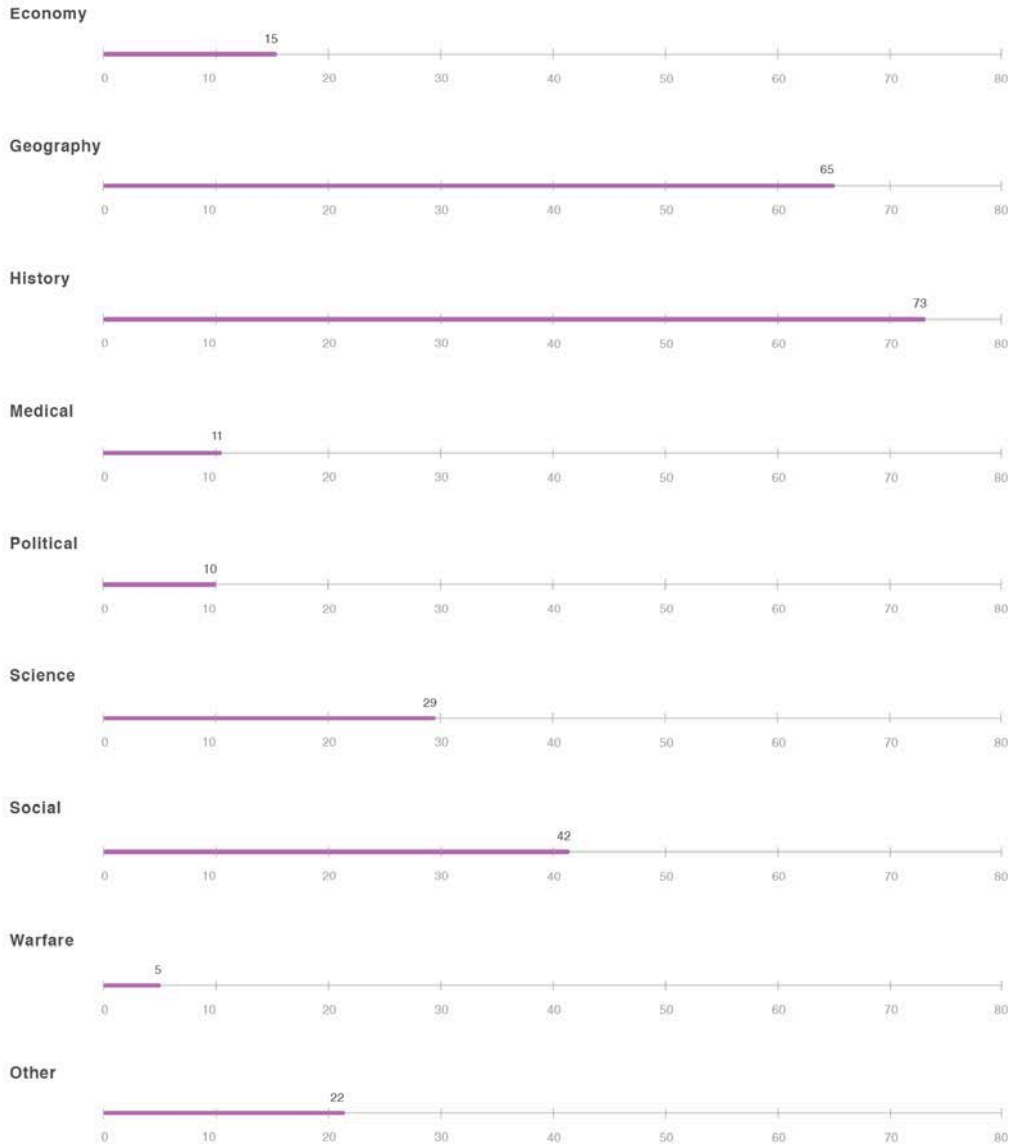


# Figure 70

## Themes

### Popular Themes

Based on the sample of visualizations collected and analyzed, the total application of each theme was calculated. Note, some visuals contained more than one theme.





