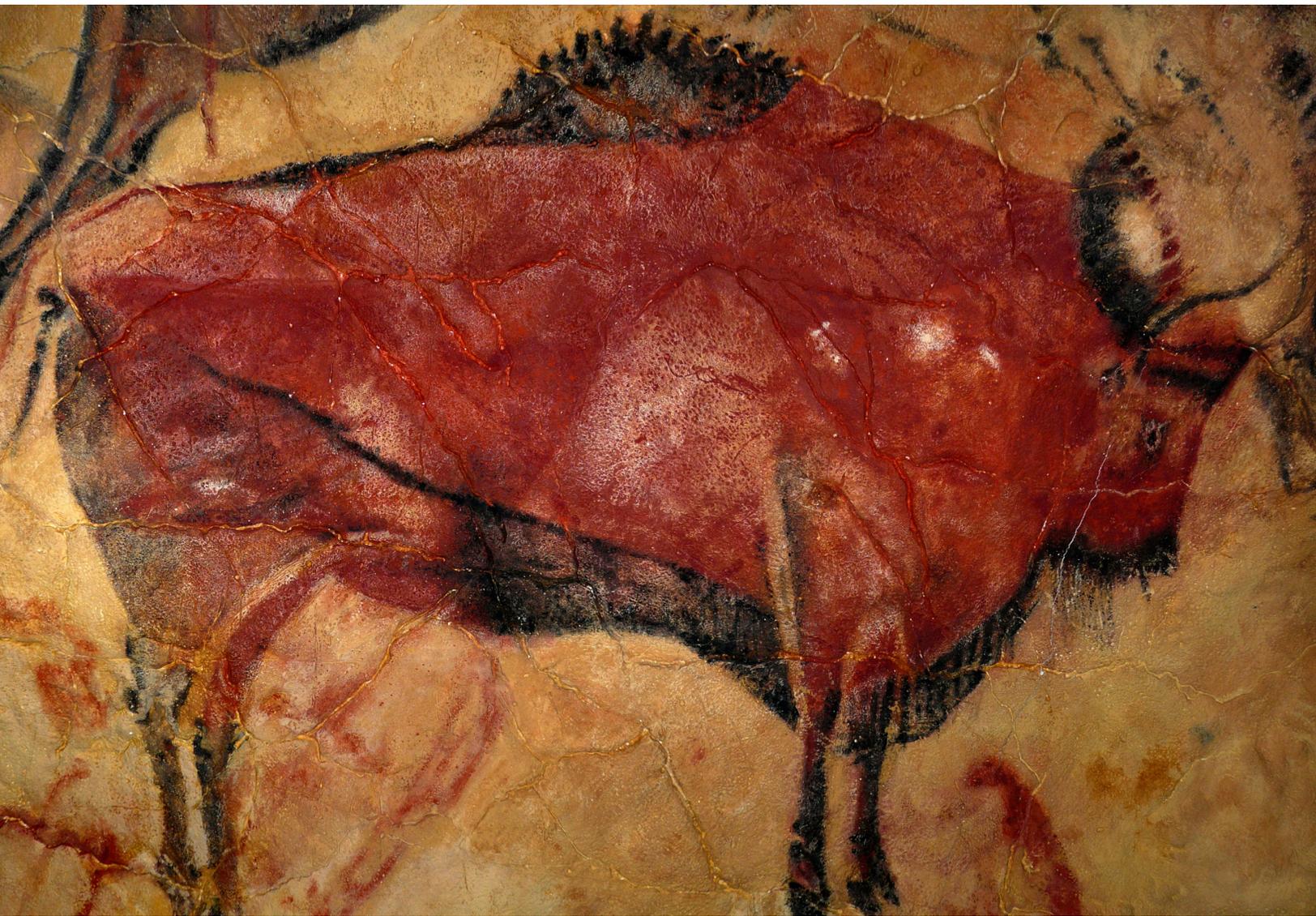

The Origins of Data Visualization

William L. Savastano



What Is Data Visualization?

