Charles Joseph Minard

Charles Joseph Minard (French: [minaʁ]; 27 March 1781 – 24 October 1870) was a French civil engineer recognized for his significant contribution in the field of information graphics in civil engineering and statistics. Minard was among other things noted for his representation of numerical data on geographic maps.

1 Early life

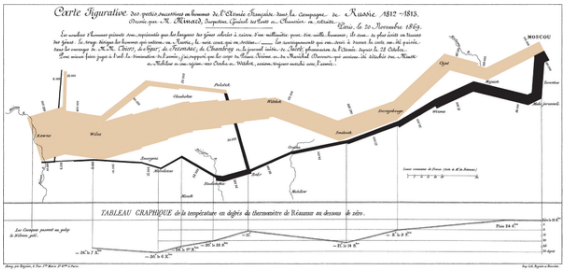
Minard was born in Dijon in the Saint Michel Parish. He was the son of Pierre Etienne Minard and Benign Lame lady. His father was a clerk of the court and an officer of the secondary school. Minard was baptized at Saint Michel on the day of his birth.[1] He was very bright and his father encouraged him to study at an early age. At age four he learned to read and to write, and when he was six his father enrolled him an elementary course in anatomy. He completed his fourth year of study at the secondary school at Dijon early, and then applied himself to studying Latin, literature, and physical and math sciences.[1] At age 15 and a half, he was admitted to the prestigious École Polytechnique, and then he studied civil engineering at École nationale des ponts et chaussées.

In September 1810 he was sent by the government to Anvers and then almost immediately to the port of Flessingue. There, he solved a critical problem with a cofferdam that was leaking water faster than it could be removed. He solved the problem by using pumps driven by a steam engine, only the third time this solution had been applied to a project.[1]

He worked for many years as a civil engineer on the construction of dams, canals and bridge projects throughout Europe. On November 1, 1830, he was named superintendent of the School of Bridges and Roads, where he continued to serve through 1836. While there he was awarded the cross of the Legion of Honor. He then became inspector of the Corps of Bridges until he retired in 1851, after which he dedicated himself to private research.[1]

2 Work

Minard was a pioneer of the use of graphics in engineering and statistics. He is most well known for his cartographic depiction of numerical data on a map of Napoleon's disastrous losses suffered during the Russian campaign of 1812 (in French, *Carte figurative des pertes successives en hommes de l'Armée Française dans la campagne de Russie 1812-1813*). The illustration depicts Napoleon's army departing the Polish-Russian border. A thick band illustrates the size of his army at specific geographic points during their advance and retreat. It displays six types of data in two dimensions: the number of Napoleon's troops; the distance traveled; temperature; latitude and longitude; direction of travel; and location relative to specific dates.[2] This type of band graph for illustration of flows was later called a Sankey diagram, although Matthew Sankey used this visualisation 30 years later and only for thematic energy flow).

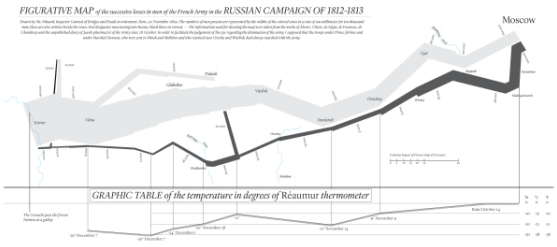


Charles Minard's map of Napoleon's disastrous Russian campaign of 1812. The graphic is notable for its representation in two dimensions of six types of data: the number of Napoleon's troops; distance; temperature; the latitude and longitude; direction of travel; and location relative to specific dates.[2]

The original description in French accompanying the map translated to English:[3]

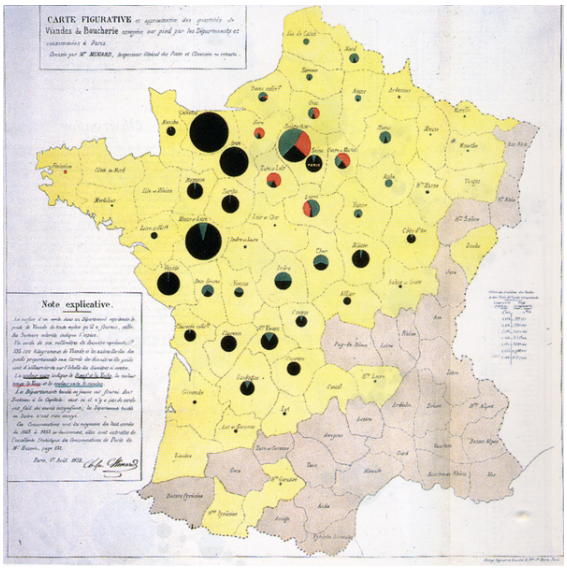
> *Figurative Map of the successive losses in men of the French Army in the Russian campaign 1812-1813.*
>
> *Drawn by Mr. Minard, Inspector General of Bridges and Roads in retirement. Paris, 20 November 1869.*
> *The numbers of men present are represented by the widths of the colored zones in a rate of one millimeter for ten thousand men; these are also written beside the zones. Red designates men moving into Russia, black those on retreat.*
> *— The informations used for drawing the map were taken from the works of Messrs. Chiers, de Ségur, de Fezensac, de Chambray and the unpublished diary of Jacob, pharmacist of the Army since 28 October.*
> *In order to facilitate the judgement of the eye re-*

