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Bertin: Semiology of Graphs: Diagrams, Networks, Maps / Tufte: The Visual Display of Quantitative Information

Reviews and Discussion

Jacques Bertin *Semiology of Graphs: Diagrams, Networks, Maps*. Madison: University of Wisconsin Press, 1984. xi + 415 pp., unnumbered illustrations. \$75.00.

Edward R. Tufte. *The Visual Display of Quantitative Information*. Graphics Press, Box 430, Cheshire, CT 06410. 1983. 197 pp., unnumbered illustrations. \$34.00.

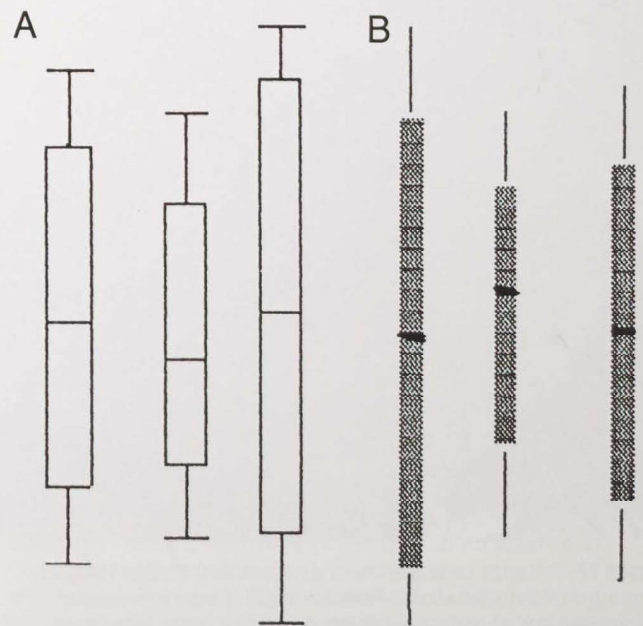
Reviewed by Howard S. Becker
Northwestern University

Academicians are inveterate word and number freaks. If it's worth saying, you can say it in words and numbers. To speak of "saying something visually" is regarded as a low-grade metaphor, and visual materials are thought not to have a language or, if they do, one so primitive and imprecise that it does not merit the name. They do not trust visual presentations, regarding them as somehow more open to abuse and lying than other formats. Puritanically, they often think of visual materials as decorations, used to get readers' attention or interest illegitimately, but essentially distractions from the "real" verbal or numerical message. In fact, social scientists use the language of visual display so much (to store information, to communicate results and conclusions, and to analyze data) that they cannot do without it. They therefore need to understand how that language works, how it is used and misused, and what its appropriate uses are.

Statistical graphics microcomputer programs show another feature of contemporary practice. They invariably focus on the bar chart, the pie chart, and the line graph (sometimes the scattergram as well) as the major graphic devices with which to display data. These were all invented around 1800 and have been little improved since then. Ingenious statisticians and researchers have invented many other devices, but none have "caught on" enough so that you can use them with the assurance that they will be understood as intended. Common practice is extremely conservative and conventional in this regard.

Edward Tufte, an American political scientist with a longstanding interest in statistical graphics, is more irritated than enlightening. He likes graphics that use practically all their ink to convey complex ideas and data concisely, clearly, and efficiently. He doesn't like graphics that mislead by mismatching numbers and areas and quoting data out of context, and especially

despises "data decorators," the artists he believes have wrestled control of the production of graphics from the scientists and scholars who ought to be running things. His interesting ideas for new graphic devices, however, show up the weaknesses of his book. They rest on no systematic analysis of the problem of visual display and mostly derive instead from ad hoc notions and appeals to the authority of past users he admires. That leads to some eccentric opinions (e.g., the sans serif type *Studies in Visual Communication* is set in its bad, apparently because Josef Albers said so) as well as to some designs that so reduce the amount of ink that I found it hard to see what was being conveyed. He thinks, for instance, that Turkey's well-known but little-used box-and-whisker distribution plots (A), which contain information on quartiles as well as the mean and range, would work better if they were redesigned like B:

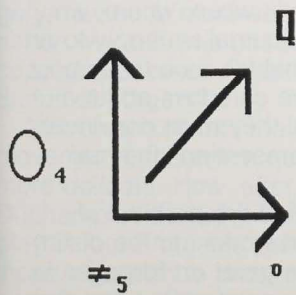


Still, he shows people who need to be convinced what a wonderful communicative job graphics can do and opens your mind up to things beyond bars and pies. That can't be bad.

