The targets were rotated between the locations, and subjects were eliminated from consideration by means of a table of random numbers (considered adequate for this purpose), in such a fashion that finally: (i) in each class, equal numbers of believers had responded to each target, and equal numbers of nonbelievers had also; and (ii) over-all, equal numbers of believers had responded to each target in each position, and equal numbers of nonbelievers had also. There now remained 372 believers and 88 nonbelievers, a total of 460 subjects.

Each subject's response-sheet was scored for *the number of items in which the left-hand square was blacked in.* If "ESP" exists in the general population, as has been recently alleged (*1–3*), one would expect distinctly more leftward choices in response to the leftward target, distinctly fewer in response to the rightward target, and thus a distinct and significant difference between the mean scores for groups responding to the two targets.

The mean number of leftward choices among all 460 subjects was 13.07, a figure very significantly different from the "chance" expectancy of 12.50 ($P < .0_51$). The mean number of leftward choices in each of the subgroups is indicated in Table 1, and it will be seen that the means of the subgroups closely approximated the over-all mean. Neither among believers, nor among nonbelievers, nor among all subjects taken together was the mean number of leftward choices significantly related to the nature of the target assigned. It is true that the differences found among believers and nonbelievers, respectively, although insignificant, were in the opposite directions sometimes hypothesized (*2, 3*; cf. *1*); however, a test of the difference between these differences showed it also to be statistically unreliable (final column, Table 1).

Under the conditions of this investigation (which summated the responses of a large number of subjects to balanced, systematically nonrandom targets), there arose no evidence whatsoever that "ESP" does in fact exist. Discovered incidentally was a general preference for left-hand choices, a preference that might have been misleading in the context of another experimental design.


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# Communications

## Etymology of Autoradiography

Scientific techniques are often named carelessly by experimenters more interested in precision of results than in precision of communication. Once started, etymological errors are easily perpetuated. Such is the situation for the technique of locating and measuring radioactivity by placing a radiation source in contact with or in proximity to a photographic emulsion, followed by exposure and development of the emulsion. Many names have been applied since Becquerel first used the technique in 1896. Among them are *autoradiography* (*1, 2*), *radio-autography* (*3*), *curiegraphy* (*4, 5*), *radiumgraphy* (*4*), *and photography by local application* (*5*). Terms for the results of the techniques have been *autoradiograph* (*2, 6*), *radioautograph, autophotograph* (*7*) *autoradiogram* (*1*), *radium gram* (*2*), *radiograph* (*2, 6*), *organoradiumgraph* (*5*), *curiegraph* (*5*), *cliché radiographique* (*2*), *microradioautogram* (*8*), *autograph* (*9*), *radiograph* (*10*), *historadiograph* (*11*), *radiogram* (*2*), and *histoautoradiograph* (*6*). One author (*2, 6*) used five terms in a single paper to indicate this technique. It is perhaps time to eliminate this confusion.

Since these words are, for the most part, derived from the Greek, it is preferable to be consistent within the system of word-building from that source. Although the ancient Greeks would probably not have used any of these terms, since they seldom employed more than two stems, three-stem words are correct and have their value in modern English. Multiple-stem words enable classification of ideas. For example, *prorubricyte, rubricyte,* and *metarubricyte* (*12*) classify red blood cells according to their age.

Similarly, in the class of radiographic techniques, we already have *gamma radiography* and *x-radiography. Autoradiography* then is a third member of the class—the descriptive prefix, *auto-* (self), being added in the same sequence to give autoradiography.

Another argument for autoradiography is that *auto-* acts in Greek as a prefix and is therefore very seldom found in the middle of a word. This logic eliminates the term *radioautography* unless one wishes to think of the technique as belonging in the class with autography. However, it does not seem logical to place the technique in the same category with the writing of one's signature. Another argument against radioautography is that four vowels—*i, o, a, u*—occur together. This should be avoided because of possible phonetic difficulties. *Curiegraphy,* named after Madame Curie, is not sufficiently descriptive and its use had but limited vogue. It is of historical interest only.