garding the diminution of the army, I supposed that the troops under Prince Jèrôme and under Marshal Davoust, who were sent to Minsk and Mobilow and who rejoined near Orscha and Witebsk, had always marched with the army.



Modern redrawing of Napoleon 1812 Russian campaign including a table of degrees in Celsius and Fahrenheit and translated to English.

2.1 Recognition



Minard's map using pie charts to represent the cattle sent from all around France for consumption in Paris (1858).

Modern information scientists say the illustration may be the best statistical graphic ever drawn.[2] French scientist, physiologist and chronophotographer Étienne-Jules Marey first called notice to Minard's dramatic depiction of the fate of Napoleon's army in the Russian campaign, saying it "defies the pen of the historian in its brutal eloquence".[4]

Noted information designer Edward Tufte says it "may well be the best statistical graphic ever drawn"[5] and uses it as a prime example in *The Visual Display of Quantitative Information*.[6] Howard Wainer identified Minard's map as a "gem" of information graphics, nominating it as the "World's Champion Graph".[7]

Arthur H. Robinson wrote that Minard was 'a cartographic pioneer in many respects' and pointed out that his famous map (of Napoleon's march) was only one of 51 thematic maps he created during his lifetime.[8]

3 References

[1] Chevallier, V. (1871). "The Life of Charles Joseph Minard (1781-1870)". Finley, Dawn (translator). From "Notice nécrologique sur M. Minard, inspecteur général des ponts et chaussées, en retraite". *Annales des ponts et chaussées* (in French) **2**: 1–22. 1871. Posted by Edward Tufte.

[2] Corbett, John. "Charles Joseph Minard: Mapping Napoleon's March, 1861". Center for Spatially Integrated Social Science. Retrieved 21 September 2014.

[3] "Charles Joseph Minard: Napoleon's Retreat From Moscow (The Russian Campaign 1812-1813) An Interactive Chart". Retrieved 21 September 2014.

[4] International Statistical Congress. Emploi de la cartographic et de la methode graphique en general pour les besoins speciaux de la statistique. In Proceedings, pages 192–197, Vienna, 1858. 3rd Session, August 31-September 5, 1857. Cited in: MINARD, CHARLES JOSEPH by Michael Friendly at datavis.ca. Accessed 09.2014

[5] Edward R. Tufte (2001). *The Visual Display of Quantitative Information*. p. 40

[6] "Poster: Napoleon's March". Edward Tufte. Retrieved 21 September 2014.

[7] Howard Wainer (1984). "How to Display Data Badly". In: *American Statistician* 38 (2): p 146 (pg 136 – 147).

[8] Arthur H. Robinson (1967), 'The Thematic Maps of Charles Joseph Minard', *Imago Mundi*, Vol. 21, (1967), pp. 95-108

4 Further reading

- Michael Friendly (2002). "Visions and re-visions of Charles Joseph Minard." *Journal of Educational and Behavioral Statistics*. 27 (1), 31 – 52.
- Minard, Charles-Joseph. *Des Tableaux graphiques et des cartes figuratives, par M. Minard,...* Thunot, 1862.
- Robinson, Arthur H. "The thematic maps of Charles Joseph Minard." *Imago Mundi* 21 (1967): 95-108.
- Edward R. Tufte (2001). *The Visual Display of Quantitative Information* (2nd ed.). Graphics Press. ISBN 0-9613921-4-2.
- Wainer, Howard. "Visual Revelations: A Graphical Legacy of Charles Joseph Minard: Two Jewels from the Past." *Chance* 16.1 (2003): 58-62.

5 External links

- Background on Minard's graph including original sources, Edward Tufte
- The Graphic Works of Charles Joseph Minard, Michael Friendly, York University (Ontario) Department of Psychology
- Minard biography, Michael Friendly
- Re-Visions of Minard, Michael Friendly
- Grime, Dr. James. "The Greatest Ever Infographic" (video). Brady Haran. Retrieved 3 April 2014.

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