CURRENT COMMENTS

Miniprint: Is It a Practical Way to Cut Publishing Costs?
or
If You Can Read This, You Can Read Miniprint!

Number 2, January 9, 1978

Back in the fifties, when I was searching for a solution to the problem of storing chemical information, I "invented" *miniprint.* Or so I thought. Later I learned that the idea of using very small print in published material is almost a century old.

Miniprint has become a generic term for any method of producing reduced-size text by printed rather than photographic methods. It is a multi-copy process designed to reduce the cost of printing full-size texts. Miniprint is usually produced on a photo-offset press by clever control of ink flow, roller pressure, etc. In general, it is from three to five times smaller than "normal" text, which is 8 to 12 point type. One point is 1/72 of an inch, or 0.31 millimeters. This essay is printed in 10 point type.

Miniprint reduces the cost of publishing primarily by reducing the amount of paper required. It also significantly reduces costs of printing plates, negatives, binding, shipping, and postage. For reference purposes, as in using a molecular formula index, I thought that miniprint might be ideal. One could easily scan boldface headings and then use a simple hand-held magnifier to "read" structural diagrams.

The main disadvantage of miniprint is that it requires an optical magnifier for reading. Only a few people can read miniprint with the naked eye for more than a few minutes. While any decent magnifier can be used to read miniprint without difficulty, there are a number of devices especially designed for the purpose. Certain reading devices designed for the partially sighted could also be used.

There is no clear dividing line between "normal" print and miniprint. In general, 8 to 12 points is considered normal for text. In Europe, however, type as small as 6 points is often used in newspapers. Type larger than 12 points is usually used for headlines. Miniprint falls in the range of 1 to 4 point type. Figure 1 shows a variety of type sizes. You can determine what would be miniprint for your own eyes.

The size of the type used in the Author Address Directory of *Current Contents*® (*CC*®) is about 4 points. Thus it is just at the border of readability with the naked eye. But even a slight increase in size to 5 point type would increase space requirements significantly. Similarly, in the *Science Citation Index*® the citing line is about 3½ point type but the cited author and reference appears in about 5 point boldface.

Figure 1. Various sizes of the English typeface used in the text of this essay.

This is 12-point type

This is 11-point type

This is 10-point type

This is 9-point type

This is 8-point type

This is 7-point type

This is 6-point type

This is 5-point type

This is 4-point type

[illegible]

[illegible]

Microprint was invented by an unsung hero of documentation—Albert Boni. It is much smaller than miniprint. Microprint is the printed equivalent of *microcards.* The latter are produced by a one-at-a-time photographic process. Each microcard is the positive version of a *microfiche.* Microprint and microcards require the use of viewers which enlarge the reduced image. Special "readers" are also needed to view *microfilm* and *microfiche.* Microfilm can be 8, 16 or 35 millimeter strips or rolls of film which contain reduced images of print or graphic material. Since typical reduction ratios for microfilm are from 15:1 to 32:1, the actual size of the characters on the film is from 0.6 to 0.25 points. Microfiche is similar to microfilm except that it usually consists of 4 by 6 inch sheets of film instead of continuous rolls.

I am often surprised how difficult it is for some people to grasp the reason why miniprint and other micrographic methods produce the economies they do. If you start out with a page which is 10 by 10, the area is 100 square units. Now, if you photographically reduce the image to 2 by 2, the area is 4 square units. The reduction ratio is 1:5, but where you once had one page you can now store 25! Similarly, using a reduction ratio of ten to one you can store 100 pages where you had one. The amount of space saved is much greater than one might imagine.

Over the years a variety of applications have been found for very small type. In 1886 a London engraver named Duncan C. Dallas produced a miniature edition of the Bible on pages reduced to 1 9/16 by 2 3/8 inches. In 1921, Admiral Bradley A. Fiske suggested the publication of books in reduced-size print to be read with a loupe magnifier. A loupe is an eyepiece magnifier used by jewelers and watchmakers. It enlarges an image three to four times. Around 1940, Dr. Lodewyk Bendikson of the Huntington Library of San Marino, California produced pages meant to be read with a low-powered microscope. His pages were produced on silver emulsion photographic paper. He managed to put 40 to 50 pages of a book on one 5 by 8 inch card.[1]

My deceased colleague and friend, Ralph R. Shaw, discussed the use of miniprint in the 1940's, before I had heard of it or him. From 1940 to 1954 Shaw was the Librarian of the US Department of Agriculture. Later he became President of the American Library Association, and owner of the Scarecrow Press. Shaw is known primarily for adapting scientific management and electronic methods to library service, and for the development of the "bookmobile" concept.

