

## The best map ever?

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**ARTICLE HISTORY** Received 9 March 2021; Accepted 24 March 2021

It is claimed Minard's 'Carte Figurative des pertes successives en hommes de l'Armée Française dans la campagne de Russie 1812–1813' is the best map ever made. Is this true and where does this quote come from? The quote – in a slightly different wording is found in Tufte's book 'The visual display of quantitative information' (1983). He wrote: 'It may well be the best statistical graphic ever drawn'. Tufte does not use the word map as such, but in his works he sees maps as just another graphic. He praises the map. He wrote '... how multivariate complexity can be subtly integrated into graphical architecture, integrated so gently and unobtrusively that the viewers are hardly aware that they are looking into a world of four or five dimensions', and later continues by saying 'Graphic elegance is often found in simplicity of design and complexity of data'. The map also features in his later works, such as the book Beautiful evidence (2006). His quotes and claims are echoed by many others who have used this map in their examples of which many you can find in my book 'Mapping time' (Kraak, 2014).

Is it indeed the best map ever? Well probably we should first answer the question 'Can there anyhow be a best map ever?'. My answer would be no. There is no single map that is the best for all purposes, even if compared with any other map. Why? Well, each situation, each geographical question requires a dedicated map considering the data, the users and the context of use. Still, there are map competitions, such as, for instance, organized biannually by the International Cartographic Association, but this competition distinguishes different map categories and limits itself to the most recent two years. Is it the most famous map? In our professional circles probably yes. Is it a good or brilliant map? Yes is it. Why does it intrigue me? In the framework of my research on how to map events, and my opinion that there cannot be a single best map, Tufte's quote challenged me. An additional important driver was a personal family history. Five generations back Gerrit Janz Kraak joined Napoleon on his Russian campaign. This essay develops around three illustrations, Minard's map, my family history, and the 'best map' claim. In this discussion I restricted the arguments to a paper map world.

### Minard's map

Charles Joseph Minard was born in Dijon, France on 24 March 1781 and studied in Paris at the École Polytechnique and the École Nationale des Pont et Chaussées, to become an

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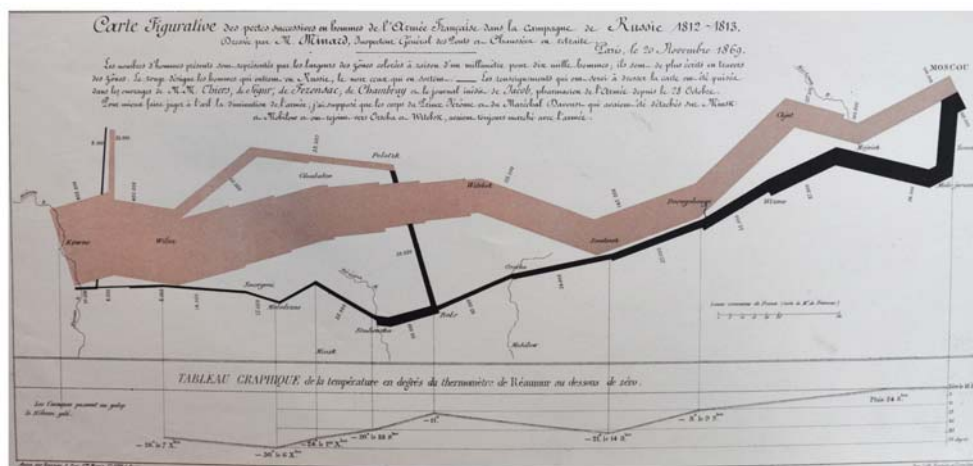
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engineer. In 1851, at the age of 70, he retired. He died in Bordeaux on 24 October 1870. His (carto)graphic career started just before his retirement. He published his first map in 1845. The last known map he produced was Napoleon's Russian Campaign, which was drawn in 1869, in combination with a map of Hannibal's campaign over the Alps.

He contributed to many innovations in both statistical graphics and thematic mapping. Minard's work and of other pioneers from that period are described by Robinson (1982) and Palsky (1998). In 2018 Rendgren published 'The Minard system: the complete statistical graphics of Charles-Joseph Minard', the new classic about Minard's work. Studying his work shows that the flow map is probably Minard's trademark. Over time many authors, like myself (Kraak, 2014), have been inspired by this map of Napoleon's Russian campaign. Several have used it as a benchmark to evaluate their own software or mapping skills.

