C. INSTRUCTIONS TO THE TYPIST

1. General.—The two most important points for the typist to bear in mind are: (a) the need for extreme care in accuracy of spelling, particularly in the case of unfamiliar technical words, and in the organization of data in graphs, charts, tabulations, etc., and (b) that you should not attempt to "second guess" the writer who prepared the material you are typing. Of course, this does not mean that you should not check the spelling of non-technical words if you have any doubt about them.

Be sure you distinguish carefully between the material the writer has given you for inclusion in the typed paper, and the instructions he has written for *you* and *you only* (*not* to be typed in the final product!!). These instructions will usually be in brackets or parentheses, often marked "transl.," or occasionally they will be in the margin. *Be specially careful* about this.

2. Specific Instructions.—(Since there must be uniformity with regard to such routine matters as spacing, margins, number of copies, and general arrangement of material, our instructions cover these in detail. Some of the details follow.)

"Double space in text; single space in tables when an entry, caption, or footnote takes up more than one line in its allotted space. . . ."

"Number all pages consecutively. . . ."

"For headings, follow manuscript copy; the translator will normally follow the pattern of the original. . . ."

"Footnotes must be at the bottom of the same page as the footnote signal. Plan ahead and line off the page below the last line of the text, leaving adequate room for the footnote."

"In the absence of any instructions otherwise, allow a separate page for each table and illustration, leaving ample space above the captions and notations to paste in a photocopy of the table or illustration. When tabular matter is to be typed, copy from the original in the indicated columns, separating columns only by spaces, and not by drawing lines."

"When lines must be drawn, use pencil and straightedge. . . ."

Coining New Terms for Polymer Science

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Until recently, the idea that polymers could be named in the same way as other chemicals has not been seriously entertained. Flory has pointed out[1] that during the first part of the present century chemists seemed to ignore polymers, perhaps because they were of indefinite weight and structure, and therefore not suitable for study by the classical methods of chemistry. Within the past decade it has become apparent that polymers could be made with as good chemical purity as most products of modern research. The term *polymer*, however, is clearly established by usage to embrace all products made by polymerization, including copolymers of the most indefinite chemical composition.

Because polymers historically have been named by process of preparation rather than by structure, polymer nomenclature has been at once confused and confusing. As a result, indexing of polymers has been extremely difficult. If, as now seems likely, linear polymers can be made with a "purity" or "regularity" of structure comparable to that obtainable in crystalline solids, it can be predicted that this will also be accomplished with more complex structures, such as ladder or network polymers. The realization that such uniformity now appears attainable encourages a serious attempt to achieve consistency and uniformity in naming and indexing polymers. Our present effort is designed to prepare the way for such a classification.

Our purpose in the current discussion is to coin new terms to describe explicitly a specific type of polymer. The polymer that we have in mind is one of ideal chemical

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(1) P. J. Flory, "Principles of Polymer Chemistry," Cornell University, Ithaca, N. Y., 1953.

homogeneity in which, except for the end groups, the polymer consists exclusively of identical repeating units. In keeping with present usage, we call this repeating unit the *mer*. The problem then was to provide a term which by definition would mean a high molecular weight chemical compound in which every *mer* was exactly like every other *mer*. The general chemical formula for such a compound would be: (eg)-$(mer)_p$-(eg). In the case of a specific compound, the monovalent radicals that formed the end groups would replace (eg) and a single divalent radical would replace (mer) in a particular chemical formula. For example, $H(OCH_2CH_2)_pOH$ for poly(oxyethylene) with end groups from water.

In our choice of a name we felt that there were certain basic considerations which should dictate our final choice. The term ultimately chosen should meet these prerequisites: (1) it should convey clarity of meaning, primarily through easy recognizability of its basic components; (2) it should be reasonably euphonious; (3) it should adapt readily to universal pronunciation; and (4) it should be distinctive.

Since the smallest unit (*mer*) and its various representations (poly*mer*, iso*mer*, homopoly*mer*, etc.) are of Greek derivation, it is at least desirable that the all-inclusive term also be derived from the Greek language, rather than be a solecistic Latin-Greek hybrid. Although we discussed many possibilities, we limit out discussion here to those few terms which, in one way or another, best fit the rationale for appropriate terminology suggested above. We present first the various suggestions, then our reasons for rejecting several of them, and, finally, our recommendation of the term which we consider most suitable.