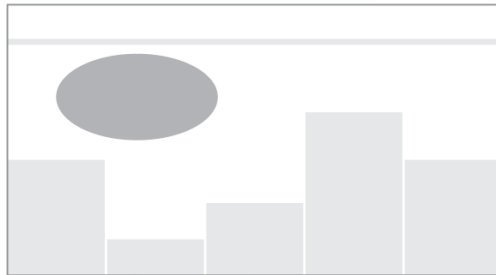
APPENDIX C  
VISUALIZATION LAYOUTS AND METHODS

## Layouts from the 18<sup>th</sup> and 19<sup>th</sup> Centuries

### Samples of Bar Chart Content



Title  
Secondary labels  
Horizontal bars  
Instructions



Title  
Secondary labels  
Vertical bars  
Overlapped layers  
Colors



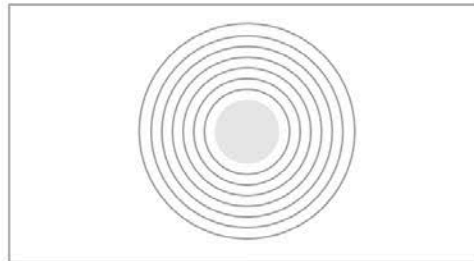
Title  
Legend  
Secondary labels  
Diversely aligned bars  
Colors



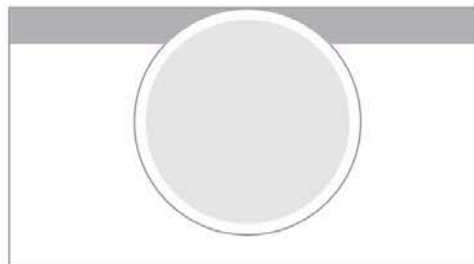
Title  
Timeline  
Secondary labels  
Legend  
Stacked bars

## Layouts from the 18<sup>th</sup> and 19<sup>th</sup> Centuries

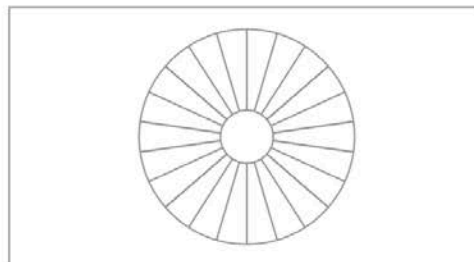
### Samples of Circular Content



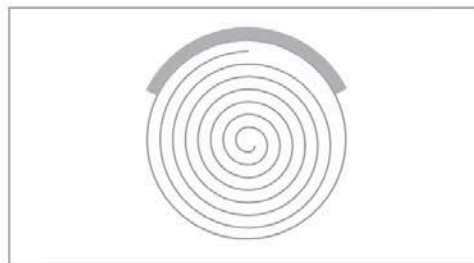
Map  
Secondary labels  
Timeline  
Colors



Title  
Secondary labels  
Overlapped layers  
Colors  
Illustrations



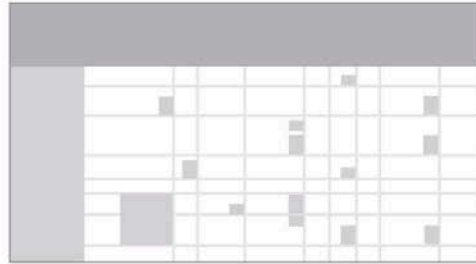
Timeline  
Secondary labels  
Colors  
Illustrations



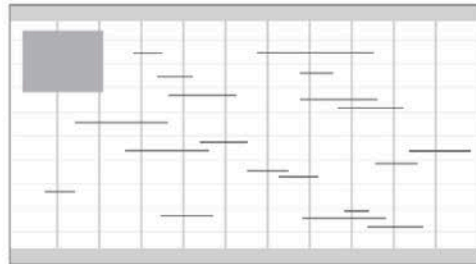
Title  
Timeline  
Secondary labels  
Legend  
Illustrations

## Layouts from the 18<sup>th</sup> and 19<sup>th</sup> Centuries

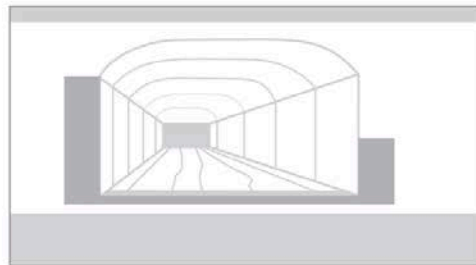
### Samples of Timeline Content



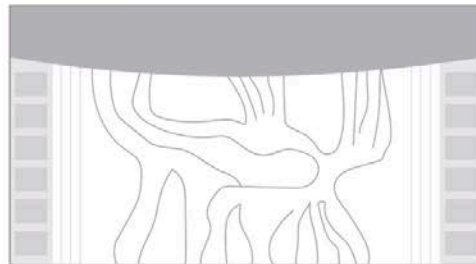
Title  
Secondary labels  
Loose grid  
Illustrations