Jacques Bertin, Director of the Laboratoire de Graphique of the École des Hautes Études en Sciences Sociales in Paris, offers a much deeper analysis of the problems of graphic display. It also requires a lot more study. I read Tufte in a short afternoon; Bertin took me the best part of three days. His dauntingly systematic book is a cross between a treatise and a reference work. You read it once to get the

idea and then refer to it to solve particular problems as they arise. He defines the graphic problem as how to choose between the available possibilities for conveying information visually in such a way as to be *monosemic*, that is, capable of being understood in only the one way the maker of the graphic intended. He catalogs the possible ways the two "planar" variables of length and width plus the six retinal variables of size, shape, color, texture, orientation, and value can be combined to express the relations between variables, depending on whether the variables are "reorderable," ordered, quantitative, or geographic and on whether you want to produce a *diagram* (correspondences on the plane between all the divisions of two components), a *network* (correspondences on the plane between all the divisions of one component), or a *map* (correspondence on the plane among divisions of one component arranged according to a geographic order). Those definitions give you an idea of the level of abstraction in the analytic prose.

Fortunately, Bertin uses his mastery of visual materials to give telling examples of what he is talking about (the way the retinal variables can represent variation in a component, for instance, or the one hundred different representations of the same information he uses to pose the problem of which graphic to choose on pp. 100–137) and to develop a visual language to summarize his theory. He represents the two components of the data (we could probably call them variables) by orthogonal arrows and the third variable by a diagonal arrow rising above the plane:



The combinations can be used to express combinations succinctly, but you must learn the language to know that the above arrows stand for the number of people in the cells defined by cross-classifying an unordered qualitative variable with five categories (e.g., five reasons for going to a café) and an ordered quantitative variable (e.g., age classes).

Most importantly, Bertin emphasizes how to know when we have solved the graphic problem: when we have created an image that allows a reader to grasp at one look (or some minimum number of looks) the

answer to the question he has posed of the data displayed. All this is at a level of theoretical generality that lets you reason out the answers to questions as yet unposed. His book is hard work but worth it; it gives you a systematic way to think about these problems.

Denis Dutton, ed. *The Forger's Art: Forgery and the Philosophy of Art.* Berkeley: University of California Press, 1983. 276 pp. \$22.50.

Reviewed by Gary Alan Fine
University of Minnesota

A forgery can be distinguished from an original because it looks more genuine.

Ernst Bloch

A forgery is one of those paradoxes of existence that brings the rest of the world into question. Should forgery be a crime? Or should we be grateful to the unappreciated forger for increasing our stock of Old Masters? If we can't tell the difference between a forgery and an original, aren't the two of equal value? Questions of the nature of art, these among them, make forgery into the Rubik's Cube of aestheticians—except that the Cube can, eventually, be solved.

Denis Dutton, editor of *The Forger's Art*, has done those of us who love a good puzzle an invaluable service by bringing together a dozen articles, some written exclusively for this volume, others previously published, on the philosophy of forgery. One emerges from the reading dazed by the contortions into which logic can be shaped and by the power of one's definition over the question one asks. Forgery is no easy topic, but it is further complicated when each theorist, like the blind men describing an elephant, "sees" the issue differently. To help the reader recognize this pachyderm, Dutton wisely opens the book with a biographical chapter on the greatest of modern forgers, Han Van Meegeren, the Dutch forger of Vermeer. Hope Werness ("Han Van Meegeren fecit") presents the historical and personal events of Van Meegeren's life in a lively, readable fashion. Although the chapter does not contribute directly to the philosophy of forgery, it does provide a grounding for other chapters. Since Van Meegeren is the primary example used throughout the volume, this base of knowledge is essential to understand the rest. From here the plot thickens.