As Pepin himself comments, we may never know whether "the pandemic was in essence caused by an unpredictable factor: bad luck."

References and Notes

1. N. Nzila *et al.*, *N. Engl. J. Med.* **318**, 276 (1988).
2. E. Hooper, *The River: A Journey to the Source of HIV and AIDS* (Penguin, London, 1999); reviewed in (*3*).
3. R. A. Weiss, Science **286**, 1305 (1999).

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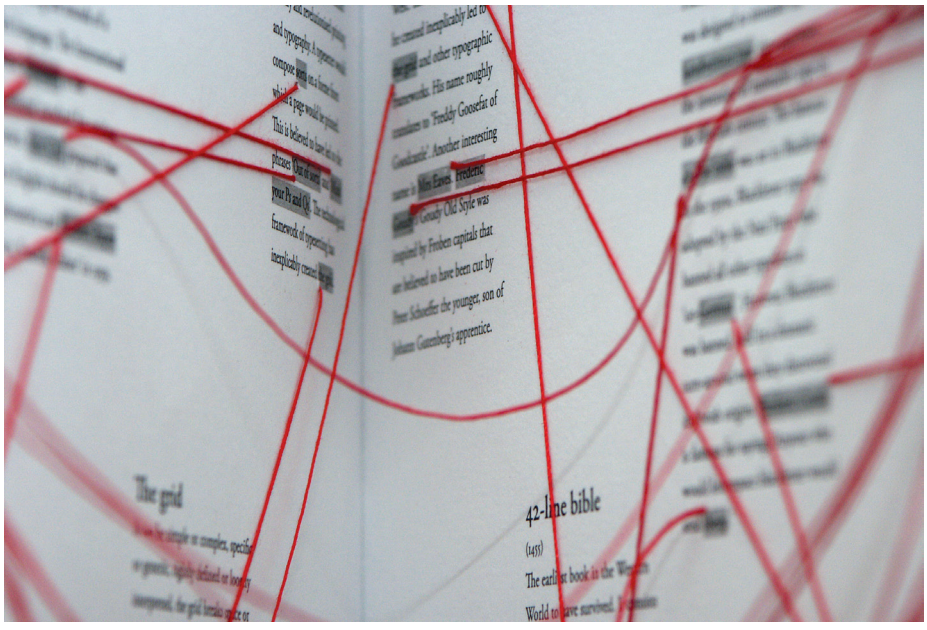
INFORMATION

The Art and Craft of Portraying Data

Robert Kosara



Dan Collier's *Typographic Links* (detail, 2007). The hand-sewn, three-dimensional hyperlink structure guides the reader through the pages of the book.

The visualization of data for communication or artistic purposes is still a relatively narrow niche as far as the academic community is concerned. On the Web, however, these are topics that many people are very interested in. Nathan Yau and Manuel Lima, two prominent visualization bloggers, have now written books about their views of visualization: respectively, *Visualize This: The FlowingData Guide to Design, Visualization, and Statistics* and *Visual Complexity: Mapping Patterns of Information.*

Visualize This offers a hands-on guide to creating a variety of different visualizations. Yau (a statistician at the University of California, Los Angeles) covers a lot of ground, from basic approaches such as bar, line, and pie charts to more sophisticated ones like scatterplots, small multiples plots, and parallel coordinates. It also includes some fairly advanced statistical techniques such as LOESS (for smooth curve estimates of sample points) and multidimensional scaling (for reducing data with many dimensions to a number that can be shown on screen). Succinct and helpful introductions provide rationales for deciding when to use each visualization, although more information could be given on when not to use them—as in the case of Chernoff faces, which map data to facial features and create neat-looking but ultimately unreadable sketches of people's heads.

Yau emphasizes the storytelling approach to visualization, which requires a close understanding of the data and the intended message. Consequently, he structures *Visualize This* by task, such as showing relationships, proportions, differences, or outliers. That refreshingly useful perspective is surprisingly rare in the technique-focused visualization literature to date.

The variety of chart types presented in the book are produced with a wide range of software: Yau uses the statistical package R and programming languages Python, JavaScript, and Flash to create the raw charts and then turns those into publishable graphics using Adobe Illustrator. It is rather ambitious to cover so many visualization techniques and tools in well under 400 pages. Yau mostly succeeds, even though he ends up with some overly detailed and unstructured recipes (such as his description of how to scrape data to visualize from a weather website). Still, he may leave readers wondering whether it is really necessary to learn a new language for almost every type of chart or if there might be one language that covers them all well enough. For such a hands-on introduction, focusing on a single implementation language rather than demonstrating the wide range of tools out there might have been the better approach.

Visual Complexity, in contrast, is less technical but more visual and theoretical. Beautifully put together and printed, the book tempts readers to simply leaf through the pages to take in the many colorful visualizations. Lima, a software designer at Microsoft Bing, provides the perspective of an art historian who assembles and curates a collection of remarkable pieces that represent a class of work: network diagrams. These cover a huge range of different application areas, from the obvious social networks, communication patterns, and flows of goods to proteins, recording artists, and characters in novels. All the examples fall under the big umbrella of node-link diagrams, which show the network as vertices (or nodes) connected with edges (or links). Alternative presentations such as matrix visualizations are not considered.