Title  
Secondary labels  
Structured grid  
Uniform time



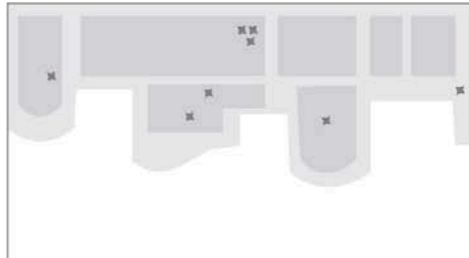
Title  
Secondary labels  
Perspective  
Structured with flow paths  
Colors



Title  
Secondary labels  
Structured with flow paths  
Colors  
Imagery

## Layouts from the 18<sup>th</sup> and 19<sup>th</sup> Centuries

### Samples of Medical Mapping Content



Location  
Secondary labels  
Indicators



Title  
Location  
Legend  
Secondary labels  
Indicators (3 years)



Title  
Location  
Legend  
Secondary labels  
Indicators  
Totals



Location  
Secondary labels  
Indicators

## Methods from the 18<sup>th</sup> and 19<sup>th</sup> Centuries

Discussions of each visualization

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Hensel's language and descendants .....	27
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Haussard's cartouche and engravings .....	29
Biddle's map of Philadelphia .....	30
Seaman's yellow fever .....	34
Humboldt's Naturgemälde .....	38
Humboldt's isotherm .....	39
Hall's geography skills .....	40
Hill's geography skills .....	40
Pinchon's geography skills .....	41
Dupin's choropleth .....	43
Guerry's choropleth .....	43
Willard and Woodbridge's Universal Geography .....	44
Willard's Locations and Wanderings of the Aboriginal Tribes .....	45
Willard's Map of 1826 .....	45
Phelps Naturgemälde frontispiece .....	45
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Williams' spread of cholera in Boston .....	50
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Snow's spread of cholera .....	59
Mühry's geographic diseases .....	60
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Hergesheimer's population .....	63
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Sterne's abstract depiction of time .....	32
Ferguson's historic events .....	33
Unknown creator's The History of France puzzle .....	33
Lavoisne's genealogical, historical, and chronological visual .....	41
Dod's chronology .....	42
Unknown's vegetable market .....	42
Wilkinson's atlas .....	42
Bostwick's genealogical connections .....	50
Shimeall's chronology .....	51
Clarkson's support of abolition .....	51
Willard's empires and temples .....	52, 66
Wallis' New Game of Universal History .....	52
Himes' millerite chart .....	53
Elliot's creation to apocalypse .....	53
Pearson religious and apocalyptic predictions .....	53
Cummings' millerite .....	66
Peabody's personalized documentation of time .....	67
Jazwinski's Polish system .....	67
Pick's universal history .....	68
Adams' chronology .....	69
Marey's ruler's reign .....	70

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Franklin's matrix .....	25
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Scott's illustrations .....	77
Ball's moon illustration .....	77
Yaggy's rock layers .....	78
Marey's hoof prints .....	78

## **Intermixed Methods**

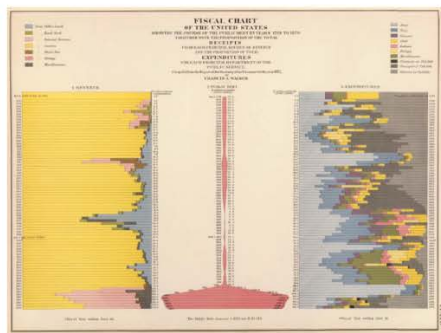
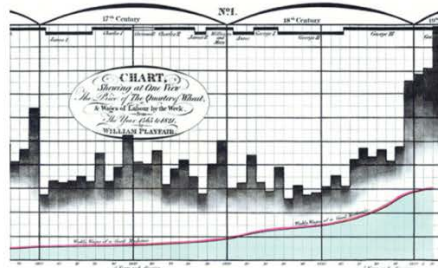
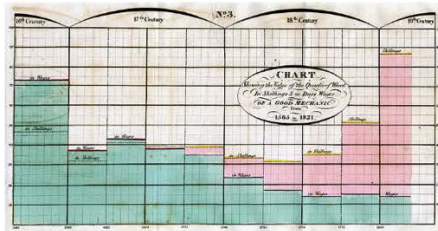
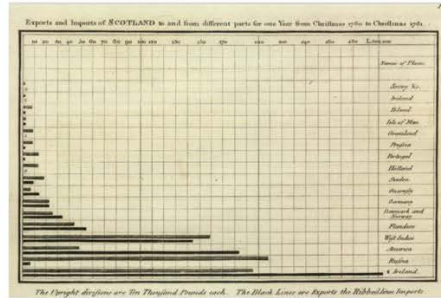
Bode's constellations .....	38
Ramsay's British colonies .....	39
Wilkinson's atlas .....	42
Marey's ruler's reign .....	70
Johnstone's California .....	71
Muybridge's horse's footing .....	73
Hewes and Gannett's census .....	74
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APPENDIX D  
LINKING VISUALS

