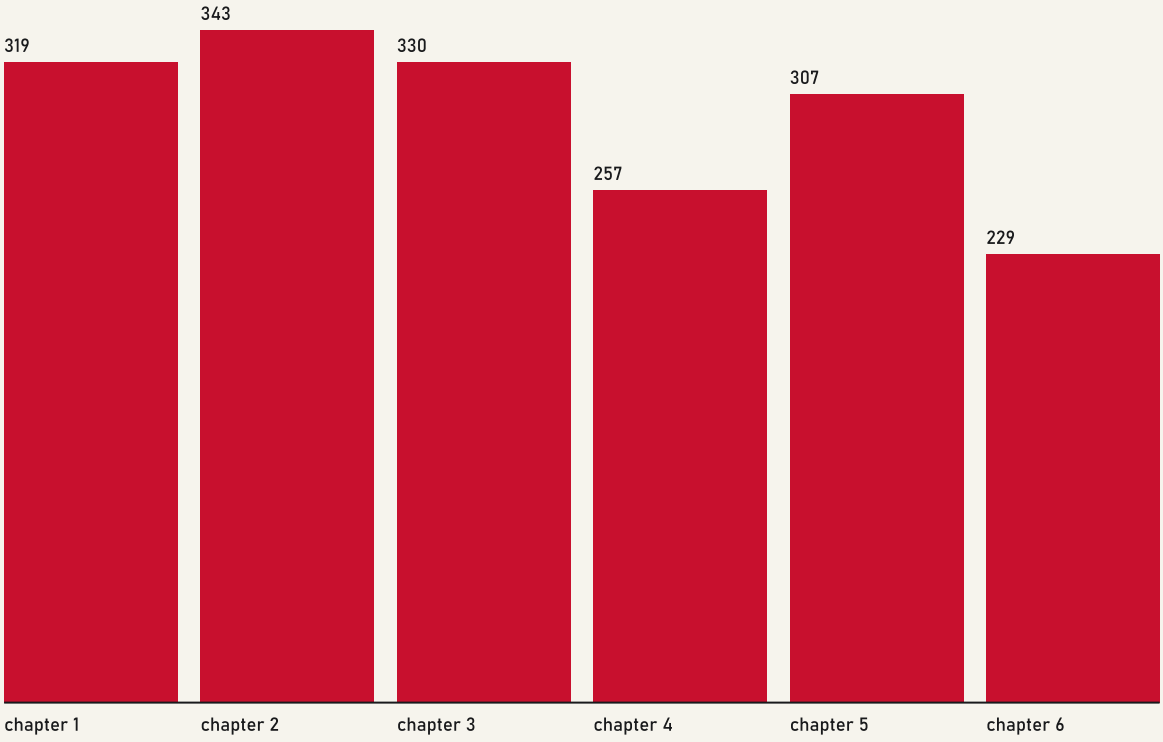

AGAINST TABLES

How numbers learned to draw: Playfair, Nightingale, Minard, and the bars of whole lines.

1

THE TABLE AND ITS DISCONTENTS

For most of history, a quantity of numbers was a wall of numbers.

Before the chart there was the table, and the table was not neutral. A table is numbers filed for retrieval: superb if you know which cell you want, mute if you want the shape of the whole. Ask a table whether trade is rising, whether one cause of death outweighs another, whether an army is melting away, and it answers with everything at once, which is a way of answering nothing. For centuries this was simply what quantitative knowledge looked like: columns ruled down the page, the reader's finger moving cell to cell, the pattern assembled slowly in the head or not at all.

The complaint sounds obvious now, and it is worth remembering that for a very long time nobody made it. Numbers were records, and records were read one at a time. The idea that a page could hand the eye a thousand numbers in a single figure, that magnitude could be given a length and time a direction, had to be invented, by a particular person, in a particular decade, against the standing assumption that serious information was written down and not drawn. The person was an underemployed Scottish engineer with a gift for going broke, and the decade was the 1780s.

