Letters

"Polywater" Is Hard To Swallow

Proponents of polywater in the pages of *Science* and elsewhere may be interested to learn why some of us find their product hard to swallow. One reason is that we are skeptical about the contents of a container whose label bears a novel name but no clear description of the contents. Another is that we are suspicious of the nature of an allegedly pure liquid that can be prepared only by certain persons in such a strange way. We choke on the explanation that glass can catalyze water into a more stable phase. Water and silica have been in intimate contact in vast amounts for millions of years; if a more stable kind of water were possible, it is hard to understand why any ordinary water should be left.

There is another and, I think, much more plausible role for the necessary glass. Water and silica interact in wonderful variety, as may be read in a fascinating book by Ralph K. Iler, *The Colloid Chemistry of Silica and Silicates* (Cornell University Press, Ithaca, N.Y., 1955). It is easy to see why a spectroscopist might be excited by the term "polywater" to try to design new ways for water to polymerize which nature had overlooked, but I think that a chemist who feels curious about what is in those glass capillaries would have more success if he assumes that he is dealing with a system of two components.

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Panic in the Marketplace

One of the most disturbing aspects of the current brouhaha over food additives and pesticides is the steady erosion in the credibility of the Food and Drug Administration. The current view of the general populace is that the FDA is an irascible, irresponsible, and dictatorial giant who periodically decides to remove certain items from the marketplace. Witness the rush to purchase cyclamates, and the unprecedented increases in sales of DDT. Very likely a similar rush to buy 2,4-D and 2,4,5-T will occur if present plans to phase out these materials are implemented.

Common sense quite obviously tells the ordinary citizen as well as the biological scientist that injecting astronomically high doses into animal organs does not provide reliable data on the effects of small amounts of a chemical consumed in an ordinary way and passed through the digestive system. The real danger that we face is that one of these days the FDA may indeed find a toxic substance. Will its announcement trigger a rush of buyers to accumulate supplies of this material also?

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CAI: Technological Misconceptions

The PLATO system is indisputably a signal achievement in the hardware development of computer-assisted instruction, allowing many impressive instructional intuitions to be explored. It is unfortunate and ironic that Alpert and Bitzer in pinpointing some misconceptions about CAI are in danger of perpetuating others ("Advances in computer-based education," 20 Mar., p. 1582). Here are four:

Misconception 1. Simply mentioning that learning strategy research exists means that solid, empirical data are available. Researchers in CAI concluded that this extremely important topic was in great need of sound theoretical and experimental development (*1*).

Misconception 2. A system consists of only the hardware and software for CAI. Although Alpert and Bitzer focus on the marvels of the hardware and the software's easy accomplishment of any teaching problems, giving documentation and illustrations, they neglect to discuss or document solid learning strategies. The PLATO approach apparently ignores the fact that "CAI" is only a technological label for valid operating instructional processes or models. The latter seem to be taken for granted, rather than to be viewed as the primary and fundamental problem whose continuing solution must progressively guide hardware and software design (*2*).

The computer per se offers the feasibility of vast and refined data analysis and unprecedented control and feedback potential. It does not *automatically* supply the valid algorithms linking instructional data input to output, nor guarantee any sensible decision rules for mapping input into output. These technological developments must be evolved systematically.

The authors state: "In the absence of a fully developed educational model or a widely accepted evaluative procedure, even for conventional educational methods, it is not possible from such relatively small samples [the authors' limited research study] to derive broad generalizations." Despite this, they conclude that "computer-based education is a plausible approach to improve individualized instruction. . . ." What is the true value of a *plausible* statement?

Misconception 3. Ignoring economics evaluations means that they do not exist. The authors' own figures concerning the economics of CAI overlook information in the published literature (*3, 4*). The study cited in addition to their own, the Booz-Allen economics analysis (*5*), based on the assumption of equivalence between CAI and production of text materials, ignores the difference between the costs of a total technology and the cost of a single portion of an educational system, the textbook. Alpert and Bitzer also seem to play down the development costs of authoring, particularly in Bitzer-Skaperdas (*6*) where author's costs seem to be identified only as royalties.

The discussion confuses developmental and operational economics. While operational costs for the PLATO III system are mentioned, this is a developmental item being put into operat*ing* use and cannot be used to estimate opera*tional* costs of the fully developed system with mass-produced components. Also, the costs of instructional material and the time needed to generate it are not agreed upon by people whose experiences derive from projects with different conceptual approaches.

Misconception 4. "If there has been informed skepticism or concern about