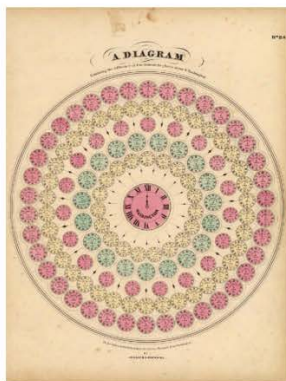
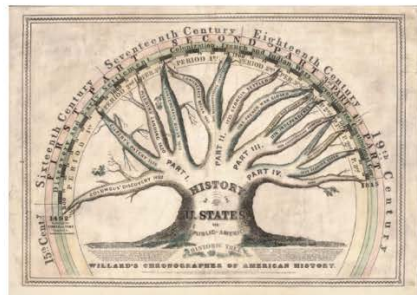
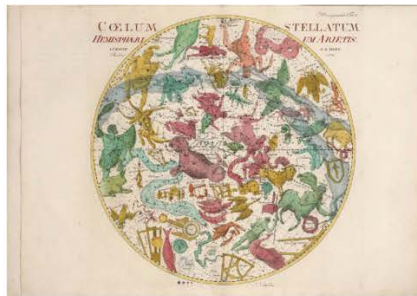
# Commonalities from the 18<sup>th</sup> and 19<sup>th</sup> Centuries

## Bar charts



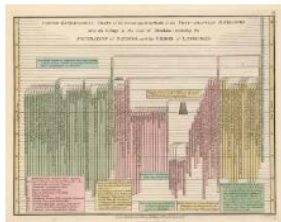
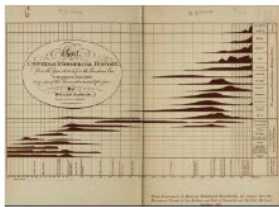
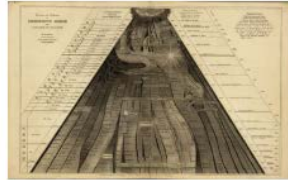
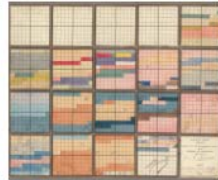
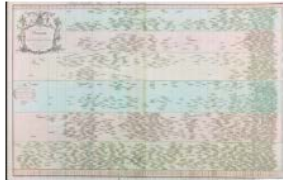
## Commonalities from the 18<sup>th</sup> and 19<sup>th</sup> Centuries

Circular designs



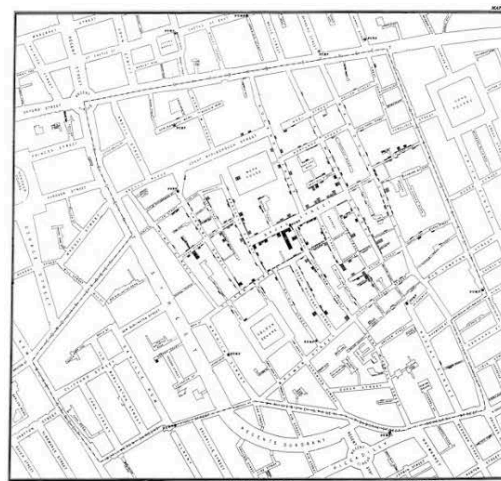
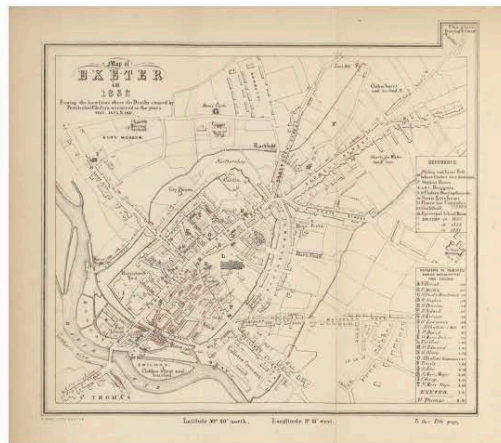
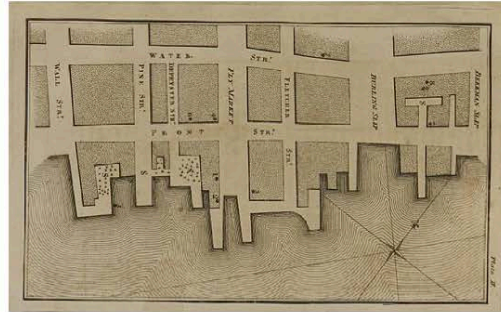
# Commonalities from the 18<sup>th</sup> and 19<sup>th</sup> Centuries