The book's back cover includes a quote that describes Lima as having the potential to become this generation's Edward Tufte. Those are large shoes to fill, of course, given Tufte's enormous influence on the field of information visualization through his series of books [beginning with (*1*)]. In terms of collecting seminal examples, the comparison is not entirely absurd. However, Tufte not only gathers cases in structured collections, he also analyzes and explains the differences among the visualizations and the choices made by their creators. What makes Tufte's work on visualization so popular is not only his historical perspective but also his

Visualize This
The FlowingData Guide to Design, Visualization, and Statistics
by Nathan Yau
Wiley, Indianapolis, 2011. 384 pp. Paper, $39.99, C$47.99. ISBN 9780470944882.

Visual Complexity
Mapping Patterns of Information
by Manuel Lima
Princeton Architectural Press, New York, 2011. 272 pp., $50, £35. ISBN 9781568989365.

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insights and pointed observations, such as the data-ink ratio as a measure of a chart's quality. Whereas the book demonstrates Lima's capability at identifying compelling cases, there is little so far in terms of penetrating, critical commentary. That is not to say that Lima might not end up becoming as important for network visualization as Tufte has for unstructured data, but *Visual Complexity* does not yet justify the comparison.

Lima presents dozens of examples, with some ordering, but explains very little. He goes to great lengths to provide a historical narrative of the use of tree and network structures to organize knowledge but does not reveal his own reasoning for structuring the book the way he did. The chapter "The syntax of a new language" starts with a visual sketch of 15 different types of network charts (e.g., arc diagram, organic rhizome, and segmented radial convergence), which Lima uses to group the examples he presents in it. But beyond a brief introduction, he provides no rationale for or further information on this "embryonic and evolving taxonomy." Why 15 types? Why these particular 15? The set clearly encompasses a mix of network topology and visual layout, but readers will find no explanation for it. Although a lot of thought undoubtedly went into this selection, we are left to wonder what that might have been.

Visual Complexity seems torn between the visualization of data and artistic expression. Media artist and theorist Lev Manovich provides the foreword, and Lima's final chapter (*2*) discusses network-like patterns in the work of artists like Jackson Pollock. The examples that fill the intervening chapters, however, are all generated from data and mostly try to represent data in a readable and useful way. Bringing the different perspectives of art and information display together would undoubtedly be a worthwhile endeavor, but the book only presents both without establishing a clear connection or attempting to reconcile these very different ideas about visualization.

For all their differences, the books share a few interesting features. Both come from authors with active websites. Lima's site (*3*) offers a collection of visualizations of complex networks that he drew on to create his book, while Yau's popular website (*4*) showcases a wide variety of visualization projects. In addition, both books are more concerned with the data presentation than with data analysis, and both are addressed more to designers than to data analysts. Although Lima describes the structural and aesthetic aspects of network diagrams, he gives very little information about the data that are shown and never attempts to explain what viewers can learn from any of the examples. Yau covers the representation of the data but focuses more on clean presentation and clear storytelling than is usually the case in treatments of visualization. Nonetheless, both *Visual Complexity*'s large collection of beautiful examples and *Visualize This*'s hands-on guidance to making visualizations provide good introductions into the vast and wonderful world of data visualization.

References and Notes

1. Edward R. Tufte, *The Visual Display of Quantitative Information* (Graphics, Cheshire, CT, 1983).
2. *Visual Complexity*'s concluding chapter, "Looking ahead," consists of short essays by Yau, Andrew Vande Moere, Christopher Kirwan, and David McConville.
3. www.visualcomplexity.com.
4. http://flowingdata.com.

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CHEMISTRY

Revisiting a Classic

The Chemical History of a Candle
Sesquicentenary Edition
by Michael Faraday. Frank A. J. L. James, Ed.
Oxford University Press, Oxford, 2011. 202 pp. $24.95, £14.99. ISBN 9780199694914.

It's become something of a maxim lately that science is becoming more interdisciplinary. That's true in the sense that more and more cutting-edge experiments involve collaborations among chemists, biologists, physicists, and others with distinct expertise to probe all sides of a problem. On an individual level, though, it would be straightforward to argue just the opposite. How many prominent researchers in the present day explore as broad a range of phenomena as Michael Faraday examined in the mid-19th century?

Faraday is probably best known now for his experiments mapping out the interrelationships of magnetic fields with electric currents. He was also a major figure in chemistry, and his love of the subject comes through vividly in the series of six Christmas lectures he delivered at the Royal Institution in London during December of 1860 and January of 1861, "The Chemical History of a Candle." The lectures were published soon afterward as a book, and the title has remained in print ever since. It has just been reissued to commemorate the 150th anniversary. The newest edition includes an introduction by science historian Frank James (an expert on Faraday and his work) and facsimiles of Faraday's original lecture notes.

As James points out toward the end of his comments, the lectures have endured in part because they remain almost entirely scientifically valid. (The only shaky sections are those that touch on the sources of light emission; these would have benefited from a quantum mechanical understanding that was still decades in the future.) Faraday beautifully traces the painstaking experimentation underlying modern chemistry—the careful tests that ascertained the formation of water and carbon dioxide from candle wax; the associated implications about the composition of Earth's atmosphere; the essential similarities of combustion to biological metabolism. All the while, he keeps the discussion vividly accessible to the young adult audience of his day and now our own.

James offers quite interesting context about the publishing environment in 1860s London and the work put in by the enterprising William Crookes to transform a public lecture and demonstration into a written record for readers worldwide. He also touches on Faraday's religious beliefs and the extent to which they influenced his deep appreciation of the natural world. There's some irony in the fact that Faraday's most famous studies—on electromagnetism—laid the groundwork for the mass electrification that ultimately supplanted candles as practical sources of light. It seems likely he would have appreciated their sustained current role in spiritual settings, as people continue to contemplate the strange beauty of their flickering flames.

–Jake Yeston

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