data-type ABSTRACTS

By Katharine Way

*Nuclear Data Group,
National Research Council, Washington, D. C.*

THE recent increase in new research results in physics hardly needs to be pointed out to those in the field. When single issues of *The Physical Review* number from 300 to 500 pages in spite of the fact that several new journals have been recently started, the physicist who is trying to "keep up" feels pretty much overwhelmed. How can he read, analyze, digest, and assimilate all the new information that might be helpful to him in his own researches or as a teacher?

Fortunately there are many ways in which he can get help in this never-ending task. There are talks by people who have spent some time organizing the material in one particular field, journal clubs, review articles, compilations, and abstract journals. Perhaps these traditional intermediaries are sufficient. However, the International Conference on Scientific Information which has been called for 1958[1] makes this a particularly good time to evaluate different techniques and to look for new ideas.

It is the purpose of this paper to describe an attempt in the field of nuclear physics to deal in a new way with the flood of information, to suggest how this method can be made more efficient in the nuclear field, and to ask whether it can be adopted in other fields with any profit.

The new approach has been to evolve an abstract quite different from the conventional one whose aim is generally to tell what *kind* of information is to be found in a certain paper. The abstract worked out by the Nuclear Data Group gives the new experimental results *themselves* in a "semitabular" style, with some key information on how the experiments were done. For each nucleus for which new experimental data are given in a paper an "item" is made consisting of the name of the nucleus, the category of the new data (e.g., levels, resonances, β or γ radiation, magnetic moments), and the new data themselves (such as the measured energy values of the levels in question, their widths, the cross sections for producing them), some information about how the experiment was done (energies, instruments, or special techniques employed), and finally the complete literature reference. For each paper abstracted there are as many items as there are nuclei on which measurements have been made. These items are first printed on 3×5-inch cards.

The card system makes it possible, after convenient intervals, to assemble or cumulate the items either according to nucleus or according to type of information, such as, for example, nuclear moments or capture γ rays. The first type of arrangement is particularly in demand. The system was actually evolved with it uppermost in mind. At quarterly, semi-annual, and annual intervals the cards which have accumulated for the entire period are arranged according to nucleus, taped down, and photographed. A plate for lithoprinting is made directly from the negative. In the published cumulation one can see at a glance all the new information reported within a given period on any particular nucleus, say Al^{26} or Pb^{205}, and one has also immediately at hand all the relevant literature references. As the nuclear field grows, however, cumulations according to topic are coming into demand. The system makes it possible also to prepare and print these very quickly.

DATA-TYPE abstracts are thus first steps toward compilations. In fact, if they are well planned, compilations of different kinds can be made from them directly without additional typesetting. They thus perform considerably more service than do conventional abstracts even when these are well indexed.

To obtain a list of new data by the typical abstract system one must first consult an index, next look up the abstracts listed there, next locate and read the papers which the abstracts show to be of interest, and finally make a summary of the data they contain. It may be argued that most research physicists are going to read the original papers anyway in order to check the data themselves and therefore not much time is saved by the new system. It is certainly true that those most deeply concerned will want to read the original papers but it is one matter to check or supplement the information which an experienced physicist-abstracter has extracted from them and quite a different matter to find and organize all the information oneself. Also, there are many times when one wishes to know some numbers in order to make a preliminary calculation or a rough check on a theory and when critical scrutiny of these numbers is not necessary. The data-abstract system produces the information quickly and in a form which is easy to use.

Data-type abstracts are truly "informative" abstracts

[1]The conference, to be held in Washington, D. C., during the fall of 1958, is being sponsored by the American Documentation Institute, the National Academy of Sciences-National Research Council, and the National Science Foundation. Dr. Alberto Thompson, Head of the Office of Scientific Information, National Science Foundation, is the Executive Secretary. For additional information on the conference, see *Physics Today*, **10**, 1, 63 (January, 1957).

in the sense of the word as used by D. E. Gray in his interesting study on physics abstracting made in 1950.[2] Dr. Gray found then that 83% of the physicists questioned favored "informative" as contrasted with "indicative" abstracts if the cost of the two were assumed to be the same. At that time no data-type abstracts such as described here were appearing.

