are examined very critically, usually by authorities who serve as anonymous advisers to the editor. Approximately 10 percent of these are rejected. There still is another type of contributor to whom I shall refer to as the "eccentric," the individual who attacks the motives or character of another investigator. Manuscripts from this source present no serious problem, since they are rejected as being inconsistent with our editorial policy, but they are a nuisance, because time must be devoted to processing them.

6) *Technical editing problems.* Some manuscripts received are perfectly typed, punctuated, and arranged in the style of our journal and require a minimum of routine attention (20 percent). The remaining 80 percent range from nearly satisfactory documents to those that require complete overhauling and in rare cases retyping. In one instance, I received a manuscript that contained 25 compositional inconsistencies. I asked the author for permission to mark the copy so that corrections could be made by him. This permission was received and I returned the manuscript; in a few days, I received the following letter:

> On receiving your letter with the corrected copy of my manuscript, I was filled with mixed emotions. In the first place, in the sixty papers I have published, I never had one more marked. At first I was tempted to call back the plate and publish it elsewhere. However, on reading through the manuscript my opinion changed. Now my sympathies are with you. However, the entire situation has been a little embarassing. My son is in the process of taking a typing course, so he offered to type the article from my notes. He thought I would proof read it and I understood that he had proof read the material. Neither of us did proof read it.
>
> I am having the article retyped and I hope it will not require further editing. Thank you for your patience.

Illustrations for Scientific Publications

Ruth C. Christman

Interscience Publishers, New York

The author who is faced with the problem of illustrating his scientific or technical writings has a dual responsibility: he must select his material carefully so that illustrations and text complement each other, and he must prepare his illustrations in a form acceptable for reproduction. The first part of the task is important to both author and publisher, since in these days of mounting costs each illustration must be evaluated for its importance to the text. The other responsibility, that of preparing acceptable illustrative copy, may sometimes be passed to the publisher, but for the purposes of this discussion it is assumed that the author must submit copy ready for reproduction.

Before selecting or preparing illustrations, the author of either a paper in a journal or a book should familiarize himself with the requirements of the publisher, so that knowledge of such details as page size and the kind of paper to be used may be helpful in considering reductions and the quality of reproduction that is desired.

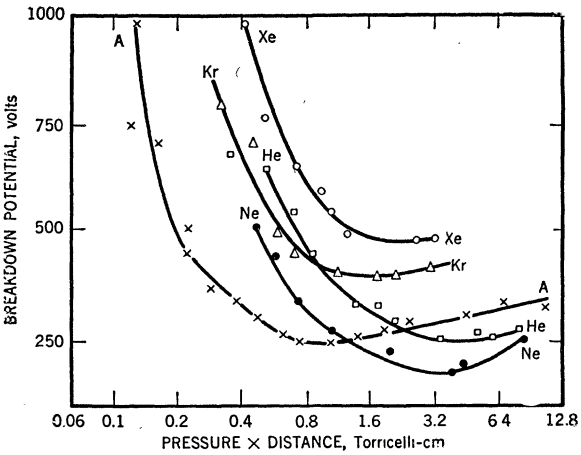

FIG. 1. A graph in which grid lines have been reduced to ticks to avoid confusion with curves. Symbols are well chosen and lettering is in proper proportion to the block. [Courtesy Interscience Publishers]

Of the two general groups of illustrations, halftones and line cuts, halftones are required when the material cannot be reproduced from lines but requires gradations of tone. Photographs form a large part of this group. Since halftones are more expensive than line cuts and require a better grade of paper in the printing process, the number of them is usually reduced to a minimum. Some authors are misled into believing that halftones that are acceptable photographically should be used to enhance the paper or book, even though they add little to the value of the text.

The value of a photograph to an understanding of the text should be considered carefully. Usually photographs are larger than the reproduction, and important details may be lost in reduction. Frequently illustrations of instruments or machines are so reduced in reproduction that the reader would be better served by a schematic or a flow diagram. When the required reproduction will result in a meaningless figure, it is sometimes possible to crop—that is, cut superfluous bordering portions from the photograph—so that the remaining featured part may be reduced less drastically.

If photomicrographs or electron micrographs are to be used, reduction problems must be considered carefully. Reduction in size may decrease magnification to a point that makes the illustration valueless. In addition, a finer screen and paper of better quality may be needed to produce satisfactory results. For these special problems, the advice of the publisher should be sought.

Halftone material submitted for reproduction should be handled carefully and be adequately protected against damage. Bending or cracking the surface will mar the reproduction. Pressure marks from pins,

staples, or clips are equally destructive. No marks of any kind should be made on the face of the photograph and, if for any reason, the illustration needs special attention, an overlay should be used on which to write instructions. The writing must be done lightly, because pencil-pressure marks will be reproduced. Care should be exercised even in writing on the reverse of the photograph, because pressure marks from the back may also cause damage.