This little book is about that invention, and it is set inside a system with a stake in the matter. The grid this page stands on treats statistics exactly as it treats photographs: a chart, says the canon this library is built from, has the size of one, two, three or four grid fields, like any other citizen of the page. The charts in the later chapters are drawn under that law by the page itself, and their bars are whole lines of text tall, because on this page even the data is forbidden half lines.

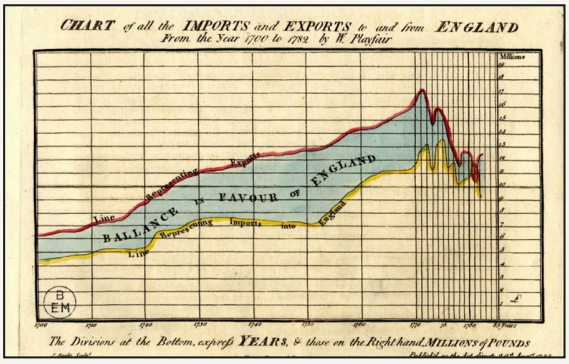

Plate 1. Playfair, 1786: England's imports and exports as two lines across time. The space between them is the argument.

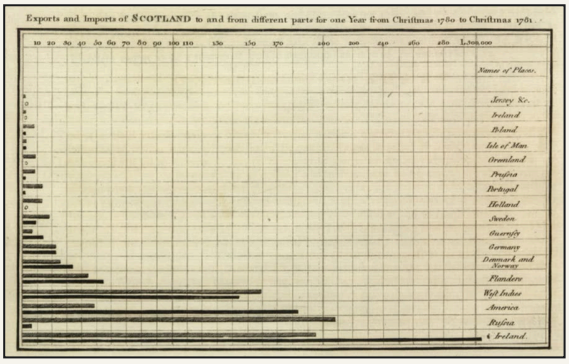

Plate 2. Playfair's Scotland, 1786: the first bar chart, invented because a column of data was missing. He apologised for it.

2

A LINE THAT MEANS MONEY

William Playfair and the Commercial and Political Atlas, 1786.

William Playfair was born in 1759 near Dundee, brother to a famous mathematician, apprentice to the great engineers of his day; as a young man he worked as a draughtsman in the Birmingham works of Boulton and Watt, drawing steam engines. Nearly everything else he touched failed: silversmithing, banking schemes, land speculation, a string of publications and prosecutions. He is one of history's clearest cases of a man who invented something immortal while failing at almost everything mortal, and what he invented, in a book of 1786 called The Commercial and Political Atlas, was the time-series line chart (Plate 1).

The Atlas plotted England's trade, imports and exports drawn as two coloured lines across a field of years, the space between them tinted and labelled for or against the nation. His argument for the method was the eye itself: a man who looks at one of these charts, he wrote in substance, takes in at a glance what a table would surrender only to hours of study.

The claim was radical precisely because it conceded something scholarly pride did not like to concede, that understanding is partly an optical event, and that a well-made picture is not an ornament to the argument but a faster road to it.

The chart born of a missing column

The bar chart, his second invention, was born of an embarrassment. For Scotland he lacked the run of yearly figures that his line charts needed; he had trade numbers for a single year, seventeen partners, no time axis at all. So he turned the axis into a list, gave each trading partner a bar, and let length alone carry the quantity (Plate 2). He apologised for it in the text, and the apology has aged into comedy: the makeshift he was embarrassed by became the most used statistical picture on earth. It is a lesson this library takes personally, since half of its own rules began as workarounds that turned out to be principles.

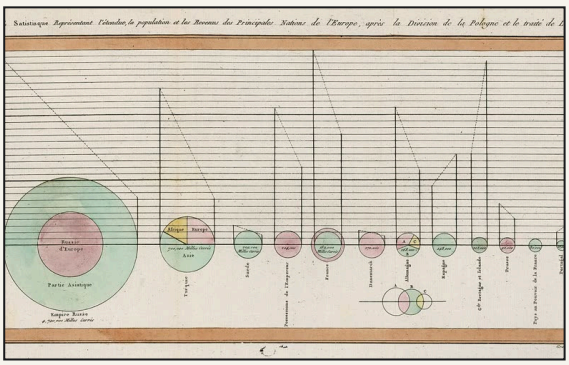

Plate 3. The Statistical Breviary, 1801: the whole and its parts as a circle, read in a second.