Dr. Gray assumed that "informative" abstracts generally would cost more to prepare than the "indicative" kind. The experience of the Nuclear Data Group certainly supports this assumption. It has been found impossible for anyone not an experienced nuclear physicist to prepare the "items" described above from most papers as they are presented today in the physics journals. If the items are to give usable numbers expressing the real experimental contributions of the paper, a good deal of watchfulness has to be exercised. Is a magnetic moment given with or without diamagnetic correction? Was an absolute measurement made or a comparison with a standard? Sometimes the authors of the paper say that their results are "all exhibited in the decay scheme of Figure 9". Here one may find γ_4 following β_3. Was a real coincidence established or does the energy sum of these radiations just equal (perhaps fortuitously) the energy of β_2? A useful data abstract should distinguish between these two situations. Again authors often state in a rather categorical way that there is "no electron capture to the ground state". Of course, such a thing can't be shown directly. At best one can set an upper limit which must probably be based on the measurement of several quantities and perhaps on a poorly known value of the x-ray fluorescence yield. A useful statement will give the limit, tell what was actually measured, and mention the values assumed for any doubtful quantities.

IF nuclear scientists want to see data-type abstracting flourish (in these days of a shortage of physicists) they can help things along by writing their papers with the need for the preparation of the data abstract in mind. Much time and effort on the part of abstracters could be saved if authors would make a point of collecting *all* their important measurements into self-explanatory and easily located tables. Even doubtful little tidbits of information should be included there, with suitable question marks or other indication of uncertainty, rather than buried elsewhere in paragraphs of discussion. The dubious bump on the 90° curve is often of the greatest interest to the later experimenter who finds a real peak on the 25° curve at the corresponding energy and should, therefore, be part of the 90° data.

Fortunately more and more authors have been adopting lately the policy of preparing concise data tables to summarize their results. Such tables, to be of maximum usefulness, should be self-contained by way of caption and footnotes and not require reference to the text for explanation of the column headings or items. The standards used, the meaning of the errors quoted and the important corrections made should also be given either with the table or in its immediate proximity so that it is not necessary to comb through the whole paper for these important details. Besides saving abstracters and other readers much time and pain, authors would, by adopting such a practice, make sure that their results are correctly reported in the data abstract. A mistake here can naturally cause endless trouble and confusion. Editors and referees could help the cause along by saying "Where is the complete summary of the experimental results reported in your paper?" or by pointing out lack of clarity in the summaries as submitted.

Better organization of nuclear physics papers would certainly facilitate the present data abstracting system. More radical changes to increase the speed and efficiency of the process can easily be imagined. One possible step would be to prepare the data abstracts from the manuscripts, or galley proofs, and print them right with the papers. From the type set for this purpose, many additional copies of the abstracts could be run off, perhaps on cards. These cards could be distributed to subscribers and used for cumulations just as the Nuclear Data Cards are now. The chief difference would be that they would be ready at the time the paper is printed rather than two or three months later as is now the case.

These abstracts need not be considered as replacing the customary author's abstract but as supplementary to it. In other words it is being suggested that there be two abstracts for every paper, one in which the author gives his view of the substance and implication of his work and the other in which the new data are set forth in a uniform style by an abstracter independent of the author, but one who perhaps would have the duty of consulting with him.

Could data-type abstracting be applied to areas other than nuclear physics? The new "elementary" particle field seems a natural place to try since here the organization of the data would probably follow lines very similar to those used for the low-energy material; that is the information would probably be organized primarily by particle and property. In fields such as solid state it is not so clear how it could be worked, if at all. Nevertheless it would be interesting to see what a solid-state expert would suggest.

There is today among librarians and similar experts a great ferment of new ideas on information storage and retrieval brought about by the introduction of punched cards and machine methods for sorting and searching. Many well-thought-out and ingenious[3] schemes are being proposed to help scientists or technologists locate the literature references which may be of help to them. This interest should spur the scientists and technologists themselves into some consideration of the most effective aids. Perhaps some discussion by them will help in evaluating data-type and conventional abstracts contrasted here or even lead to some entirely new ideas.

[2] D. E. Gray, *Am. J. Phys.*, **18**, 417 (1950).

[3] See for example *Machine Literature Searching*, J. W. Perry, A. Kent, M. M. Berry (Interscience Publishers, New York, London, 1956).