

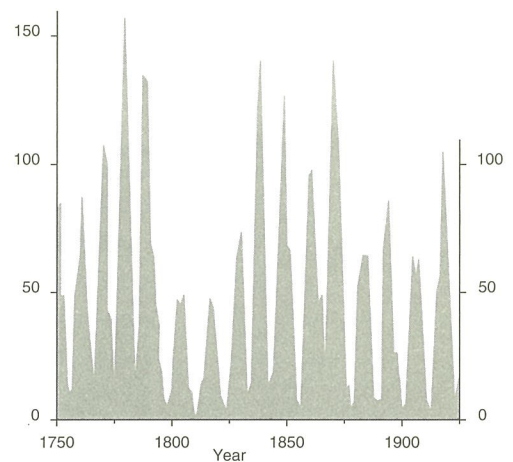
Enthusiasts, partisans, and liars have long tinkered with graphical evidence by dequantifying images, selecting and hyping advantageous visual effects, distorting data. Recently, inexpensive computing and ingenious techniques for image processing have provided endless new opportunities for mischief. Arbitrary, transient, one-sided, fractured, undocumented materials have become the great predicament of image making and processing. How are we to assess the integrity of visual evidence? What ethical standards are to be observed in the production of such images?<sup>12</sup> One way to enforce some standard of truth-telling is to insist that the innocent, unprocessed, natural image be shown along with the manipulated image, and, further, that the manipulators and their methods be identified. If images are to be credible, their source and history must be documented. And, if an image is to serve as serious evidence, a more rigorous accounting should reveal the overall pool of images from which the displayed image was selected.

FINALLY, despite the chronic dangers of misrepresentation, *appropriate* re-expressions or transforms of scales are among the most powerful strategies for exploring data. And in both two- and three-dimensional design, it is often useful to see images and objects at approximately an order of magnitude smaller and larger than actual size.

For example, consider this helpful rescaling, a solution (developed by William Cleveland) to the problem of the aspect ratio in statistical displays. The graph at right shows the number of sunspots by year, 1749 to 1924, moving along in the well-known 11-year cycle. But there is much more in these data than simply rhythms and shapes. Cleveland's clever idea is to choose an aspect ratio that centers the absolute values of the slopes of selected line segments on  $45^\circ$ , a technique implemented by iterative computing. Applying this method to the sunspot data yields the graph at lower right, which reveals that cycles tend to rise rapidly and decline slowly, a behavior strongest for cycles with high peaks, less strong for medium peaks, and absent for cycles with low peaks.<sup>13</sup> From the original spiky mass of data, fresh and subtle information about quantities emerges with a radiant clarity in the rescaled image.

<sup>12</sup> The issues raised by image processing are discussed in William J. Mitchell, *The Reconfigured Eye: Visual Truth in the Post-Photographic Era* (Cambridge, Massachusetts, 1992).

Number of sunspots each year, 1749–1924



Number of sunspots each year, 1749–1924



<sup>13</sup> William S. Cleveland, *The Elements of Graphing Data* (Murray Hill, New Jersey, revised edition, 1994), 66–79. Redrawn.