But Albert Boni probably thought of miniprint even before Shaw. In 1940, Boni formed the Readex Microprint Corporation. Incidentally, he is the same Boni of Boni and Liveright fame, the original publishers of James Thurber and other notables. Readex publications include *Landmarks of Science*, a collection of documents which reproduces 2½ million full-size pages on 15,000 microprint cards. *Landmarks* includes reproductions of the first editions of Newton's *Opticks*, Darwin's *Origin of Species*, and other classics. Each 6 by 9 inch microprint card contains as many as 200 reduced 8½ by 11 inch pages. They can be read easily with a viewer sold by the company.

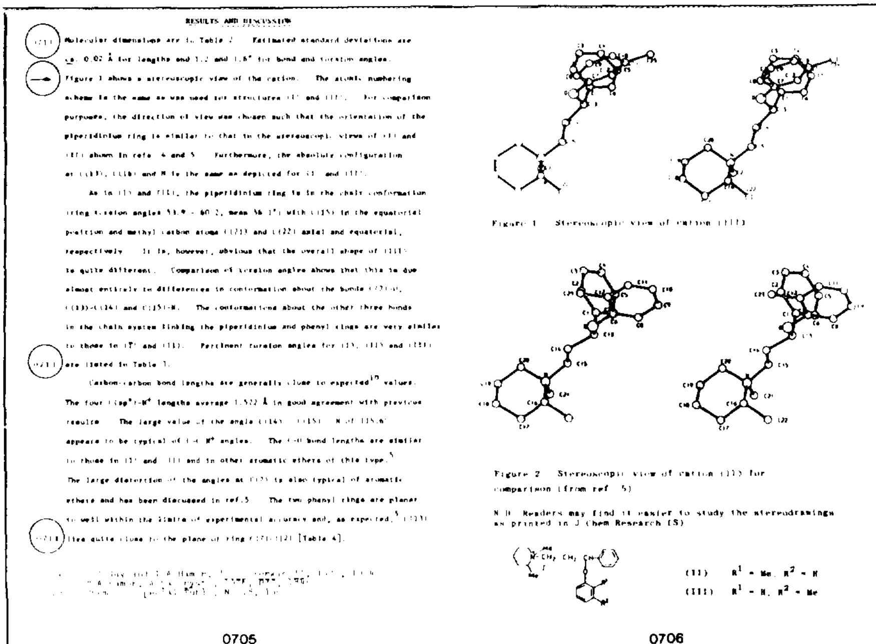
Of all reduced-size printing methods, miniprint is probably the most "natural." People have been reading print on pages for centuries. For most of us, gazing at an illuminated screen for more than a few minutes —as must be done to read microprint, microfilm, and microfiche—is alien and uncomfortable. Thus miniprint is better suited for the publication of original texts than are the other forms. But I think it is best used in reference works where one does not need to read the material for lengthy periods.

Recently some scientific journals have experimented with miniprint. In 1974, the *Journal of Organic Chemistry* used miniprint for the supplemental sections of 36 papers. These sections concerned peripheral or noncentral points; the major findings appeared in standard size print. According to Frederick D. Greene of MIT, *JOC*'s editor-in-chief, the journal did not save enough money to justify continuing the experiment. However, this was partly because authors did not pay the usual ACS page charges. It was dropped primarily because the editors felt, as Greene explained, "There is an esthetic drawback to miniprint."

One sarcastic reader apparently agreed. He reduced a letter to the editor to the size of a postage stamp. He then mailed it to the *JOC* with this note attached: "If you can read this, then miniprint is great."

In another experiment, the *Jour-*

Figure 2. Two frames of miniprint from the *Journal of Chemical Research (M)*. Nine frames this size can fit on each 8¼ by 11½ inch (20.96 by 29.21 cm.) page.



