Clean lines

Ian Stewart

The Visual Display of Quantitative Information.
By Edward R. Tufte.
Graphics Press, Box 430, Cheshire, Connecticut 06410: 1983. Pp.195. $34 (US, postpaid).

EXPERIMENTAL scientists devote much of their time to obtaining data; theoretical scientists devote theirs to explaining data, or making predictions for experimentalists to test. A comparatively neglected stage is the *presentation* of data, which since the 1750s has increasingly meant graphical displays.

"Neglected" is perhaps not the right word: there must be few scientists who have not, at some time, drawn a graph or a statistical chart to illustrate their results or theories. But conscious attempts to analyse the processes involved in the effective communication of data are a rarity. This unusual and fascinating book is both a history and a critique of graphic display methods; the clarity of much scientific writing would benefit greatly if it were to become compulsory reading.

The first section of the book, "Graphical Practice", is a compilation of a wide range of examples of good graphic design. Edmund Halley's chart of trade winds and monsoons of 1686; the dot map made by Dr John Snow in 1854 which pinpointed the Broad Street water pump as the source of a cholera epidemic; an amazing time-series plot of planetary movements dating from the tenth or eleventh century; Marey's train schedule for the Paris–Lyon run in the 1880s; and Minard's *tour de force*, a chart of what befell Napoleon's invasion of Russia, which displays six variables simultaneously. A pivotal role is assigned to William Playfair, who assiduously sought to replace tabulations of statistical data by graphs and charts, and was responsible for many innovations of graphic design that are now taken for granted.

The author lays down several guiding principles for graphical excellence, of which two will suffice here: "Graphical excellence consists of complex ideas communicated with clarity, precision, and efficiency"; and "Graphical excellence is that which gives to the viewer the greatest number of ideas in the shortest time with the least ink in the smallest space".

There is the (almost obligatory) analysis of how graphics can be used to distort statistical data, a crime committed by Playfair himself as part of a polemic against the supposedly skyrocketing national debt. In particular, he failed to allow for inflation — a common sin even in these enlightened times. This is familiar material, but it is well documented and bears careful reading.

The heart of the book, though, is its second, more critical part, with the somewhat off-target title "Theory of Data Graphics". In reality it is a devastating critique of many standard graphical techniques; but a constructive one that suggests many ingenious and effective improvements and alternatives. However, many of these are dependent on very recent advances in printing technology.

There is a scathing and accurate attack on the "We Used a Computer to Build a Duck" syndrome — a duck being the author's symbol for a graphic that subjugates content to style (especially in a pretentious and "arty" fashion). The name is taken from the Big Duck Store in New York, shaped like the bird in question, for which "the whole structure is itself decoration". Today's computers make the production of immensely complicated multicolour multidimensional charts relatively routine: this is a timely warning indeed, deserving more attention than (sadly) it is likely to get.

The author takes his dictum "with the least ink" to heart. Many arguments against particular designs are supported by an analysis of the percentage of ink devoted to "chartjunk" — parts of the display that convey no information (or, worse, obscure the parts that do, such as unduly heavy grid-lines, eyeboggling Moiré-effect shading, or irrelevant frames).

It is not necessary to agree totally with the author's re-designs to accept that many standard displays (such as the awful pie-chart) are cluttered, fussy and fail in their aim: to convey information more clearly than a bare table of numbers, but as honestly. There is much here that will sensitize readers to the problems and reveal defects in designs; and as scientific data become increasingly multidimensional, effective and honest simplification must become the order of the day. □

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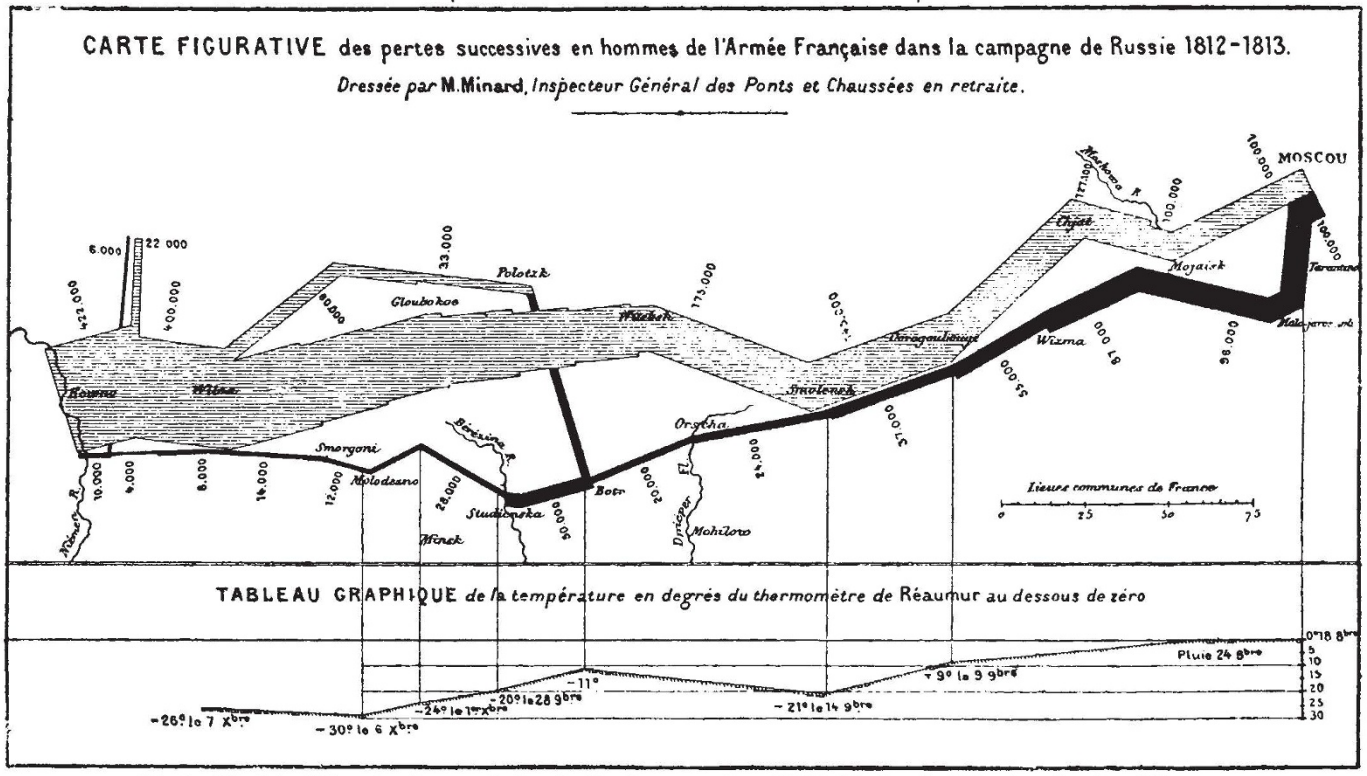

The terrible fate of Napoleon's army during the Russian campaign of 1812. The band widths show the size of the army over time and space. The hatched band on the left shows the start of the campaign, at the Polish-Russian border. The dark band shows the retreat from Moscow. An early example of displaying multiple variables.