## Timelines



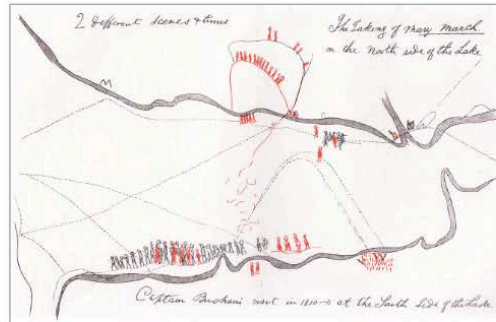
# Commonalities from the 18<sup>th</sup> and 19<sup>th</sup> Centuries

## Medical mapping



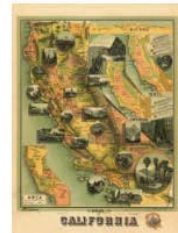
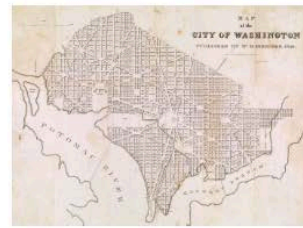
## Commonalities from the 18<sup>th</sup> and 19<sup>th</sup> Centuries

Students' maps



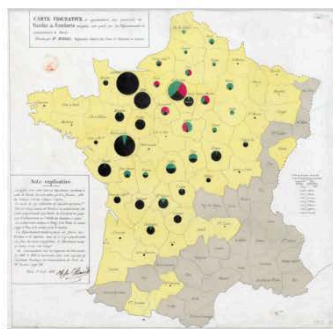
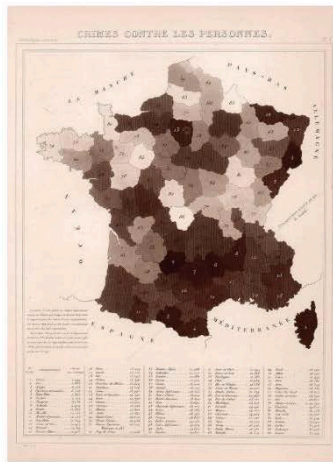
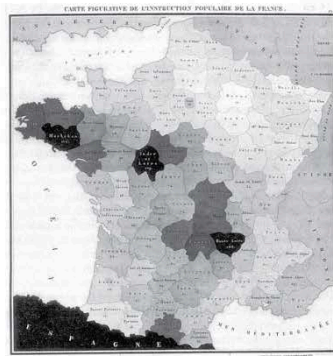
# Commonalities from the 18<sup>th</sup> and 19<sup>th</sup> Centuries

Regional and international maps



# Commonalities from the 18<sup>th</sup> and 19<sup>th</sup> Centuries

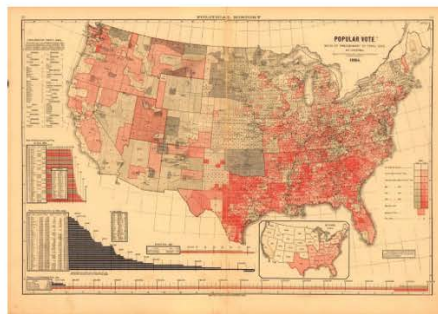
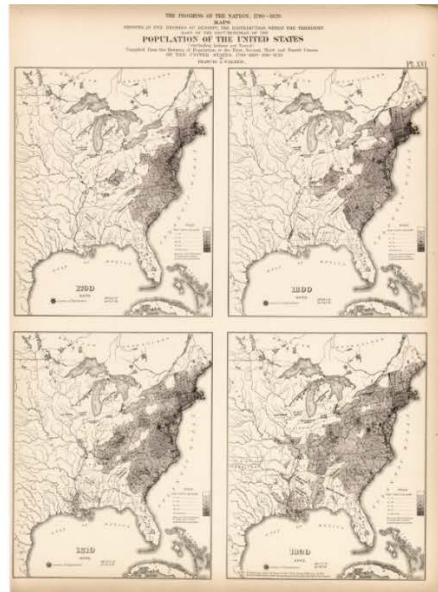
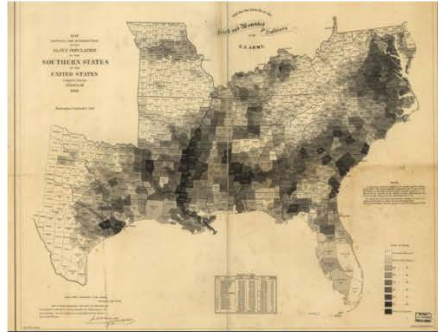
French thematic maps