(1) *analepsimer*.—The components of this word are *mer* from the Greek μέρος meaning "part," and *analepsi-* from the Greek ἀνάληψις meaning "a taking again."[2] ἀνάληψις is a noun from the same root as the verb ἀναλαμβάνω, which is virtually equivalent to the Latin verb *reitero*,[3] from which we get our English word "reiterate." The term *analepsimer* thus would denote a *mer* with a repetitive pattern.

(2) *homoîdeomer*.—The components of this word are *mer* (*cf. supra*) and *homoideo-* from the Greek ὁμοειδείης meaning "of the same species or kind, of like form, uniform, unaltered, lacking in variety." ὁμοειδείης is a compound adjective formed from ὁμοῦ (*cf.* ὅμοιος) meaning "same, like, similar" and εἶδος meaning "form." εἶδος is from the same root as ἰδέα, the word familiar to us as the "Ideas" or absolute abstractions of Plato. The term *homoîdeomer* would thus denote a *mer* with a uniform pattern.

(3) *homotagemer*.—The components of this word are *mer* and *homotage-* from the Greek ὁμοταγής meaning "ranged in the same row or line." Thus the term *homotagemer* would denote a linear arrangement of *mers*.

(4) *polyhomomer*.—The components of this word are *mer*, *homo-* from the Greek ὁμοῦ which in compounds signifies "like, same, similar," and *poly-* from the Greek πολύς meaning "much, many." Thus the denotation of this term would be many identical *mers* joined together in succession.

After considering these possibilities, we rejected the first because it fails to satisfy the initial prerequisite of clarity of meaning; the second term falls short of the first two prerequisities; and the third term inadequately meets the first three prerequisites. All four terms appear to be sufficiently distinctive to satisfy the fourth prerequisite.

Our decision to recommend *polyhomomer* is based on our firm belief that it most nearly satisfies all four prerequisites which we posited. An added argument for the choice of this term is that it consists of a rearrangement of the familiar, since the term *homopolymer* is currently employed to describe the product of the polymerization of a single monomer (which, however, often has a number of different structural elements in the product; *e.g.*, polybutadiene, atactic polymers, high-pressure polyethylene).

A further buttress for the term *polyhomomer* was discovered after we had settled on this choice, and it derives from a certain degree of parallelism with an antonym, *polyallomer*, whose middle component is from the Greek ἄλλος,[4] which is an antonym of ὅμοιος (*cf.* ὁμοῦ).

In speaking of the repetitiveness of regular ("perfect") polymers, in which the *mer* appears again and again along the chain, we could use the term *polyhomoëity*, or possibly *polyhomogeneity*.

Our search for an appropriate term for the polymer with identical repeating units fortuitously led to the coining of a term which clearly and succinctly describes another polymer that was previously unnamed, the polymer of a single molecular weight. Work with the living polymerization technique[5] has provided samples of polystyrene that begin to approach this sharp a molecular weight distribution. A summary of the progress that has been made in obtaining narrow molecular weight distributions will be forthcoming.[6] A noun to name such polymers in a single word would be desirable. The term *homoplethemer*, whose components are *mer* and *homoplethe-* from the Greek ὁμοπληθής, a mathematical term meaning "of classes or series containing the same number of [individuals or terms]; with the same coefficient," is a noun which precisely fits the demand for a name for this type of polymer. This term, moreover, concisely corresponds to the rationale prescribed above.

We therefore propose that the term *polyhomomer* be adopted for the naming of polymers consisting exclusively of identical repeating units; we further recommend that the term *homoplethemer* be applied to polymers of a single molecular weight.

(2) The meanings of the Greek words generally are those given in Liddell and Scott, "Greek-English Lexicon," 9th Ed. revised by H. S. Jones and R. McKenzie, Oxford University Press, Oxford, 1940.

(3) *Cf.* A. Forcellini, "Lexicon Totius Latinitatis," revised by F. Corradini and J. Perin, Seminarium Patavianum, Padua, 1940.

(4) H. J. Hagemeyer and M. B. Edwards, *J. Polymer Sci., Pt. C*, **No. 4**, 731 (1964).

(5) M. Szwarc, *Advan. Chem. Phys.*, **2**, 147 (1959).

(6) H. K. Livingston plans to publish an article on this subject in the near future.