of its distinct elements but not the square of its elements of order 4. Since the quaternion group plays such an important rôle in the history of mathematics it is interesting to note that it is the only non-abelian group which involves a set of generating elements such that they satisfy the former of the two given conditions without implying the latter.

Among the abelian groups it is obvious that every cyclic group contains such a set of two operators composed of a generator of the group and the identity. When the order of a cyclic group exceeds 2 it also contains such a set of three elements composed of a generator, its inverse and the identity. When a group involves only elements of order 2 besides the identity, all its elements of this order constitute such a set. As these elementary groups are the only ones which separately involve such a set it results that when a set of distinct group elements satisfies the conditions that it includes the product of every pair of these elements and does not generate one of these elementary groups it must also involve the square of each of its elements and hence constitute a group. Since the properties noted above lie at the very door of group theory they should be of interest not only to those who desire to enter therein but also to those who wish to know only where this subject abides and whence its growing influence emanates.

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AUTHORS' ABSTRACTS[1]

DR. LAMSON, and other readers of SCIENCE, may be interested to know, in connection with Dr. Lamson's article on *Biological Abstracts* in SCIENCE for November 13, that the principle of having authors' abstracts accompany all geological publications has been accepted by geologists.

A motion asking that the International Geological Congress recommend such abstracts was presented, by a representative of the division of geology and geography of the National Research Council, at the fifteenth session of the congress, which met in South Africa in 1929, and was passed by the congress. A year or two before that, authors' abstracts were called for in all publications of the Geologic Branch of the U. S. Geological Survey, and a committee of the branch prepared a set of suggestions for authors of abstracts. The plan of having authors' abstracts in the publications of the various state geological surveys has also been presented to the state geologists in their annual meeting and approved by them. A memorandum calling for authors' abstracts in publications of all branches of the U. S. Geological Survey has just been issued. In two geological publications, the *Journal of Geology* and the *Bulletin of the American Association of Petroleum Geologists*, authors' abstracts accompany almost all papers. Authors' abstracts of all papers to be presented at the annual meeting of the Geological Society of America are distributed before the meeting and printed in the annual volume.

As far as actual accomplishment goes, these results are still far from covering the field of geological publications. The action of the International Geological Congress is not binding in any way; it is merely a very valuable step in the promotion of the project. It has, however, created interest in the idea in other countries and led to its adoption by a number of important publications.

That ultimately the idea will be generally accepted in scientific publications can scarcely be doubted. The additional percentage of time required for an author to prepare an abstract of a paper which he has just completed is so slight that the only objection there can be to it is the additional bother; but when authors generally have fully realized the growing impossibility of keeping up with the flow of scientific literature, the unfairness of burdening their more public-spirited colleagues with the preparation of an abstract of another's paper, and the value to themselves of an abstract as a means of bringing before their busy colleagues the essence of their publication, they will be not only willing, but eager, to prepare the best possible abstract.

Biology and chemistry have perhaps solved, even under present conditions, the problem of covering with abstracts the entire field of their interests. But it is hard to believe that when those more public-spirited members of these professions, who prepare the abstracts, once realize the needlessness of their self-sacrifice, they will submit indefinitely to being made the goats. It is true that not all authors, at present, know how to prepare good abstracts of their own papers. Some authors find it hard to write an abstract much shorter than the original paper; but a study of abstracts indicates that the majority of authors' abstracts are too short and too incomplete. Either type of defect may be due to insufficient effort as well as to inexperience. But it is worth while to point out another peculiar psychological twist which leads to inadequate abstracts; that is, that some authors, in preparing abstracts, have in mind, often unconsciously, to conceal from the reader as far as possible the conclusions arrived at and, by merely indicating the subject-matter with which the paper deals, to lead the reader of their abstract to read the paper itself. If they knew how often this ruse fails they would probably soon abandon it.

