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Charts

Worth a thousand words

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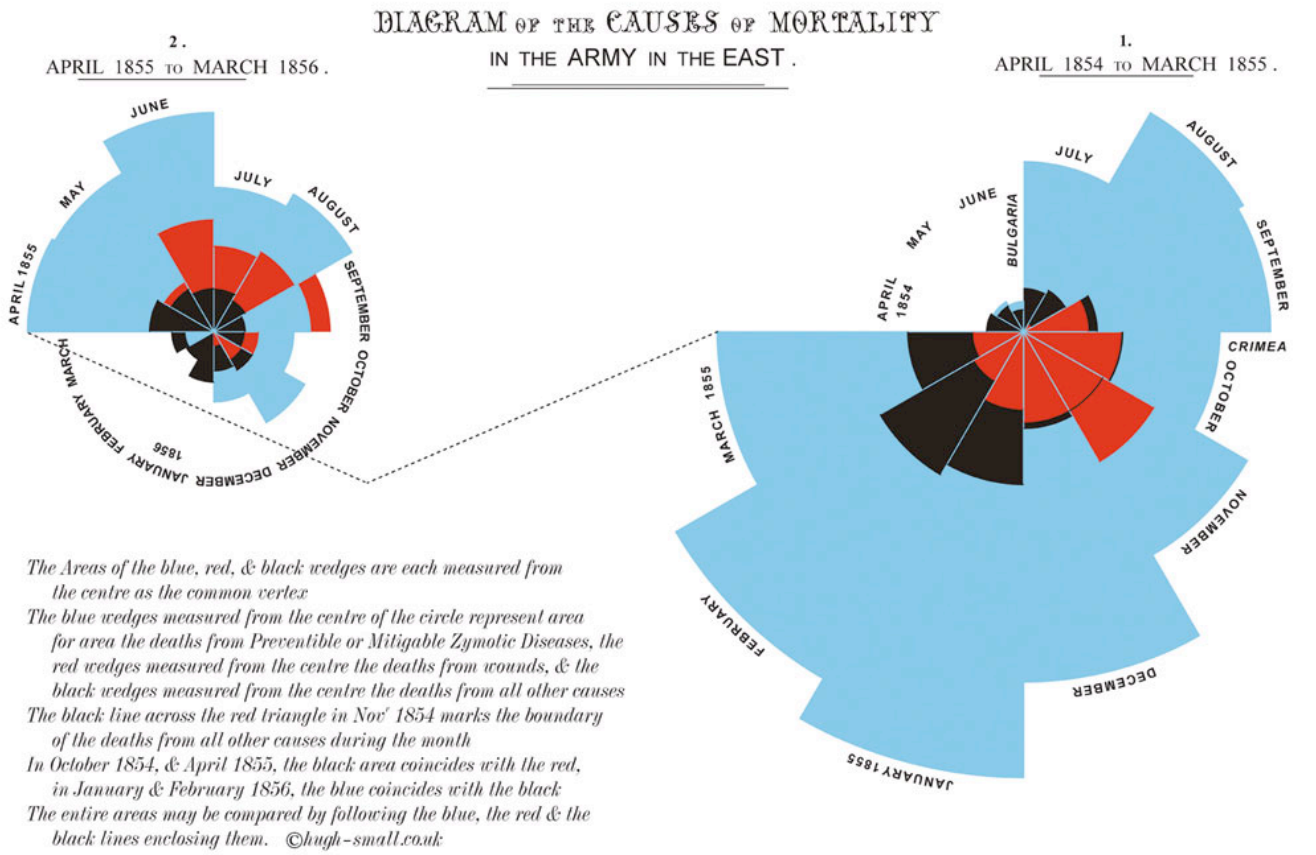
A good graphic can tell a story, bring a lump to the throat, even change policies. Here are three of history's best

IT WAS at a dinner party in 1856 that Florence Nightingale met William Farr. The Lady of the Lamp was already famous for nursing British soldiers wounded in the Crimea; Farr, the Compiler of Abstracts in the General Registry Office, was widely recognised as an innovative statistician. Both cared deeply about improving the world through sanitation; both understood the importance of meticulous records in providing the evidence needed to bring about change.