Data visualization is the visual representation of information extracted from a source and provided as an easier means of understanding the data. Effective data visualization imparts the same information as a list of raw data but communicates more clearly and efficiently through the use of graphical representations like charts, tables, graphs or other easily understandable artwork.

Data visualizations are designed with the accomplishment of a particular task in mind; usually data analysis to identify movement like increases and declines as well as the movement's cause or to identify patterns and relationships in the data.

Effective data visualization finds a proper balance between the aesthetic of the artwork and the functionality of easily understanding the data's representation. An effective data visualization will give its viewer a clear understanding of complex data sets in a manner that is quicker and more intuitive than viewing just the raw data.

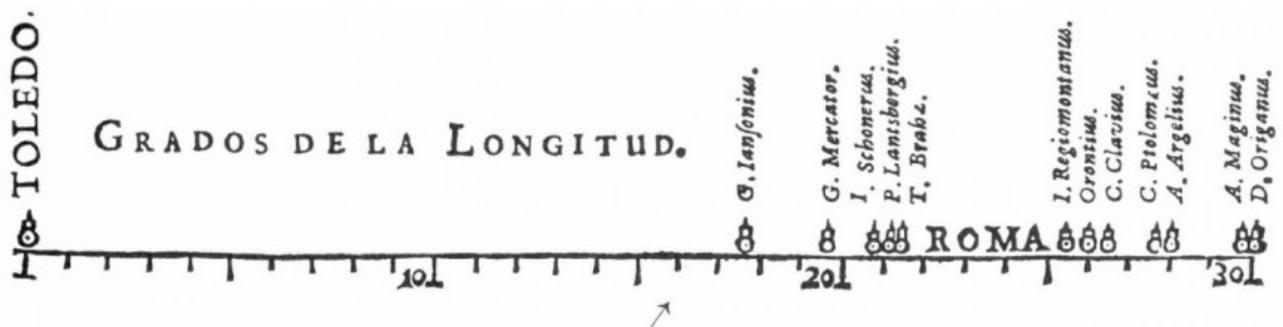


17th Century - Modern Data Visualization Takes Shape

Data visualization's history can be traced as far back as prehistoric times when depictions of successful hunts were drawn on cave walls. Relatively accurate geographic representations of land can be traced back to Ptolemy's known-world map in the second century and early maps of China date back as far as the fifth century. While it may be a stretch to call these early examples data visualizations, many scholars agree that solving the problems of the 17th century is how modern data visualization began to take shape.

In the 17th century world, seafaring improvements, reductions in long distance travel time, advances in astronomy and navigation, as well as deeper study in theory, measurement and estimation, all gave rise to the problem of representing vast distance, time and space at a small scale on paper.

A one-dimensional line graph created in 1644 by Flemish astronomer Michael Florent Van Langren is believed to be the very first visual representation of statistical data. Langren placed the twelve known estimates of the difference in longitude between Toledo and Rome on a line, placing the name of the astronomer who made the estimate next to their estimate point. The graph visually showed the estimates ranged widely, covering almost half the length of the line representing 30 degrees of longitude. It also showed 10 of the estimates were similar to at least one of the other estimates and there were two sets of three estimates that were close to each other.