What is the story behind Minard's map (Figure 1)? At the beginning of 1812, Napoleon organized his Grand Armée with over 500,000 soldiers recruited from all parts of the European continent. Many nations had to supply troops as part of the alliance with France. The French army was organized in different Corps. Napoleon commanded the main body including his Imperial Guard (Smith, 2004; Zamoyski, 2004). The campaign has been extensively described by Nafziger (1988), Austin (2000), and Lieven (2011). The Russian adventure started with the Neman River crossing on 24 June 1812, heading toward Vilnius. After a two-week stay in this city, his troops moved toward Vitsyebsk, on the River Dzvina. Here it proved the troops were already exhausted and lacked the necessary food and supplies. In August he moved towards Smolensk, where between 16 and 18 August, the battle of Smolensk took place. After the battle the Russians retreated further east, but finally, Kutuzov, in charge of the Russian army, made a stand at Borodino, where the largest battle of the whole campaign took place on 7 September. As a result, the Russians retreated back even beyond Moskva. Napoleon entered the city on 14 September 1812. 19 October, Napoleon left Moskva with just over 105,000 troops. At the end of October, the weather also started to take its toll due to heavy snow and temperatures



**Figure 1.** Minard's 1869 'Carte Figurative des pertes successives en hommes de l'Armée Française dans la campagne de Russie 1812-1813'

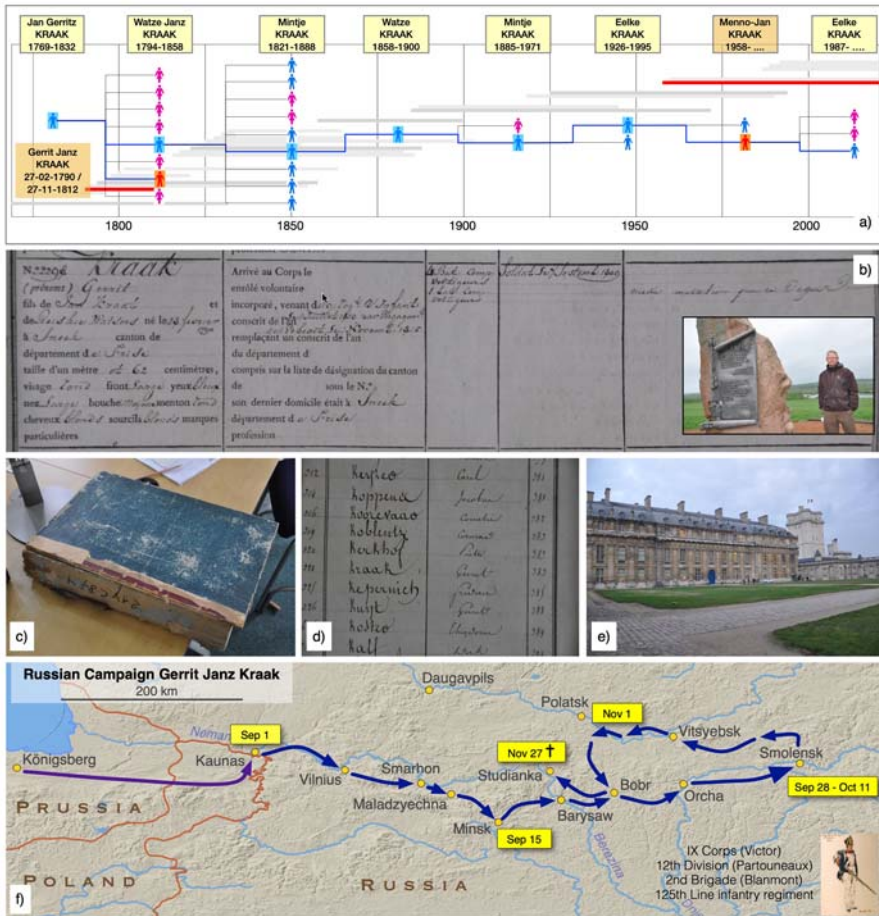
Source: Library Lasage – Collection Ecole Nationale des Ponts et Chaussées.

far below zero degree Celsius. After leaving Smolensk on 14 November, the French army was down to just over 50,000 men. 25 November, Napoleon reached the Berezina River. He had assumed that he could cross the frozen river easily, but the temperatures had risen, and the river was no longer completely frozen. Near the village of Studianka they found an option to cross, but bridges had to be built. 27 November, Napoleon and his Imperial Guard crossed the river. He lost over half of his troops at the crossing, as is so well expressed by Minard's map. Napoleon and the remains of his army retreated further toward Vilnius. On December 5, Napoleon left the army for Paris.