Graphic News



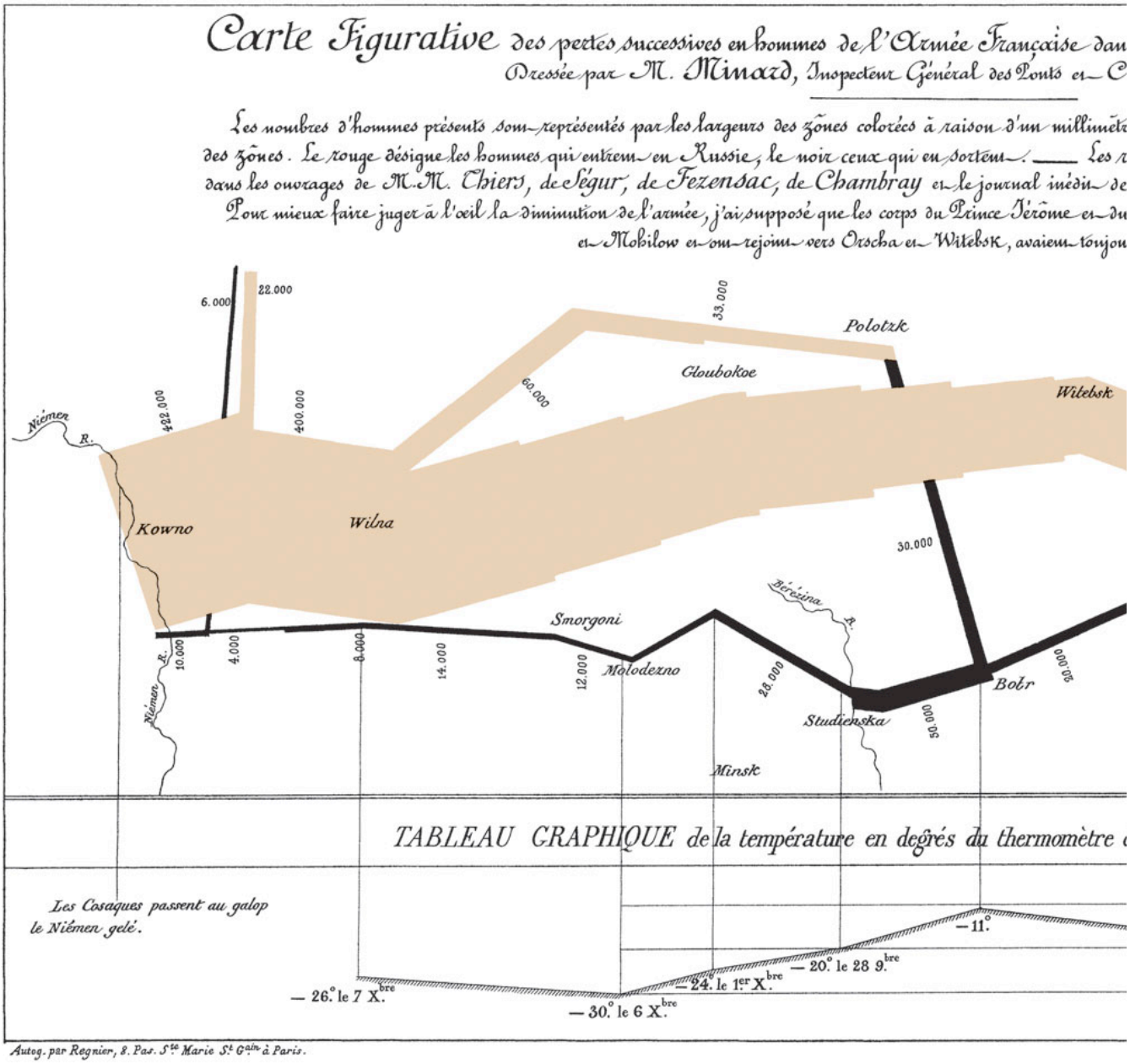
Farr was the first to compile "mortality tables", listing causes of death in the general population; Nightingale compared his numbers with her own on the deaths of soldiers to great effect. By showing that even in peacetime a soldier faced twice the risk of dying in a given year as a civilian, she campaigned successfully for better conditions in barracks. The pair were instrumental in setting up a royal commission of inquiry into sanitary conditions during the Crimean war.