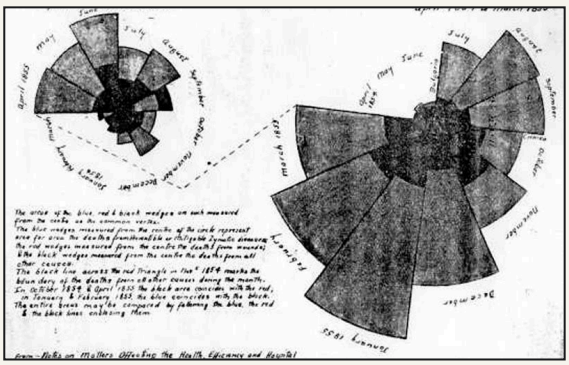

Plate 4. Nightingale's diagram of the causes of mortality, 1858: the blue of preventable disease dwarfing the red of wounds.

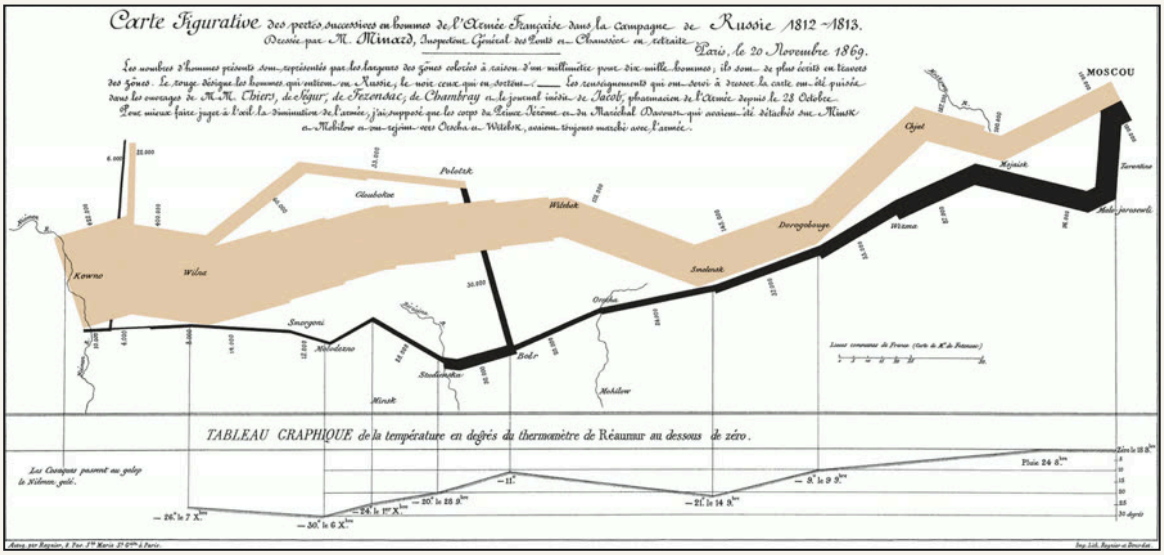

Plate 5. Minard, 1869: the army as a band that narrows. Six quantities in one figure.

3

THE CIRCLE, THE ROSE, THE MARCH

The chart leaves the counting house: 1801, 1858, 1869.

In 1801 Playfair added the third of his inventions in the Statistical Breviary: the circle cut into proportional slices, showing the parts of a whole at a glance (Plate 3). The pie chart has been abused ever since, mostly by people asking it to compare what it can only display, but the original intent was sound and modest: a whole and its parts, one shape, no axis, read in a second.

Half a century later the chart stopped describing money and started saving lives. Florence Nightingale returned from the Crimean War with mortality figures and a political problem: the men she needed to convince did not read tables. Her answer, published in 1858, was the polar diagram her circle of readers came to call the rose: each month a wedge, each wedge's area the deaths of that month, coloured by cause, and the blue zones of preventable disease dwarfing the red of wounds (Plate 4). The picture made the argument that the tables had failed to make, that the army's own camps and hospitals were deadlier than its enemies, and sanitary reform followed. It is the first great case of a chart as an act of persuasion aimed upward, at power.