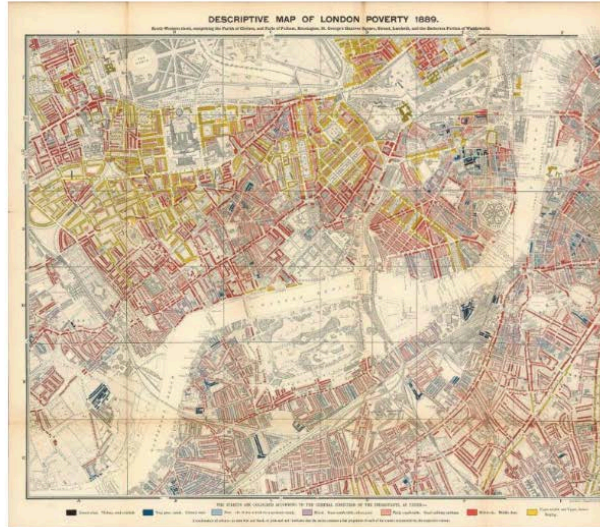
# Commonalities from the 18<sup>th</sup> and 19<sup>th</sup> Centuries

American thematic maps



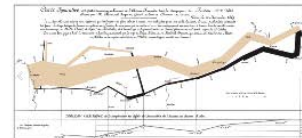
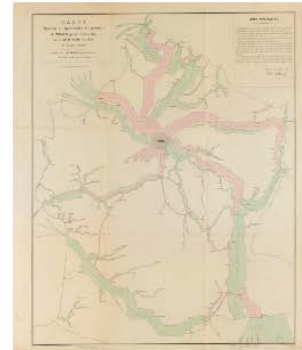
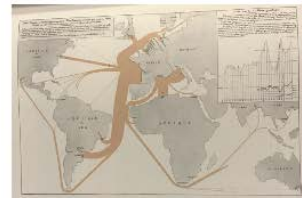
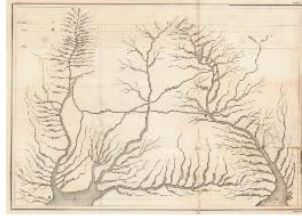
# Commonalities from the 18<sup>th</sup> and 19<sup>th</sup> Centuries

Reform maps



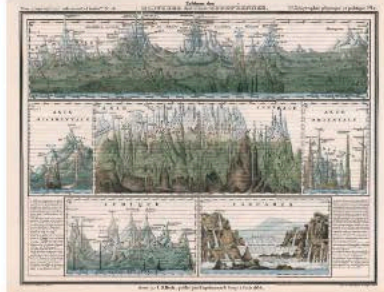
# Commonalities from the 18<sup>th</sup> and 19<sup>th</sup> Centuries

## Path/Stream designs



## Commonalities from the 18<sup>th</sup> and 19<sup>th</sup> Centuries

Mountain/Water comparison designs



APPENDIX E  
INTERVIEW QUESTIONS

## Interview Questions

### Practitioners

#### **Semi-structured Interview: Practitioners**

Hello! I'm Lisa Peña; a PhD Candidate of The Design School at Arizona State University. I'm currently developing a collection that reveals the history of information design.

Your answers are strictly to inform research and will be kept confidential. Thank you so much for participating!

**Years studying and/or producing information design:**

**Type of institution (studio, agency, etc.):**

**Specialty (print, digital, etc.):**

**Location: (city, state, country):**

What Information design resources do you use for yourself and/or your clients?

How often do you refer to historic information design pieces? (anything before the 20th century)

What individuals come to mind when you hear me say "Historic Information Design"?

Can you name anyone in particular? (If only men are mentioned, can you name any women?)

What fields of study or disciplines do you feel contributed to information design?

How many information design pieces do you produce each year (on average)?

Do you believe you could connect historic information design examples to the work you've produced in present day?