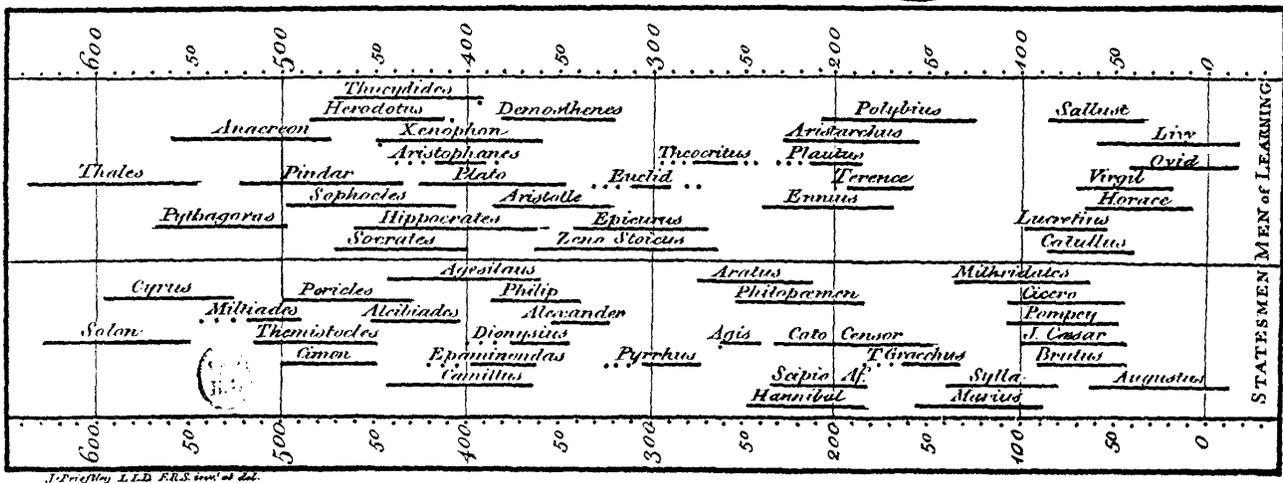
What is most notable about this visualization is that Langren envisioned a proportional representation of 30 degrees of longitude and placed the estimates in relation to each other and in relation to the entire span of the line. While rudimentary to us today, this was truly a standout representation of distance and relational data for its time.

18th Century - Data Visualization Gets Some Depth

In the 18th century, mapmakers made great strides in mapmaking, showing more than just geographical location, but also contours and isopleths, depicting terrain height. Two men, Joseph Priestley and William Playfair are credited by multiple sources as being two of the most influential people in 18th century data visualization.

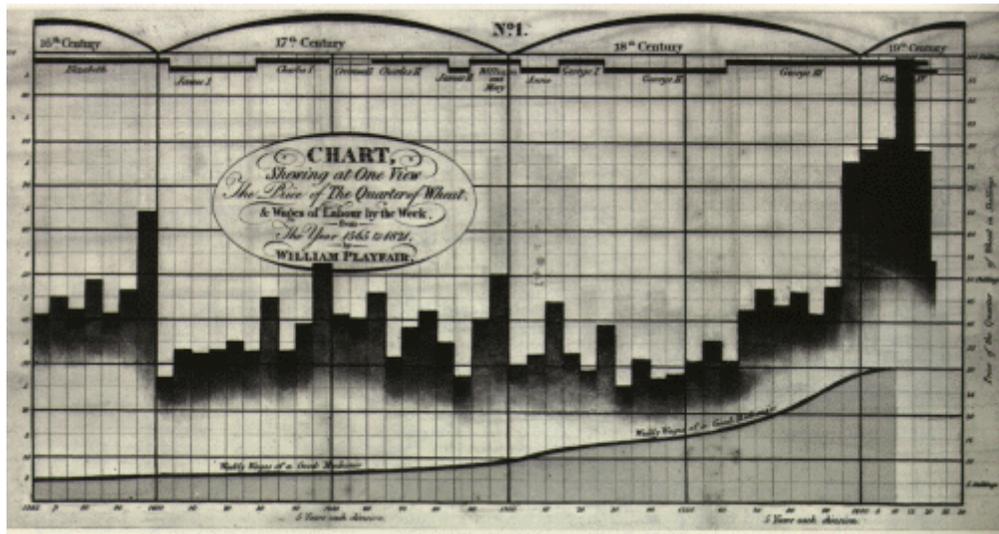
In 1765, Priestly, an English theologian, philosopher and chemist, created the first timeline chart. He mapped out hundreds of years on a line then placed the lifespans of people in relation to the entire span as well as the life span of the other people, along that line.

A Specimen of a Chart of Biography.