And in 1869 the retired French engineer Charles Joseph Minard drew what admirers have called, more than once, the finest statistical graphic ever made: the figurative map of Napoleon's Russian campaign of 1812 (Plate 5). One flowing band crosses the map eastward, its width the size of the army, shrinking from over four hundred thousand at the Niemen to a trickle at Moscow; a black band crawls home beneath it, pinned to a temperature scale that falls off the bottom of the chart. Six kinds of quantity live in that one figure, and no sentence in any history book has ever said "the army died" the way the narrowing of that band says it.

4

WHAT A CHART CLAIMS

Length is honest, area is slippery, and the grid keeps the drawing lawful.

Every chart makes a claim of correspondence: this length IS that quantity. The whole ethics of the form lives in how faithfully the geometry keeps that promise. Length kept it best, which is why the bar chart survived its inventor's apology; the eye compares lengths against a common base with almost judicial accuracy. Area keeps it loosely, which is why the pie chart flatters and the rose exaggerates; Nightingale's wedges grew as the square of their radius, and her critics said so at the time. The moral is not that curved charts lie, but that every geometry is an argument, and the reader deserves to know which argument the picture is making.

This is where the chart and the typographic grid turn out to be relatives. Both are machines for making correspondence inspectable. The grid promises that equal distances on the page mean equal quantities of text, that a column is a column everywhere, that alignment is evidence of relation; the chart promises the same for data. Set a chart ON a grid and the two promises fuse: the bar becomes a citizen of the same lattice as the prose, measurable against the very lines the reader is reading. The canon behind this book demands exactly that, a statistic sized in grid fields like any photograph, and the demand is not pedantry. It is a chain of custody for the number, from the data to the drawing to the page.

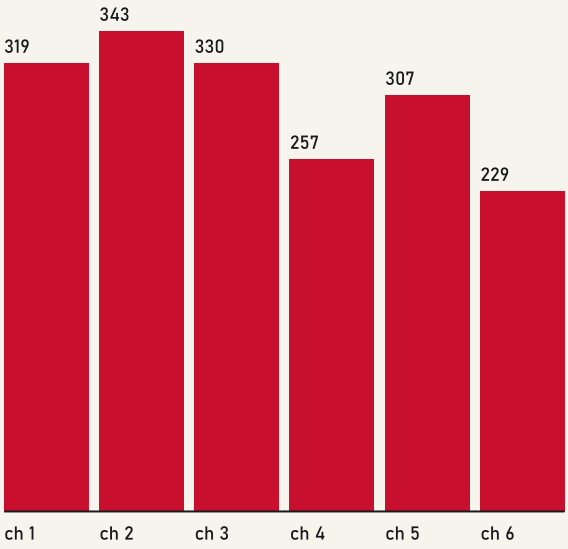

Chart 1. Words per chapter of this essay, counted from the manuscript at composition. Bars are whole text lines, by law.

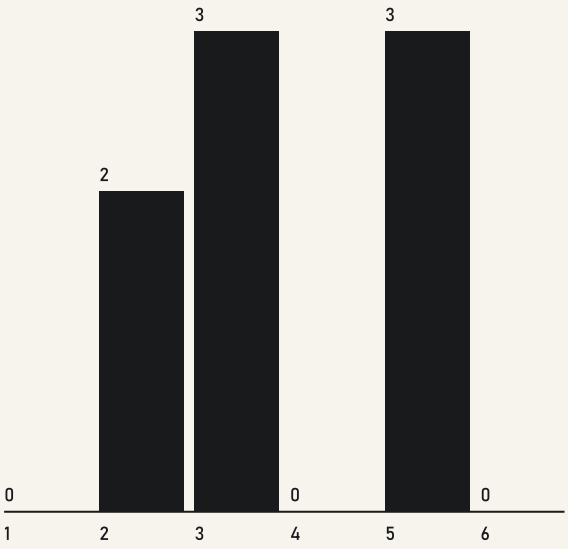

Chart 2. Pictures per chapter: engravings and drawn charts together.