Under paragraphs (1) and (2) of his discussion of the possibilities of carrying out the plan of having

[1] Published with permission of the Director of the U. S. Geological Survey.

authors' abstracts with all biological publications, Dr. Lamson takes up the question of obtaining the cooperation of editors of biological journals and of their contributors. At first glance it would seem that so simple and reasonable a plan would obtain the immediate support of all editors. On investigation, however, a reason, and probably the only one, for hesitation on the part of some of them becomes obvious. Many journals are dependent on their subscribers for their existence. They must, therefore, obtain as many interesting papers as they can, and some of them hesitate to make any special demands on possible contributors, that might lead the contributors to offer their papers elsewhere. This difficulty, as Dr. Lamson points out, will diminish as the requirement of authors' abstracts becomes more general with the stronger, more independent publications and as authors awaken to the reasonableness and advantage of preparing abstracts of their own papers. When the expense in cash, in wasted time, and in the duplication of researches through ignorance of what has gone before (of which there are some astounding examples) is considered, it would undoubtedly be to the economic advantage, not only of science but of the community in general, to promote the preparation of authors' abstracts by a subsidy to those journals which require them of their contributors. However, time, good sense and fair-mindedness will undoubtedly bring about the same result.

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THE DISTRIBUTION OF STATE AGRICULTURAL EXPERIMENT STATION BULLETINS TO FOREIGN COUNTRIES[1]

IT is recognized generally that the character of the work of the state agricultural experiment stations has undergone a gradual change during the past twenty-five or thirty years. In recent years a much larger proportion of the bulletins published are technical in nature. Many of them constitute distinct contributions to science and are of interest to agricultural workers throughout the world. If these bulletins are to justify the labor and expense involved in producing them they must be so distributed that they will be readily available to investigators in the field of agricultural science in all countries. A personal inspection of the libraries of a considerable number of European institutions of agricultural research led one of the writers to suspect that such adequate distribution was not being accomplished. A further investigation of the extent of the distribution of bulletins to foreign libraries was made by sending a questionnaire to fifty state agricultural experiment stations. The earlier suspicion was thoroughly confirmed. The agencies for distribution have not kept pace with the change in the nature of bulletins to be distributed. Distribution to libraries in the United States is adequate, but only a few states have built up a mailing list of foreign institutions of any appreciable size. Many of the foreign mailing lists consist largely of the names of individuals who have requested that their names be placed on the mailing list. Bulletins so distributed into the hands of individual workers doubtless serve a useful purpose, but it is obvious that the first responsibility of distribution is to see that a copy of the bulletin is deposited in the library of those institutions where agricultural research or teaching is in progress.

The task of securing adequate distribution of these bulletins need not be done entirely with altruistic motives. Many people familiar with the lavish way in which agricultural experiment station bulletins are distributed within the United States do not realize that nearly all research institutions in European countries make a charge for their publications and do not send them gratuitously, even to other institutions, unless exchange relations have been established. Most foreign institutions are glad to exchange publications with our state experiment stations, but are generally quite careful to see that a real exchange basis is reached. If our state experiment stations wish to receive the research publications of foreign institutions, it behooves them to see that these institutions receive their bulletins.

With help from various sources the writers have prepared for the Minnesota Agricultural Experiment Station a classified list of libraries of foreign agricultural institutions. Approximately eleven hundred libraries are included. About six hundred of these will receive all bulletins published by the experiment station. The remaining addresses are classified according to subject-matter interest and will receive those bulletins in which they are interested. The list is by no means perfect, but considerable time has been spent in an effort to make it complete, at the same time weeding out those institutions with only a superficial interest in agricultural research. It is realized that constant revision of such a list will be necessary if it is to function to the best advantage.

Attention is called to this list and to the present inadequate distribution of bulletins to foreign institutions in the hope that other states may take steps to secure better distribution of their bulletins. It is the opinion of the writers that some central agency, by proper cooperation with all the various state experiment stations, could render a distinct service to

[1] Paper No. 1061 of the Journal Series of the Minnesota Agricultural Experiment Station.