In 1786, William Playfair, a Scottish engineer and political economist who is credited with being the founder of graphical methods of statistics, took Priestly's timeline, moved all of the bars to the left and then put every span on its own line, creating the first bar chart. Playfair is also credited with creating the line graph that same year as well as the pie chart and circle graph in 1801. One of Playfair's most notable charts used three parallel time series to show the price of wheat, weekly wages and the reigning monarch over a 250 year span, successfully depicting that workers were better off in the most recent years.

18th Century - Data Visualization Gets Some Depth



Also in the 18th century, the continuing rise in the study of theory brought about the beginnings of statistical theory study and the systematic collection of empirical data. As the need to quickly analyze this data arose, visual forms were invented to accommodate that need. Towards the end of the 18th century, geologic, economic and medical data was all being charted in visual representations.



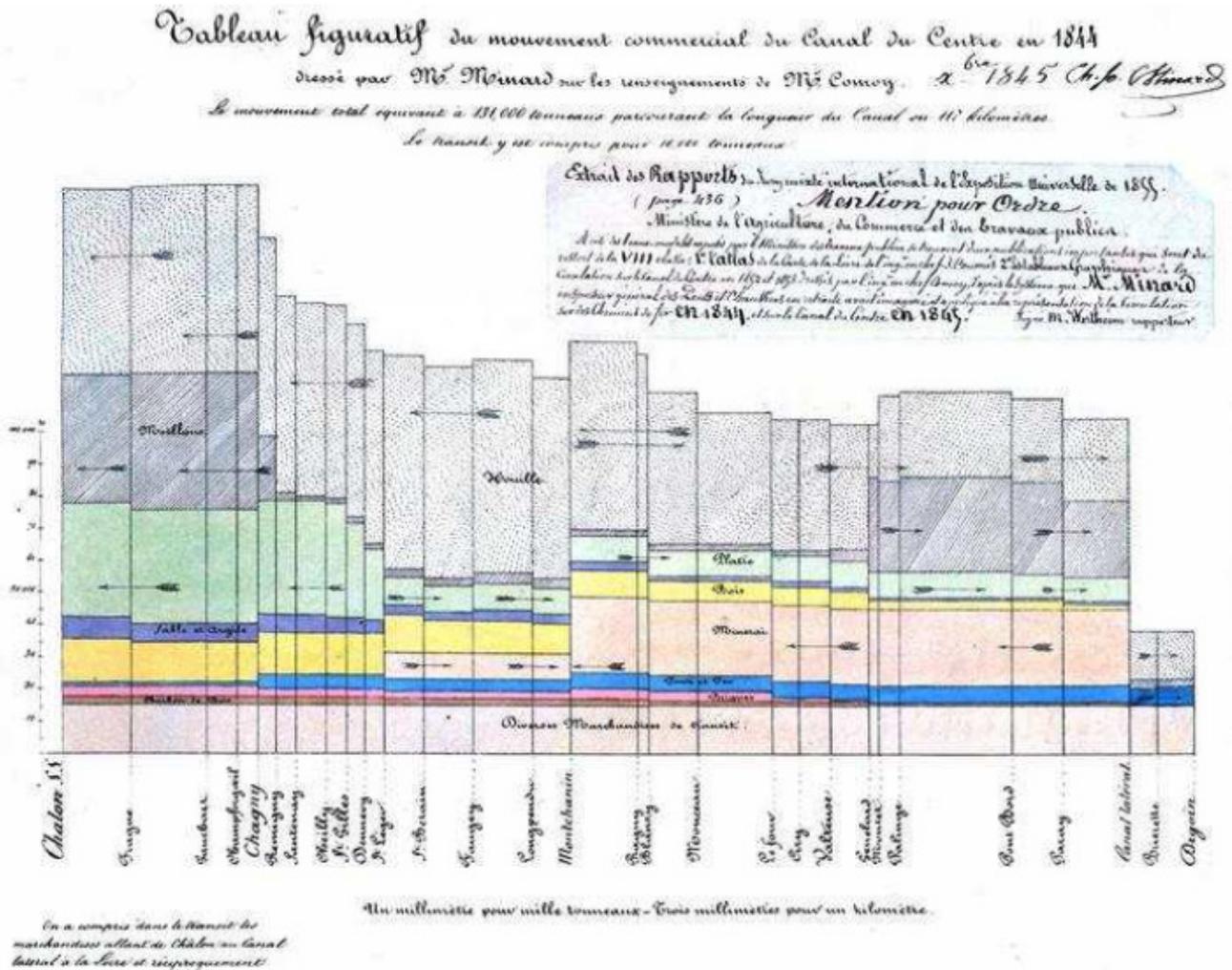
Joseph Priestley

William Playfair



19th Century - Data Visualization On A Industrial Scale

The first half of the 19th century would see great strides in thematic cartography as maps moved from single sheets to complete and comprehensive atlases containing economic, social, moral, medical and physical data as well as complex symbols. Statistical information also made great strides as civil engineers looked for new ways to easily present commerce and traffic data. During this time, Charles Joseph Minard developed mosaic plots of commercial goods along a canal route using variable width, divided bars and segmented bar height to depict the amount of various goods moved and to plot their prices. The most notable characteristic of this chart is that the area of each rectangular segment is proportional to its transport cost. This provided a clear view of which ports and routes provided the most profitability.



19th Century - Data Visualization On A Industrial Scale