Minard use his favorite flow map design techniques to tell the above story. Flow maps give an immediate impression of direction and volume of the movement. Minard divided the campaign into two sections, 'advance' and 'retreat'. However, direction can only be deduced if one knows that the army shrinks over time. In the text below the map title, which functions as a kind of map legend, he explains that the 'red' part refers to the troops advancing to Moskva and the 'black' to those who retreat. This text also informs us that 'The number of men present are represented by the width of the colored zones at a rate of one millimeter for every ten thousand men; they are further written across the zones'. The map contains some minimal topographic information for orientation purposes. However, this information is in the one hand very detailed and the other hand vague. Examples of the first are the river courses, like the Berezina River in the center which played a prominent role during the retreat. This detail is in stark contrast with the generalized path of the army. The exact locations of places, indicated by names, only remain vague. Battle locations are not even given. Not only was Minard ahead of his time with his flow maps, but one could argue he also introduced the principle of linked views. The temperature diagram below the map is linked to the 'Napoleon's retreat section' of flow map via vertical lines, which in the diagram holds also dates.

## Personal links

For me the most intriguing part of my Minard project has been researching the family history linked to the map. This story is summarized in [Figure 2](#). At that time the Netherlands was part of the French empire and Dutch male had to serve in Napoleon's army. In [Figure 2\(a\)](#) you see my relationship with soldier Gerrit-Jan Kraak. The diagram shows the direct line between me and the brother of Gerrit Janz, spanning five generations. Behind the family tree you can see the lifespan of all individual family members. To find details about Gerrit-Jan's military career I have visited the archive of the French army in Vincennes, near Paris (see [Figure 2\(b-e\)](#)). All details on the Napoleonic wars have been meticulously recorded in many ledgers, also those of Gerrit-Jan. He was born in Sneek, 1790 and died 27 November 1812 during the Battle at the Berezina River. He served in the 125th Line Infantry regiment of the IX Corps, composed mainly of Dutch soldiers. The maps show the path his regiment had followed. Plotting this path on Minard's map more or less gives a geographic match. However, time wise it is out of sync because the IX Corps was part of Napoleon's reserve and only entered Russia on 1 September. The reserve joined of what is left over of Napoleon's main army mid-November. In the text below the map title in [Figure 1](#) map Minard does explain he took some liberties and made assumptions to keep the flow map simple and get the main message across.