Although remembered as the mother of modern nursing, Nightingale was an accomplished statistician too. She was particularly innovative in presenting data visually. The example above, of a type now known as "Nightingale's Rose" or "Nightingale's Coxcomb", comes from her monograph, "Notes on matters affecting the health, efficiency and hospital administration of the British army" published in 1858. In the same year she became the first female fellow of the Statistical Society of London (now Royal Statistical Society).

The chart displays the causes of the deaths of soldiers during the Crimean war, divided into three categories: "Preventible or Mitigable Zymotic Diseases" (infectious diseases, including cholera and dysentery, coloured in blue), "wounds" (red) and "all other causes" (black). As with today's pie charts, the area of each wedge is proportional to the figure it stands for, but it is the radius of each slice (the distance from the common centre

to the outer edge) rather than the angle that is altered to achieve this. Her principal message—that even during periods of heavy fighting, such as November 1854, far more soldiers died from infection than from wounds—can be seen at a glance. She sent the chart to the War Office; and it is a fair assumption that it contributed to the improvements in military hospitals that she brought about.

Nightingale's chart is a beautiful and persuasive call to action, but it is not perfect. The red, black and blue wedges are all measured from the centre, so some areas mask parts of others. The numbers of deaths from the various causes are not stated—although, to be fair, it was their relative size that Nightingale wished to show.



The chart to the left also tells the story of a war: Napoleon's Russian campaign of 1812. It was drawn half a century afterwards by Charles Joseph Minard, a French civil engineer who worked on dams, canals and bridges. He was 80 years old and long retired when, in 1861, he called on the innovative techniques he had invented for the purpose of displaying flows of people, in order to tell the tragic tale in a single image. Edward Tufte, whose book, "The Visual Display of Quantitative Information" is a bible to statisticians, calls it "the best statistical graphic ever drawn".

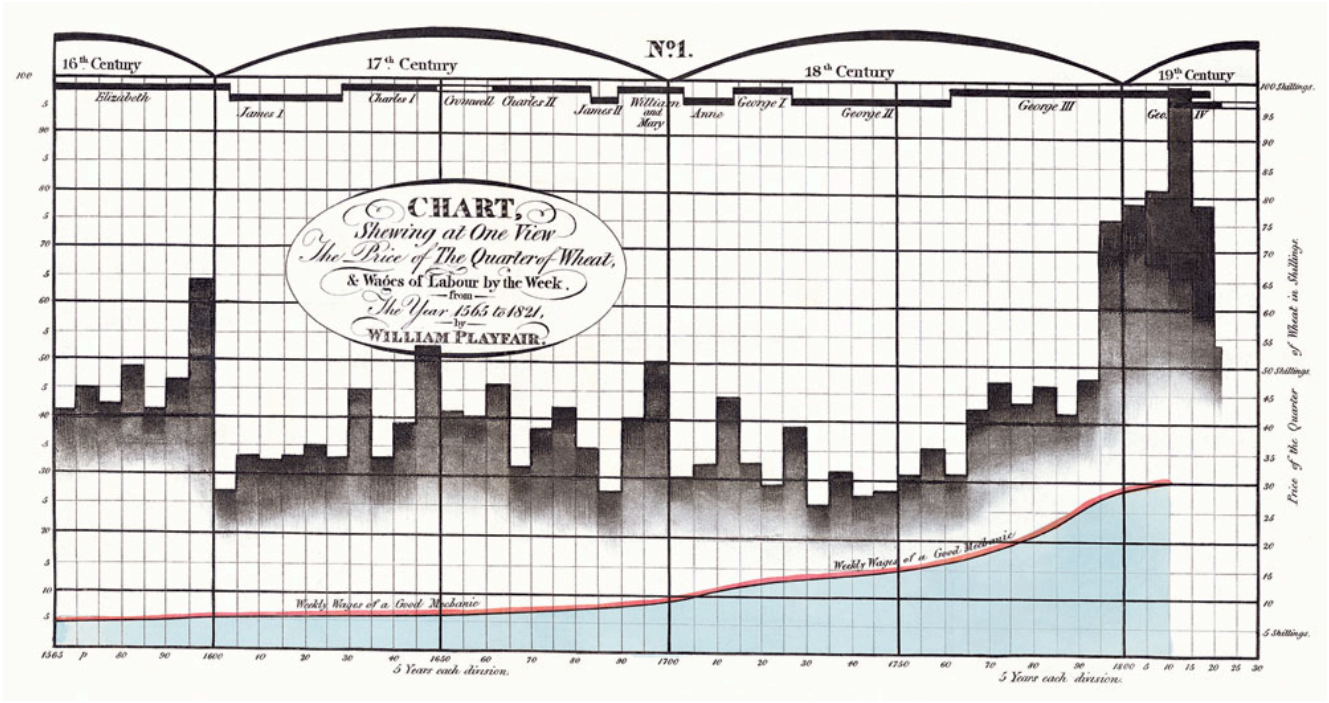
Minard's chart shows six types of information: geography, time, temperature, the course and direction of the army's movement, and the number of troops remaining. The widths of the gold (outward) and black (returning) paths represent the size of the force, one millimetre to 10,000 men. Geographical features and major battles are marked and named, and plummeting temperatures on the return journey are shown along the bottom.