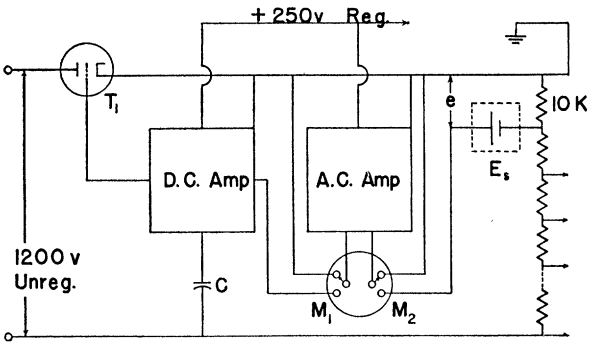

FIG. 2. A well-drawn electrical diagram shows the circuit uncluttered by details. [From *Astronomical Photoelectric Photometry*, published by AAAS, 1953]

Four kinds of line cuts are commonly used in scientific and technical writings: curves, block diagrams, bar diagrams, and schematics. To all, the same general principles of good draftsmanship apply. First, the simple instructions that are always given scarcely seem to need to be repeated; yet they are frequently overlooked or disregarded. Drawings should be submitted on Bristol board, tracing paper, or tracing cloth and should be drawn in India ink. It is advisable to make line drawings larger than the desired result, so that minor defects and unevenness will be reduced and, hence, will be less apparent in the reproduced illustration. Lines should be smooth and of the proper thickness for satisfactory reproduction. The choice of a pen is, therefore, of prime importance.

In planning a drawing, the over-all size must be considered in relation to the components. For example, a well-drawn graph may be unusable after reduction because the size of the lettering after reduction was not computed or visualized. Instructions are sometimes given to the effect that the reduction of the drawing must not result in letters less than a certain height, say 1/16 in. Height alone, however, is not the criterion of readability—letters should be well spaced, not too narrow, and should be drawn with the correct thickness of line. Too thin a line will break in reproduction, and a thick line will close openings such as those in "g" and "e". Hand lettering should be avoided, for even the best cannot give the evenness of line and uniformity of design found in mechanical lettering devices such as Wrico and Leroy. Stamping, when uniformity in the type for the text and illustrations is desirable, and gummed letters and numbers, when needed in limited amount, are also in general use.

All drawings should be planned to highlight and emphasize the text. To achieve this, heterogeneous bits of information should be eliminated, and the introduction of too many facts should be guarded against. Legend material should not be incorporated in the drawing but should be relegated to either the text or the caption. Abbreviations should agree with those used in the text to avoid confusing the reader and should conform to the conventions of the science or the particular publication in which the drawings are to be used.

Symbols on drawings should be well chosen for reproduction value. Open circles, filled circles, squares, and triangles reproduce well, if of sufficient size. If they are not sufficiently large, the openings tend to fill in reproduction. Half-filled symbols, for example, circles with the upper halves black and the lower halves white, are to be avoided, particularly when they are used with filled circles, since they will not be easily distinguished after reduction.

In preparing curves for reproduction, it must be kept in mind that fine blue lines will disappear in the photographic process. All lines, therefore, that are needed for an understanding of the graph must be inked in black. Grids in other colors should never be submitted for reproduction.

Grids should be carefully planned so that in reduction the grid size will be uniform within related sections of the discussion. For example, two curves that are reproduced for purposes of comparison should not

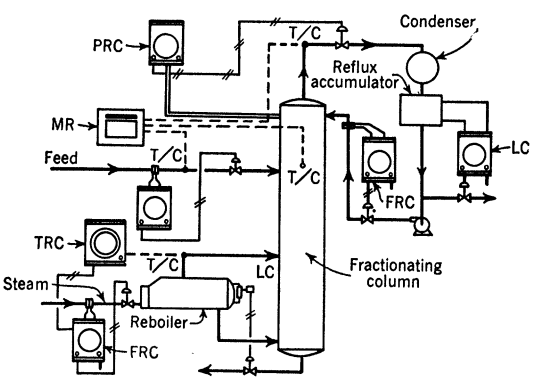

FIG. 3. A flow diagram of a control system for a continuous fractionating column. The principal parts of the system and their relation to one another are in a small, well-proportioned outline. [Courtesy Interscience Publishers]

be drawn on grids of different size. If the grids of one drawing to be reduced one-quarter are 1-in. square, another comparable drawing with grids 1½-in. square should be reduced one-half. Lettering, of course, must aso be carefully checked for likeness of size after reduction.