Do you believe a resource that shares a collection of information design pieces from the 18th and 19th century could help you? (whether it be to share methods, develop analysis techniques, inspire, etc.?)

Is there anything else you'd like to mention that would help with this study?

Thank you for your time!

## Interview Questions

### Educators

#### **Semi-structured Interview: Educators**

Hello! I'm Lisa Peña; a PhD Candidate of The Design School at Arizona State University. I'm currently developing a collection that reveals the history of information design.

Your answers are strictly to inform research and will be kept confidential. Thank you so much for participating!

**Years teaching information design:**

**Type of institution (community college, university, technical school, etc.):**

**Type of students (undergrad/grad):**

**Location: (city, state, country):**

What Information design resources do you use for yourself and/or your students?

How often do you refer to historic information design pieces? (anything before the 20th century)

What individuals come to mind when you hear me say "Historic Information Design"?

We often hear the same names repeated in historic information design, why do you think that is the case?

Can you name anyone in particular? (If only men are mentioned, can you name any women?)

Why do you think historic information design is ignored or overlooked?

Do you assign any historic information design projects to your students?

Do you believe your students could connect historic information design examples to the work they see and produce in present day?

Is there a key lesson about information design you feel is missing from today's understanding of it?

Do you believe a resource that shares a collection of information design pieces from the 18th and 19th century could help you (or your students) today?

Is there anything else you'd like to mention that would help with this study?

Thank you for your time!

APPENDIX F  
PHOTO ELICITATION ACTIVITY



# Photo Elicitation Activity

## Introduction and Visual Works Analyzed

### Photo Elicitation Activity

Hello! I'm Lisa Peña, a PhD Candidate of The Design School at Arizona State University. I'm currently developing a collection that reveals the history of information design.

Your answers are strictly to inform research and will be kept confidential. Thank you so much for participating!

Please share your type of institution (community college, university, etc.): \_\_\_\_\_  
Please share your education level (undergrad/grad): \_\_\_\_\_

Please verbalize any thoughts you may have about the visualizations provided below. There are no right or wrong answers.

### *A Specimen of a Chart of Biography.*

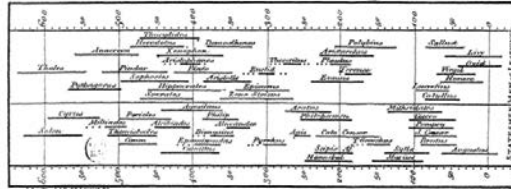


Image Source: Marshall, Celia. (2016) retrieved from <http://www.openchart.com/2016/07/joseph-priority-visualizes-history-with-one-of-the-most-influential-infographics-ever-1707.html>

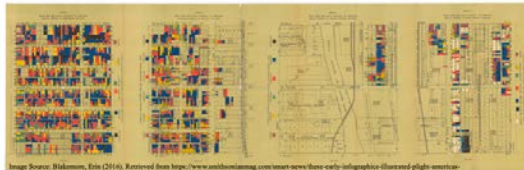


Image Source: Rickman, Eric (2016). Retrieved from [http://www.audibleinsight.com/content/view/full/eric\\_rickman\\_infographic\\_illustrated\\_slide\\_show\\_page\\_10.html](http://www.audibleinsight.com/content/view/full/eric_rickman_infographic_illustrated_slide_show_page_10.html)



Image Source: Zappo, Nick. (no date) retrieved from <http://www.stickfigure.com/infographic/>

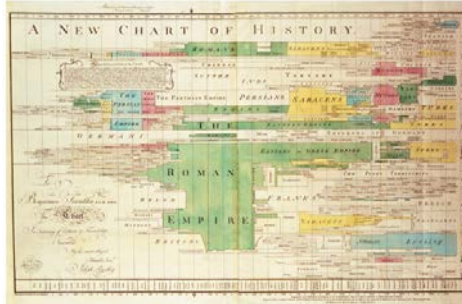


Image Source: Marshall, Celia. (2016) retrieved from <http://www.openchart.com/2016/07/joseph-priority-visualizes-history-with-one-of-the-most-influential-infographics-ever-1707.html>

APPENDIX G

HISTORIC INFORMATION DESIGN CONTEXT SHEET

# Historic Information Design Context Sheet

## Form for Documenting Visualizations

Information Design Creator	Source			Author		Date	Medium		
Year Information Design Piece was Created	Early 18th	Mid 18th	Late 18th	Early 19th	Mid 19th	Late 19th	No Date		
Analysis 1 Visual Display Style 2 Layers 3 Unique element(s) 4 Storytelling 5 Misc.	1 2 3 4 5								
Topic(s) Represented	Econ.	Geo.	Hist.	Medical	Political	Science	Social	Warfare	Other
Source Comments									
Similar Context									
Image(s)									
Personal Comments									