The second half of the 19th century is often called the golden age of statistical graphics as growing governments and cities throughout Europe created official statistical offices to accommodate the vast amounts of data that was being gathered and analyzed throughout the continent.



Charles Joseph Minard

20th Century - First Stagnation...Then, Computerization

Then, in the first half of the 20th century, data visualization innovation ground to a halt. It seemed all that could have been done in the discipline had been done - all the charts and graphs and diagrams possible had already been designed. In addition, with the rise of the industrial age and the accompanying financial industry explosion, by the mid 1930s, data visualizations were frowned upon when compared to the precision of actual data figures. During this time frame, data visualizations began to be viewed as inaccurate and imprecise.

This is also the time period during which data visualization, which was once viewed as groundbreaking and innovative, became commonplace. Vast improvements in the distribution of information led to data visualizations appearing everywhere. Once they were commonplace, the luster and excitement was gone.

But with the popularization of computing, data visualization would emerge again at the forefront of innovation in the mid-1960s. Combining the advances in computer science research, data analysis as well as display and input technologies, data visualization would once again become popular, particularly in civics and business, leading to an explosive growth in new data visualization methods throughout the second half of the 20th century.

According to "A Brief History of Data Visualization" by Michael Friendly, there were three main factors that led to the renaissance of data visualization in the 1960s:

- A paper by John W. Tukey, released in 1962, that called for "the recognition of data analysis as a legitimate branch of statistics distinct from mathematical statistics..."
- A book by Jacques Bertin, published in 1967, which organized "the visual and perceptual elements of graphics according to the features and relations in data."
- The rise of mainframe university computers, which "offered the possibility to construct old and new graphic forms by computer programs."