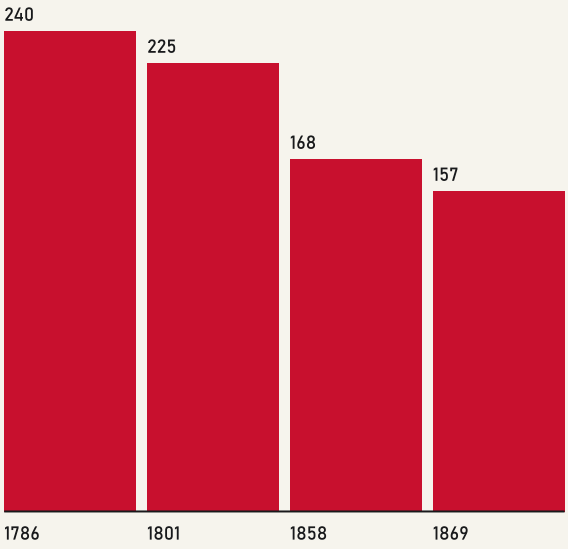

Chart 3. Years from each invention to this printing. One glance, as intended.

5

BARS OF WHOLE LINES

The chart item, demonstrated on the only data this book can vouch for: its own.

The charts in this chapter were not pasted in. They were drawn a moment before printing by the same programme that set the type, under one added law: a bar may only be a whole number of text lines tall. No half lines in typography, says the canon, and on this page the rule extends to the data, so every bar top coincides with a baseline and the chart stands in the text the way a column of figures stands in a ledger (Chart 1). The rounding this forces is visible and honest: the chart declares its resolution, one line, the way a ruler declares its smallest mark.

The data is the book's own body, because that is the only data this book can vouch for completely. Chart 1 counts the words of each chapter, measured from the manuscript at the moment of composition. Chart 2 counts each chapter's pictures, the five engravings

and the three charts. The numbers are small and the stakes are nil, which is the point: the demonstration is the drawing, not the data (Chart 2). A chart whose provenance is the page it stands on cannot be accused of anything except modesty.

And one more, because Playfair earned it: Chart 3 gives the years between each invention in this book's story and the year of its printing, from the Atlas of 1786 to Minard's map of 1869. The intervals are long, and they should be looked at the way Playfair intended his own charts to be looked at, in one glance that saves an hour: everything in this essay happened between eight and ten generations ago, and the forms invented then are on your screen today, unchanged in anything but ink (Chart 3).

6

THE GLANCE THAT SAVES AN HOUR

What the chart and the grid both know about the reader.

Strip the history away and one belief remains under all of it, from Playfair's trade lines to Nightingale's wedges to the lattice under this paragraph: the reader's attention is the scarcest quantity on the page, and everything else should be spent to conserve it. The table hoards information and spends the reader. The chart spends ink and hoards the reader. Every rule this library has taken from the Swiss canon, the whole lines, the aligned columns, the pictures sized to fields, is the same transaction in a different currency: structure paid in advance, by the designer, so that comprehension is cheap at the moment of reading.

Playfair, who was never solvent for long, understood spending better than most. His charts were a kind of generosity that his finances never managed, the work done up front so the reader would not have to do it. The failed banker drew the shape of money more clearly than anyone who ever kept it, and the drawings outlived the debts, the prosecutions, and the century. Numbers learned to draw in 1786. They have not stopped since, and the page you are holding, where even the bars must stand on the baselines, is one more descendant keeping the family rule: never make the eye do the arithmetic.

Set solid in Georgia, 9 on 12, first lines indented one em (MB p.34), titles in Bahnschrift, subtitles on the centred axis (p.79), on a four-column grid of thirty-two fields whose margins are scaled to the golden canon so that the type area is exactly half the paper area (p.51). The three drawn charts obey the same law as the text: their bars are whole lines tall, no half lines even in the data (pp.14, 58–59), and their numbers are the book's own body, counted at composition. The five engravings are public domain, via Wikimedia Commons: William Playfair (1786, 1801), Florence Nightingale (1858), Charles Joseph Minard (1869). Composed by programme from a space of valid books; this is seed "tables-1". Typeset by GEVIERT, das Geviert, the em quad.