APPENDIX H  
HUMAN SUBJECTS INSTITUTIONAL REVIEW BOARD



EXEMPTION GRANTED

[William Heywood](#)  
[HIDA: The Design School](#)  
 480/894-6231  
 WILLIAM.HEYWOOD@asu.edu

Dear [William Heywood](#):

On 11/4/2019 the ASU IRB reviewed the following protocol:

Type of Review:	Initial Study
Title:	Revealing the History of Information Design
Investigator:	<a href="#">William Heywood</a>
IRB ID:	STUDY00010865
Funding:	None
Grant Title:	None
Grant ID:	None
Documents Reviewed:	<ul style="list-style-type: none"> <li>• Pena_Survey_Practioners_Educators, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions);</li> <li>• Pena_Interview_Practitioners, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions);</li> <li>• Pena_Photo Elicitation Activity, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions);</li> <li>• Pena_Interview_Educators, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions);</li> <li>• Pena_Survey_Students, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions);</li> <li>• Pena_Social-Behavioral-Protocol, Category: IRB Protocol;</li> <li>• Pena_Consent Form 1 - Survey with Interview Opt In, Category: Consent Form;</li> <li>• Pena_Consent Form 2 - Interview, Category:</li> </ul>

	Consent Form; • Pena_ Consent Form 3 - Photo Elicitation Activity, Category: Consent Form; • Pena_ Recruitment 1 - Interview, Category: Recruitment Materials; • Pena_ Recruitment 2 - Survey with Interview Opt In, Category: Recruitment Materials; • Pena_ Recruitment 3 - Photo Elicitation Activity, Category: Recruitment Materials;
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The IRB determined that the protocol is considered exempt pursuant to Federal Regulations 45CFR46 on 11/4/2019.

In conducting this protocol you are required to follow the requirements listed in the INVESTIGATOR MANUAL (HRP-103).

Sincerely,

IRB Administrator

cc: Lisa Pena  
Lisa Pena

## Consent Form: Social Behavioral

***Title of research study:***

Revealing the History of Information Design

***Investigator:*** William Heywood and Lisa Peña

***Why am I being invited to take part in a research study?***

We invite you to participate in this research study because you are part of the target audience that the project is aimed at.

***Why is this research being done?***

The purpose of this study is to identify what information design students, educators, and practitioners know in regards to the History of Information Design.

***How long will the research last?***

It is expected that individuals will spend 30-45 minutes for each interview.

***How many people will be studied?***

We anticipate approximately 20-50 college students studying information design, 10-30 practitioners of information design, and 3-5 experts in the field, to potentially participate in the study.

***What happens if I say yes, I want to be in this research?***

You will be asked a few questions relevant to the study over a period of 30-45 minutes. Your responses will be documented by the research. You are free to decide whether you wish to participate in this study.

***What happens if I say yes, but I change my mind later?***

You can leave the research at any time it will not be held against you. The participation of this study is completely voluntary. You are free to decline to answer any particular question(s) you do not wish to answer for any reason.

***What happens to the information collected for the research?***

Efforts will be made to limit the use and disclosure of your research study records, to people who have a need to review this information. The information collected will remain anonymous but we cannot promise complete secrecy.

Only I and my Primary Investigator (PI), William Heywood, will have access to the data. The data will be stored on a password protected external hard drive and locked in a secure filing cabinet. The data will be stored for the duration of my project, until completion.

***Who can I talk to?***

If you have questions, concerns, or complaints, talk to the research team at:

Lisa Peña

Tel: (480) 965-2158

E-mail: [Lisa.Pena@asu.edu](mailto:Lisa.Pena@asu.edu)

You can also contact my PI Clinical Professor William Heywood

Tel: 480-236-6114

E-mail: [William.Heywood@asu.edu](mailto:William.Heywood@asu.edu)

This research has been reviewed and approved by the Social Behavioral IRB. You may talk to them at (480) 965-6788 or by email at [research.integrity@asu.edu](mailto:research.integrity@asu.edu) if:

- Your questions, concerns, or complaints are not being answered by the research team.
- You cannot reach the research team.
- You want to talk to someone besides the research team.
- You have questions about your rights as a research participant.
- You want to get information or provide input about this research.

**By agreeing, you accept that you are over 18 years of age and consent to be part of this research study.**