20th Century - First Stagnation...Then, Computerization

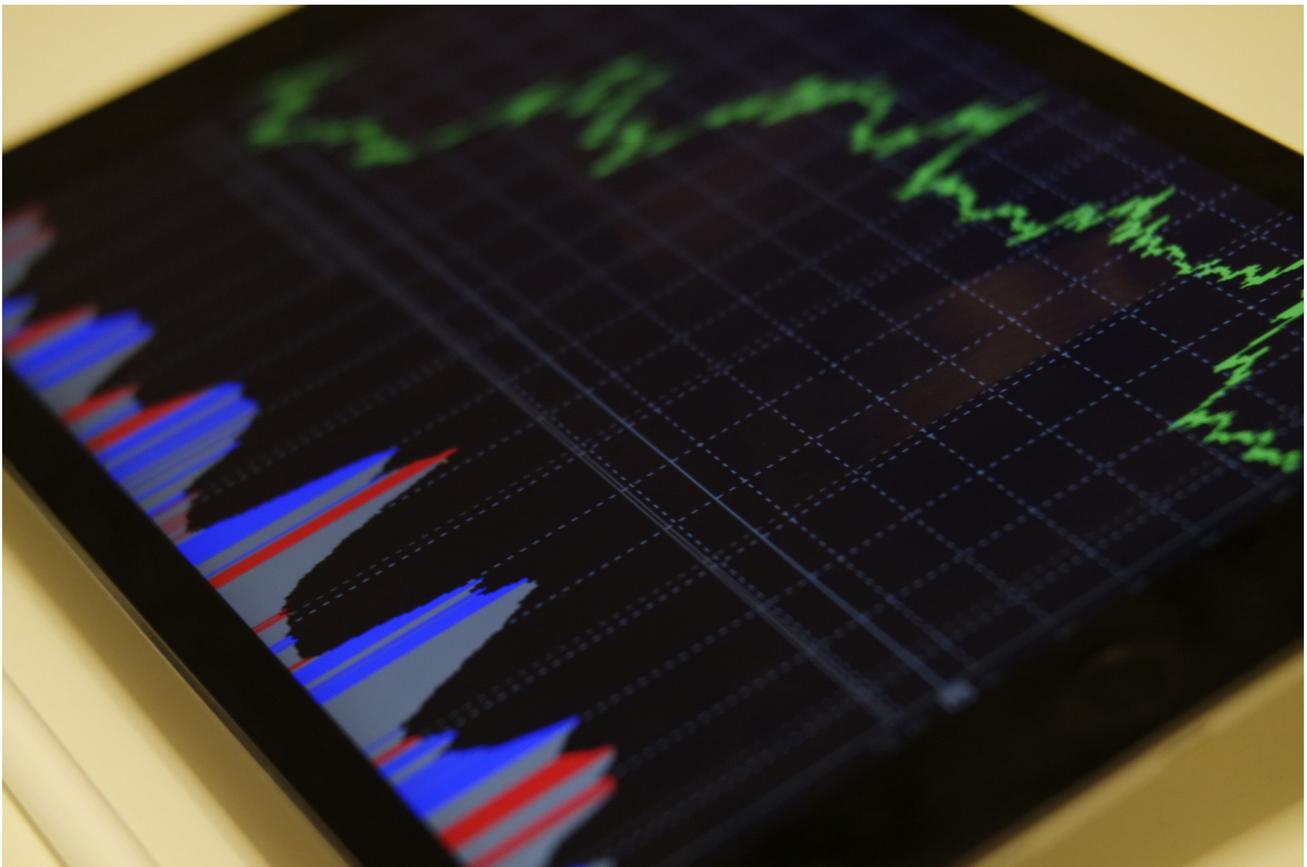
By 1975, the foundation for what would become computerized data visualization, driven by computer processing power and limited only by our imagination, would be in place. By the end of the 20th Century, the college mainframe would become the personal computer and hours spent in the lab to construct complex data visualizations would lead to seconds spent executing a simple command by keystroke on a personal computer in every dorm room and virtually every house in the developed world.



21st Century - Data Visualization Belongs To All Of Us

Today, and for the foreseeable future, data visualization is a wide-open field with so many developments made on a daily basis through the use of computers that they simply cannot be compiled into a single list or condensed down into a volume that could be reasonably written or read in a single lifetime. Where data visualization was once groundbreaking and new, a science known and used by just a few anointed individuals, today, is something that can be achieved by any person who has purchased a piece of software and a computer. While elite mathematicians and scientists in the world's top learning institutions are still uncovering new ground, the fact remains that data visualization now belongs to everyone.

I hope that with an understanding of data visualization's origins, the next time you create one by simply pushing Enter on a keyboard, you'll remember the pioneers that made it possible.



About

William L. Savastano is a business professional and two time Society for Technical Communication Award Winner with over two decades of experience in the corporate arena. William trained extensively in advertising and marketing copywriting, technical writing, journalism, and both print and electronic publishing. William's body of work includes a large volume of marketing content, collateral materials, websites, operating manuals, technical manuals, as well as inclusion in national publications and a number of published poems and short stories.

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