Too numerous grids, too close together clutter the drawing. If the curve is not to be used for computing numerous precise points, ticks may be used to indicate the scale. In other cases, lines may be more widely

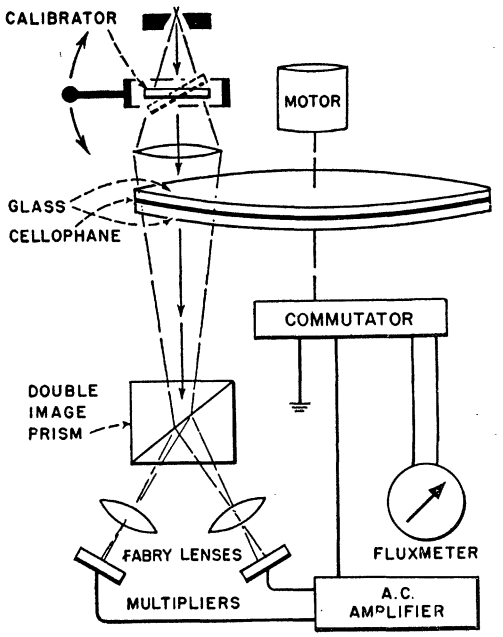

FIG. 4. This line drawing of a polarimeter shows the working parts of the instrument better than the finest photograph. [From *Astronomical Photoelectric Photometry*, published by AAAS, 1953]

spaced without jeopardizing the value of the drawing. When neither device may be resorted to, variation in the thickness of the lines will serve as an aid to readability. For example, if 5-point units are used, every 20th unit may be represented by a heavier line. Scale values are always shown on the horizontal plane, but scale descriptions should be parallel to the enclosing line. Theoretically, all graphs should be scaled from the zero point. Some scientists consider scaling from higher points a breach of form, but a reasonable attitude toward the inclusion of waste space has made scaling from higher points acceptable. For example, if a curve fills only the right-hand portion of the block, the points unrelated to it are cut from the drawing and, thus, the over-all size is reduced.

The use of bar drawings is sometimes more effective than tabular arrangement, especially if it is desirable to show the relation of two items under varying conditions. Block diagrams are also an effective means of conveying an idea, for example, to serve as flow sheets.

Schematic drawings are widely used and are especially valuable to show the working of a piece of machinery or an electric device. For these purposes, the details should be carefully chosen. When the scheme is simplified and the drawing is not cluttered with too numerous details, the effectiveness of the illustration will be increased. Changing the thickness of the line is also a means of emphasizing the important parts of the machine and increasing an understanding of its operation.

In all illustrations, we return to the important admonition to direct them to a single idea and, in line drawings, to keep that idea uncluttered by superfluous bits of information.

Jargon—Good and Bad

Joseph D. Elder

Harvard University Press, Cambridge, Massachusetts

It is recorded of Lord Rutherford that he "took great pains over his writings, holding that no scientific discovery is complete until it has been expressed in clear and concise language." The obligation to make oneself clear in reporting the results of a piece of research is as great as the obligation to be objective and honest in doing the research.

Although a writer may find clarity hard to achieve, difficulty in expressing one's meaning is not a valid reason for slipshod or muddy writing. An experimental scientist will not hesitate to take whatever pains may be necessary to improve the working of his apparatus, so far as his equipment or funds or technical abilities will allow. A voltmeter must give accurate readings, a meter bar must be of the standard length, a clock must run with a known rate, if the measurements made with these instruments are to be reliable.

In many laboratories, even the superficial appearance of the apparatus is given some thought. An amplifier does not work better because it is housed in a case with a black crackle finish, or because the knobs are arranged in straight rows instead of at random over the face of the panel, but it looks better that way. The neat appearance suggests that the maker is competent, and the user may even find the amplifier easier to operate. The same is true of a piece of writing. It ought to have the best finish that the writer can provide, so that the reader can use it easily and will feel that the maker is competent.

Moreover, as Rutherford held, the research is not complete until the results have been reported. What is the use of research conducted with the best apparatus, at great expense of time and effort and money, if the results of it are not communicated to all who might benefit from knowing them? Publication is the end-product of research. Research without publication is sterile.

How, then, can this last essential of scientific research—the preparation of a report, or the collection of the fruits of a long research program in a book—be best carried out? How can a writer express "in clear and concise language" what he has found out and the conclusions that he has arrived at?

One way in which he can improve the clarity of his expression is to avoid the use of jargon; another way, and one that may improve not only his clarity but his conciseness, is to use jargon well. Let us first agree on the meaning of the word *jargon*. The dictionary defines it as "confused, unintelligible language; gibberish; hence . . . the technical or secret vocabulary of a science, art, trade, sect, profession, or other special