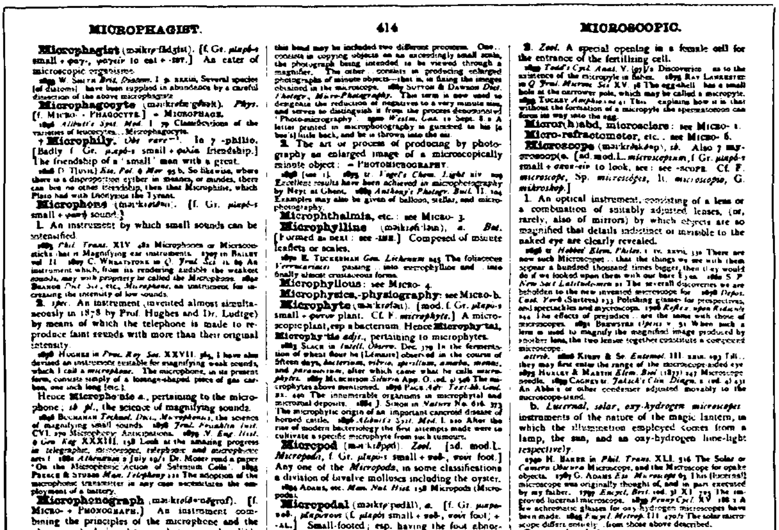
Courtesy The Chemical Society, London

nal of Chemical Research, a synopsis journal, included complete papers in miniprint at the beginning of 1977. They plan to continue the experiment throughout 1978. I.A. Williams, its managing editor, says the journal plans to survey its readers on whether they prefer miniprint or microfiche. This journal is now available in both forms. Another part of the *Journal of Chemical Research* contains full-size synopses of articles accepted for publication in the miniprint and microfiche versions. To give you an idea of how the miniprint version looks, Figure 2 contains a few frames from it. The print has been reduced to 3.3 points from a typewriter's 10-point type.

The most familiar example of miniprint is *The Compact Edition of the Oxford English Dictionary.*[2] It reproduces, in two miniprint volumes, the entire text of the full-size thirteen-volume set. The miniprint edition, which is 6 inches thick, requires about one-sixth as much shelf space as the 34½ inch-thick standard edition. A magnifying glass is included with the miniprint edition. Credit for this publishing venture, perhaps the most successful of the past decade, goes to Albert Boni, who suggested the idea. For this and his many other contributions to information science he should receive the equivalent of a Nobel or Pulitzer prize! Boni, who is 85, won the National Microfilm Association's Pioneer Medal in 1961. I hope that he will also be recognized by the Information Industry Association in the near future.

Besides the *Compact OED*, there has, to my knowledge, been only one other successful application of miniprint. In the United States, businesses often use "advertising specialties"—souvenir items such as calendars or ashtrays imprinted with the firm's logo. The manufacturers of such items need a way to reach the distributors who sell them. Advertising Specialty Institute, a division of National Business Services in Trevose, Pa., publishes an annual *Magni-File*. Using miniprint, it lists all "catalog sheets," or manufacturer's advertisements for advertising specialties. The *Magni-File* is an 8½ by 11 *inch* book, 2 inches thick. The full-size version, a "Master Catalog File," occupies an 8 x 8 x 11 *foot* filing cabinet. Apparently, a lot of people have been willing to use an inexpensive hand-held magnifier to read these reference volumes published at a 1:5 reduction ratio.

Back in the early days of *Current*


MICROPHAGIST. 414 MICROSCOPIC.

Courtesy Oxford University Press

Figure 3. Part of a miniprint frame from the *Compact Edition of the Oxford English Dictionary*. Four 3 5/8 by 5 1/4 inch (9.21 by 13.34 cm.) frames fit on each 9 by 12 inch (22.86 by 30.48 cm.) page.

Contents, I contemplated another use of miniprint. Since its beginning, *CC* has been competing with abstract services. Even to this day some scientists insist they must have an abstract while browsing. The use of miniprint could make it possible to include abstracts in a *CC* supplement. The size of such a weekly supplement would be formidable. In the sample opposite, I've used a recent contents page from the *American Journal of Psychology* to illustrate what a contents page might look like, if it included miniprint abstracts.

