$y_{.x}$ scattered against x where y = rows and x = columns, b) partial residual scatters, with $y_{.\text{REST}}$ (where REST is all but y and x) scattered against x and c) full residual scatters, with $y_{.\text{ALL}}$ (where ALL is all but y) scattered against x.

16. SUMMARY

The paper of Becker, Cleveland and Wilks has gone a long way from graphic archeology ("you can see it, if you know how to look!") toward graphic impact ("you can't miss it"). But we need to go further (Points 1, 2, 7, 11 and 15). The proposed styles of graphic presentation could have been improved in a few other cases (Points 3, 5, 6, 13 and 14). There are a variety of points where the text could have been clarified (Points 4, 8, 9, 10, 13 and 14). In general, however, one can only praise the paper of Becker, Cleveland and Wilks.

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Comment

Peter J. Huber

The authors deserve to be congratulated for a competent overview of an area of statistics that is becoming more important (and accessible) every year.

They try hard to give a sober, no-nonsense account of the current state of the art. There is a core of simple-minded, extremely useful techniques—foremost among them methods for identification and labeling. But there is also a halo of experimental techniques, and the cautious statement: "Far more experimentation is needed with these advanced strategies" (Section 2.6) ought to be translated into plain English as: "We could not make sense out of those strategies, but perhaps somebody else will." The lunatic fringe techniques are useful to hatch new ideas, but only few of them will survive.

I believe that newcomers to high interaction graphics—the buzzword "dynamic" is semantically inaccurate, by the way—are still attracted mostly for the wrong reasons, namely by the video game glamor of fancy techniques. Reflection on the intrinsic, practical value of a technique comes only afterward, when the glamor has rubbed off. For example, when we gained direct, hands-on access to decent computer graphics in 1978, Stuetzle and I began to experiment first with the most exotic techniques—like interactively controlled sharpening (see Tukey and Tukey, 1981), combined with kinematic graphics in three dimensions. It took a long while for me to realize that I never would be able to interpret the curious shapes I saw in those sharpened scatterplots.

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The following are comments on points where I either disagree with the authors or would put the emphasis differently.

It is important to avoid gimmicks. Built-in side effects can become extremely annoying when a technique is used in a context not anticipated by its designer. For this reason rescaling after a deletion ought not be automatic (Section 2.2), but should require a separate user request.

In Section 2.4, I suspect that the authors' judgment has been colored by accidental features of their implementations (cf. the remarks of Huber, 1987, Section 4). I fail to understand why roping in a region by drawing a line around it should be intrinsically slower than, and inferior to, brushing the interior of that region. Roping is relatively elastic with regard to timing considerations, while the response to brushing can become unacceptably slow in the case of very large scatterplots.

Undeleting is trickier than the authors make it appear (end of Section 2.4). The problem is to *selectively* undelete a few points. It is aggravating if you have to undelete everything and then to start the deletion process from scratch. A more convenient solution, using alternagraphics, is due to Thoma: alternate with a view showing the deleted points only. If you delete a point in the alternative view, it gets visible in the original view, and vice versa. Incidentally, this is one of many examples where alternagraphic switching is better done by the user hitting a button, rather than by an automatic timer.

In Section 2.6, the authors say that "it is entirely reasonable to implement all three ... rotation-control methods ...." I would substitute "feasible" for