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The Ignorance Explosion

One cannot help being both fascinated and frightened in reading "The Ignorance Explosion," an article recently published by J. Lukasiewicz (*Trans. New York Acad. Sci.*, 1972, p. 373).

Lukasiewicz's theme is that we are becoming less and less able to appreciate and to use effectively the new information published each year. A similar paper appeared in *Chemtech*, 1972, page 393 by S. S. Dubin. If you suspect you are becoming obsolete, these papers will confirm the worst in a semiquantitative manner.

Much of the analysis employs as a yardstick the annual volume of published manuscripts. This rate has been growing exponentially and doubling about every 15 years. Professor Lukasiewicz also suggests that the complexity of the material is increasing so rapidly that we must narrow our specialities to the point that the adage "to know everything about nothing" ceases to be particularly amusing.

One of the scales used to measure our degree of obsolescence is the "coefficient of immediacy," C_I. (Price, D. J. de Solla, *Little Science, Big Science*, Columbia University Press, New York, 1963). If the advances in our total knowledge are proportional to the annual publication rate, then $C_I = 1 - 2^{-\Delta t/D}$. D represents the doubling time in the exponential growth rate of publications. Δt is the time period in question. For example, if a graduate has been working 20 years (Δt) and D is 15 years, then $C_I = 0.6$, that is, 60% of all the technical literature has appeared since his/her graduation. This result is arresting, but in some of the more active fields of chemical engineering, D is much less than 15 years and one's potential obsolescence rate is much higher.

There is also the measurement factor "coefficient of obsolescence" obtained by examining the changes in engineering curricula over the years. If all the courses we took as engineering students have been superseded by new courses, then our coefficient of obsolescence is 100%. Quoting from Professor Lukasiewicz, "The time to reach 50% potential obsolescence has beeen decreasing from about ten years for the 1945 graduates to five years for current graduates."

Obsolescence is then characterized by a half-life which, according to Dr. Dubin, is "the time after completion of professional training when, because of new developments, practicing professionals have become roughly half as competent as they were upon graduation." Half-life values for a current engineering graduate are about five years.

In all of these measurements systems, the bulk of published literature is equated to real progress. However, most engineering papers report incremental advances in theory or supply experimental observations, but papers which are truly advances are few and far between. In fact, they are not often even recognized as milestones in the sense that they must, by definition, diverge from the existing mainstream of thought.

We have for a long time been subjected to a literature overkill, yet the rate of obsolescence does appear to be increasing. Engineering graduates find it increasingly difficult to read papers written by advanced researchers in various fields. If such a trend continues, who will read and appreciate what is published? Who will be the critics?

The trend to continuing education projects is a hopeful sign and should be encouraged. Editors of technical journals can also help by insisting that papers be clear, interesting, and readable with the more significant results and conclusions clearly noted. We need to learn how to convey information rather than write to impress our colleagues.