As I said at the outset, I first became interested in miniprint as a way to improve the molecular formula index to new compounds listed in *Index Chemicus*® .[3] The conventional molecular formula index enables you to determine whether a particular compound has been indexed. It is easy enough to locate the empirical or molecular formula, but without the full name or structural diagram you cannot be sure which chemical has been indexed until you turn to the abstract in *Current Abstracts of Chemistry*™ or *Chemical Abstracts*, whichever you are searching.

Using molecular formulas in normal-size type and structural diagrams in miniprint, I tried in the 1950's to produce a hybrid that would simplify searching. Unfortunately, there was no simple mechanical or electronic means then available to produce such an index. It would have had to be done by a completely manual procedure that was too costly. Publishing the entire index in miniprint seemed to be a reasonable way to make the inclusion of structural diagrams economically feasible.

Eventually, the Wiswesser Line Notation (WLN) was developed as an unambiguous way of describing chemical compounds with alphanumeric symbols. In theory this reduced the need for storing and reproducing structural diagrams in chemical information systems. Indeed, a molecular formula WLN index to about 1.8 million compounds reported in *CAC/IC*™ from 1966-76 is available from ISI®. This molecular formula index is issued on computer output microfiche,4 as is ISI's *Chemical Substructure Index*® (*CSI*).[5] But there can be no doubt that most chemists still prefer to scan structural diagrams. Hence the popularity of *Current Abstracts of Chemistry*. Once we have programs for converting line notations into aesthetically acceptable structural diagrams, we can use computer-activated photocomposing machines to generate miniprint molecular formula indexes.

We have also considered using miniprint in conjunction with the *Science Citation Index*, *Social Sciences Citation Index*™, and *Index to Scientific Reviews*™. Miniprint abstracts could be used in supplementary volumes arranged by author. The user would thus be able to move quickly from either the *Source*, *Citation*, or *Permuterm*®

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Louis G. Lippman and Richard W. Thompson. The effect of shock on the exploratory behavior of rats in a complex maze 363

As replication and extension of prior work, two experiments investigated the activity and exploratory behavior of rats during 10–16 days of testing in a complex environment — a +-maze with black, white, striped and checkered arms. Two measures were taken: frequency of entrance into each arm and a sampling of each animal's location within each minute of each daily 3-min trial. Results of both experiments showed consistent trends in the animals' topographies of exploratory activity and configuration of arm preference. Shock-induced fear reinstated the preferences for low-intensity and low-complexity arms exhibited at the outset of testing, thus providing evidence for the contribution of fear to exploratory activity.

Henry M. Halff. The role of opportunities for recall in learning to retrieve 383

Three theories of learning hold that test trials are equally effective on errors or successes; that test trials are effective only for successfully recalled material; or, by Restle's strategy-selection model, that presentations are effective only following failures of recall. The implications of these three theories were developed for the parameters of a two-stage *Markov model* of learning. An application of the model to the RTT paradigm in free recall provided support for the strategy-selection theory, as did two experiments involving error-contingent presentation. The paper concludes with a theory relating organizational aspects of free recall to the strategy-selection theory.

Charles F. Hinderliter and David C. Riccio. Long-term effects of prior experience in attenuating amnesia 407

In Experiment I, prior experience with passive-avoidance training followed by latent extinction was given 1, 3, 5, or 15 days before criterion (re)training and an amnesic treatment. It produced nearly complete protection from retrograde amnesia at the three shorter intervals; at the longest interval, amnesia was present but less severe than in a control group without the familiarization. In Experiment II, prior experience was given 1, 5, or 15 days before a noncontingent shock and an amnesic treatment. Evidence of a reactivation of memory was obtained only at the longest interval. Thus, familiarization and reactivation seem to represent different processes. The results are interpreted as consistent with explanations stressing the disruption of retrieval in retrograde amnesia.

James W. Pellegrino and Judith Petrich. List discrimination during transfer in free recall 419

The free recall of successive partially overlapping lists was studied, using Anderson and Bower's 1972 model to derive specific predictions. All predictions were supported by the data. Specifically, items repeated across lists showed depressed recall relative to new items, particularly when repeated across multiple lists. Knowledge of the interlist relationship served only to reduce the level of negative transfer relative to an uninformed condition. The data on a test of list identification given to the experimental informed and uninformed conditions and to a control condition with nonoverlapping lists also support the model of the role of list tagging and contextual elements in the recall decision.