*Autophotography* implies visible radiation and thus is not suitable for radioactive radiation. Because of the wide application of *autoradiography,* it will undoubtedly be necessary to qualify the term by the use of prefixes to distinguish its various phases—such as *micro-, macro-,* or *histo-autoradiography.* When necessary, this would seem to take advantage of the ability of Greek to lend itself to the logical classification of ideas.

The verb stem, *-graph,* is derived from *graphein* (to write or to draw). Thus by performing the technique, one autoradiographs. The result from this action—that is, the developed film or plate—is a *-gram.* This noun stem is derived from the Greek noun *gramma,* meaning something that has been written or drawn. *Autoradiogram* is correct, notwithstanding a photograph produced by photography. Etymologically, this result should be a *photogram* and the camera a *photograph.* Wide and consistent usage of this error has made these two terms acceptable. Not so for autoradiograph, since the usage has been neither so widely nor so consistently used. It does not seem appropriate that autoradiograph as a noun should be similarly perpetuated by scientists.

It might be argued that *graph* could be derived from the adjective *graphic* (pertaining to writing or drawing). To use *autoradiograph*—that is, self-ray-writing—is to employ it in its adjectival sense [*cf.* I sent the message by telegraph(ic) instrument] whereas a genuine noun use is desired. The *-gram* ending accurately provides this by its meaning, the result of an action. Another objection to *autoradiograph* as a noun form is the tendency to delete the *radio-,* producing *autograph,* which means a person's signature. However, *autogram* is a convenient nickname for autoradiogram and does not cause confusion. (Fischer (*5*), by the way, used *autophoto* as such a nickname.)

Therefore, we recommend the terms *autoradiography* to designate the technique, and *autoradiogram* to designate the result of the technique.

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## A Concise Form for Scientific Literature Citations

A single issue of a modern scientific journal or book often contains thousands of literature citations. In view of the large total space thus consumed, it would appear worth while to adopt a more concise style for such citations than that now customary. Table 1 demonstrates a proposed new style, which would reduce the minimum linear space requirement for each citation by about one-half and would save time and labor for the authors, editors, and users of scientific literature. Although Table 1 is largely self-explanatory, certain features require comment.

*Items regularly included.* The minimum information necessary in principle to specify a certain article (or page of an article) consists of the page number, journal name, and year number. These items would be handled as follows:

The left-hand number in each new-style citation (Table 1) is the page number, consisting usually of one to four digits.

The set of capital letters in each citation is the code for the journal name. For the most important journals, these letters could be so chosen as to suggest the name, but this is not essential and would not be possible for all journals. With four letters, $26^4$ or 456,976 different journal codes can be assigned. This number should be more than ample, not only for all scientific journals published in the world at present, but also

Table 1. Comparison of conventional and proposed concise form for some typical literature citations.

| Ref. No. | Conventional form | Concise form |
|---|---|---|
| (1) | *Helv. Chim. Acta* **26**, 2266 (1943) | 2266-**HCAC**-43 |
| (2) | *Ann.* **3**, 132 (1832) | 132-**DANN**-832.3 |
| (3) | *J. Biol. Chem.* **188**, 287 (1951) | 287-**AJBC**-51.8 |
| (4) | *Bull. Soc. Chim.* [4] **19**, 327 (1916) | 327-**FBSC**-16.9 |
| (5) | *J. Am. Chem. Soc.* **72**, 4077 (1950) | 4077-**ACSJ**-50 |
| (6) | *J. Chem. Educ.* **27**, 654 (1950) | 654-**AJCE**-50 |
| (7) | *J. Org. Chem.* **13**, 697 (1948) | 697-**AJOC**-48 |
| (8) | *Chem. Abs.* **40**, 6512 (1946) | 6512-**ACAB**-46 |
| (9) | *Bull. Chem. Soc. Japan* **10**, 424 (1935) | 424-**KBCS**-35 |
| (10) | *Science* **119**, 135 (1954) | 135-**ASCI**-54.9 |