The chart tells the dreadful story with painful clarity: in 1812, the Grand Army set out from Poland with a force of 422,000; only 100,000 reached Moscow; and only 10,000 returned. The detail and understatement with which such horrifying loss is represented combine to bring a lump to the throat. As men tried, and mostly failed, to cross the Bérézina river under heavy attack, the width of the black line halves: another 20,000 or so

gone. The French now use the expression "C'est la Bérézina" to describe a total disaster.

In 1871, the year after Minard died, his obituarist cited particularly his graphical innovations: "For the dry and complicated columns of statistical data, of which the analysis and the discussion always require a great sustained mental effort, he had substituted images mathematically proportioned, that the first glance takes in and knows without fatigue, and which manifest immediately the natural consequences or the comparisons unforeseen." The chart shown here is singled out for special mention: it "inspires bitter reflections on the cost to humanity of the madnesses of conquerors and the merciless thirst of military glory".

Graphic News



The chart to the left is the earliest of our three. It was published in 1821 by William Playfair, a Scottish engineer, political economist and scoundrel: he was convicted of libel in England and swindling in France. Alongside these many and varied skills he was also an engraver (he produced some of James Watt's engineering drawings), which explains this image's handsomeness, with its delicate shading and ornate attribution.

Playfair liked controversial topics. He drew a chart comparing tax levels in various countries in order to show that Britain's was too high. He was the first to show imports and exports on one chart, shading the area between the two to indicate the balance of trade and explaining that the intersection of the lines showed a shift in favour of one country or the other.

This chart, his most famous, shows the "weekly wages of a good mechanic" and the "price of a quarter of wheat", with the reigns of monarchs displayed along the top. It is a little difficult to see the point Playfair wished to make: "that never at any former period was wheat so cheap, in proportion to mechanical labour as it is at the present time". Presumably he was not familiar with the idea of combining two variables—prices and wages—to make a third—affordability. Still, he should not be overly criticised for this. For a start, his conclusion was correct. Statisticians have used his data to plot wages divided by prices (showing how much wheat a week's wages would buy) against time, and the point becomes clear—as, incidentally, does a more subtle one: the increase in buying power was slowing down.

And Playfair was already making a leap of abstraction that few of his contemporaries could follow. Using the horizontal and vertical axes to represent time and money was such a novelty that he had to explain it painstakingly in accompanying text. "This method has struck several persons as being fallacious", he wrote, "because geometrical measurement has not any relation to money or to time; yet here it is made to represent both."

He was the first in a series of economists, statisticians and social reformers who wanted to use data not only to inform but also to persuade and even campaign—and who understood that when the eye comprehends, the heart often follows. Nightingale hoped her charts would liven up her publications; the queen, she thought, might look at the pictures, even if she did not read the words.

Not everyone thought it was right to include such fripperies in a sober publication. "We do not want impressions, we want facts," Farr wrote to her in 1861. "You complain that your report would be dry. The dryer the better. Statistics should be the dryest of all reading." Fortunately, she ignored him.