Robert E. Hicks, George W. Miller, Gerald Gaes, and Karen Bierman. Concurrent processing demands and the experience of time-in-passing 431

Under the prospective paradigm, judged time decreased monotonically with the increased processing demands of concurrent card sorting (Experiment I) and of concurrent verbal rehearsal (Experiment II). It was nonmonotonically related to concurrent tapping rate (Experiment III), which latter, when required during verbal rehearsal, had an identical curvilinear effect on short-term recall (Experiment IV). It is concluded that the experience of time-in-passing is an inverse function of the processing demanded by a concurrent task. An attentional model is suggested and evaluated against the literature.

James H. Neely. The effects of visual and verbal satiation on a lexical decision task 447

Immediately before a visually presented target, a string of letters that was to be quickly classified as a word or nonword, the subject saw a prime, a word either semantically related (R) or unrelated (U) to the target. Before this prime, the subject had received visual satiation (V) or both visual and verbal satiation (B) on a word either identical (I) to the prime itself or related to *neither* (N) *the prime or target*. Decision times to word targets were faster under condition R than U, but equally so under conditions VI, VN, BI, and BN. Averaged across conditions R and U, decision times to word targets were slower under condition BI than under conditions VI, VN, and BN; decision times to nonword targets under the same four conditions were equal. The results are discussed in terms of the semantic-satiation hypothesis, which they fail to support.

Thomas R. Herzog and Daniel J. Weintraub. Preserving the kinesthetic aftereffect: Alternating inducing blocks day by day 461

The kinesthetic aftereffect was measured across five days by traditional wedge-adjustment procedures with wide and narrow inducing blocks alternated day by day. The results showed generally stable mean pre- and postinduction scores from day to day for both inducing blocks, a stable and significant positive mean aftereffect (post- minus preinduction) for the narrow inducing block, and a negative mean aftereffect for the wide one. Three sources of artifact in measuring the aftereffect and the problems involved in using it as an indicant of personality are discussed. Still, alternating the width of the inducing block will preserve the aftereffect, and individual differences in induction seem to lie along an augmentation/reduction dimension.

James W. Aldridge and Michael T. Farrell. Long-term recency effects in free recall 475

Although Tzeng (1973) and Bjork and Whitten (1974) have obtained positive recency effects in free recall using a procedure designed to eliminate any component of short-term storage, their procedures may not have truly cleared short-term storage. In the present experiment, subjects were presented with four lists for free recall, each list composed of seven sets of noun triples. Presentation was either visual or auditory, and subjects counted backward by sevens before and after each item. Even with short-term storage thus cleared, recency effects were obtained equally for both modalities. No effect of serial position was found in a final test of free recall.

Courtesy *American Journal of Psychology*

Figure 4. This prototype *Current Contents* page illustrates how miniprint could be used to provide abstracts in a *CC* supplement. Abstracts from the *American Journal of Psychology* were reduced 50% and combined with the journal's contents page.

indexes to the miniprint abstract. Another possibility is to include a miniprint abstract under the full-size bibliographic description of each item in the *Source Index.*

The main questions are these: Would people be willing to read miniprint abstracts for retrospective searching? And would they be willing to pay for the dubious privilege? The advantages of abstracts have been described at great length. They are supposed to eliminate time spent in retrieving irrelevant papers. It is not really known whether abstracts encourage or discourage the use of original papers. I can only assume that their wide availability means editors and publishers are convinced of their value. But English-language abstracts are not yet *universally* included with original articles. So long as publishers provide abstracts, the cost of including them in the *SCI®* might be reasonable. But to create abstracts where none exist is a formidable and expensive task, as the many existing abstracting services well know.

Many *CC* readers are concerned about the high cost of producing, storing, and distributing reprints.[6] By reducing the amounts of paper, postage, and storage space required, miniprint could help solve this problem—even at one-half to one-third the original size. And these would be readable with the naked eye.

Over the last few years more and more emphasis has been placed on conserving all types of resources. We have begun to realize that bigger is not always better. Creative applications of miniprint may thus play a large role in information handling in future years.

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