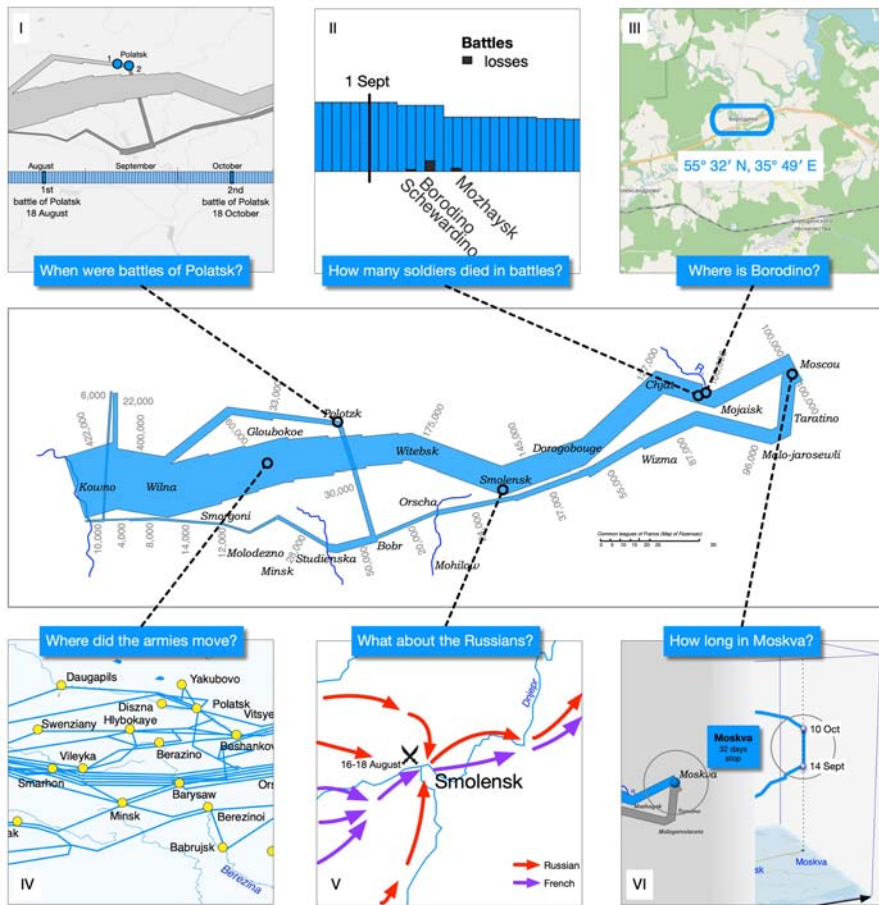


**Figure 2.** Kraak and Napoleon’s Russian Campaign: (a) family tree; (b–d) military record Gerrit Janz Kraak; (e) Chateau Vincennes home of the French military archives; (f) route of Gerrit Janz Kraak during the campaign.

The photo inset in Figure 2(a) shows me visiting the battlegrounds along the Berezina River, Belarus, near the crossing point in 1812.

### The best map? Really?

To evaluate how good Minard’s map really is a set of basic questions related to where, what and when have been formulated (see Figure 3). The answers are visualized by the linked maps and diagrams each holding an alternative graphic. The map does give a good overview of the whole campaign, but if we ask ‘Where is Borodino?’, the location of the largest battle during the campaign, we do not get an answer. Adding more detailed geography will provide the answer (Figure 3(III)). Finding battles could potentially be deduced from the map. When the width of the segments on the maps reduces considerably, it might be a location of a battle with high losses, such as is the case at the Berezina River crossing. This is not apparent near the location of the Battle of Borodino. The



**Figure 3.** Questioning Minard's map: Where? (III and IV); What? (II and V); When (I and VI).

question 'Where did the armies move?' cannot be answered because they have been combined by Minard in a single flow. Mapping the individual army routes tells us more about the course of the campaign (Figure 3(IV)). The main message of the map is that the size of Napoleon's army reduced dramatically over time. However, it does not tell us why. A logical question in this context could be 'How many soldiers have died during battle?' The map does not really answer this. Historical source reveals that battle losses are only a minor part of the reduction of the army (Figure 3(II)). Hunger, diseases and desertion played a bigger role. Minard only shows Napoleon's army, which leads to the question 'What about the Russian?'. Of course, they were there too (Figure 3(V)). The map proves not very helpful in answering time-related questions, maybe except for those locations that link to the temperature diagram (see original map in Figure 1). Questions like 'When did the battles of Polatsk take place?' remain unanswered. Linking the map to a timeline with events helps (Figure 3(I)). Also, the question 'How long did Napoleon stay in Moskva?' remains unanswered. Actually, the map does not invite such questions at all. A Space-time Cube representation does give an answer (Figure 3 (III)).

Not being able to answer the above questions does not disqualify the map. It is well designed and provides a clear overview. It has probably never been designed with the purpose to answer these detailed questions. On the other hand, details like the number to troops have been added to emphasize his protest to the senselessness of war. A single best map is probably only possible based on a small single variable dataset with a particular audience in mind, otherwise it is always good to triangulate the objective of the geographic data visualization. That is, to look at the data from different perspectives and use alternative visualization method together. This will shed additional light on the data, potentially improve understanding, and will stimulate further (visual) thinking. However, this map of Minard map is my favorite, and one of the most influential maps we know. It has had quite some impact on cartography and beyond. Personally, it took at least two years of my life, not only to verify or contest Tufte's quote, but also because of the relation to my research on how to map events, and personal family connections resulting in the book 'Mapping Time: Illustrated by Minard's Map of Napoleon's Russian Campaign of 1812' (Kraak, 2014).

Concluding, I would qualify it as one of the best maps ever made.

## Disclosure statement

No potential conflict of interest was reported by the author(s).

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