and Proper Motions: C. D. Perrine, Observatorio Nacional Argentino, Córdoba.

Hydrology of the Isthmus of Panama: Brig. Gen. Henry L. Abbot, United States Army, retired. Extensive tables for rainfall, outflow, evaporation, etc., are given and discussed.

The Meteor System of Pons-Winnecke's Comet: Charles P. Olivier, Leander McCormick Observatory, University of Virginia. The elements of the meteor's orbit are determined from more than 1,000 observations.

Improvements in Calorimetric Combustion, and the Heat of Combustion of Toluene: Theodore W. Richards and Harold S. Davis, Wolcott Gibbs Memorial Laboratory, Harvard University. The improvements are: Means of effectively closing the bomb with less risk to the lining and cover; means of burning volatile liquids without loss; a method of automatically controlling the temperature of the environment; means of evaluating the incompleteness of combustion. The heat of combustion of toulene is determined as 10,155 calories (18°) per gram.

The Mass of the Electric Carrier in Copper, Silver and Aluminium: Richard C. Tolman and T. Dale Stewart. A continuation of experiments on currents produced by acceleration in metals.

The Silver Voltameter as an International Standard for the Measurement of Electric Current: E. B. Rosa and G. W. Vinal, U. S. Bureau of Standards, Washington, D. C. A summary of eight years' experimental work which has shown how the voltameter can be used as a reliable current standard and as a means of checking the constancy of the value of the Weston normal cell.

EDWIN BIDWELL WILSON
MASSACHUSETTS INSTITUTE OF TECHNOLOGY,
CAMBRIDGE, MASS.

SUGGESTIONS FOR THE DEVELOPMENT OF SCIENTIFIC LIBRARIES; WITH SPECIAL REFERENCE TO AUTHORS' SEPARATES

THE communication from Tracy I. Storer in SCIENCE for November 24, on the care of pamphlet collections, brings up a matter which has interested me for several years. It has been my task to rearrange a few scientific libraries and my privilege to consult several others, and I have found in nearly all of them considerable room for improvement, especially in the method of handling authors' separates and other pamphlets.

It seems to be a common, if not the prevailing, custom in private and semi-private scientific libraries to arrange pamphlets alphabetically by authors, as Mr. Storer recommends. This has the advantage of obviating the mental exertion of classifying them by subjects (which ought to be an important consideration with that apparently increasing class of persons who prefer to follow a mechanical routine rather than exercise judgment) and of keeping together the writings of one's friends, so that if a friend comes for a visit one can see at a glance just how many of his papers one has. But in most other respects the alphabetical arrangement is an undesirable expedient. For there is no important difference between a pamphlet and a book, and no good reason for putting a pamphlet on a different shelf from a book on the same subject (unless of course there happens to be a considerable difference in size of page or the pamphlet belongs to a series of bulletins).

Large libraries use some sort of subject classification, and this is equally desirable for small ones. When one is carrying on a particular line of research one likes to have all the literature bearing on it together as far as possible. It is out of the question to keep in mind every one who has written on a given subject, and unless a library is pretty fully catalogued (which is not usually the case with private working libraries), some pamphlets are pretty sure to be overlooked if they are not classified by subjects. Another objection to the alphabetical arrangement is that every scientist receives many pamphlets on subjects that he is not particularly interested in,[1] and with any other system than a subject classification these will always be in the way, unless they are relegated to a special "limbo."

[1] See *Torreya*, 16, 101–102, April, 1916.

Of course there will always be cases where it is difficult to decide under what head to file a pamphlet; *e. g.*, whether one on the snakes of Ireland should go with reptiles, British Isles, or mythology. But in some such cases the scale is easily turned by the owner's interests, and in others duplicates may be at hand, or obtainable on request, and can then be filed in both places. Still another plan is to make notes, on slips of paper of convenient size, or in thin note-books, of the titles of papers in serials, in other parts of the library, or in other libraries, and assemble them under their respective subjects. To provide a full series of such cross-references for a library of any size would of course be quite a task; but the references can be jotted down one at a time whenever one comes across them in reading, so that the time spent will not be missed; and their usefulness is directly proportional to their number, completeness not being essential.

If the library is catalogued the pamphlets can be numbered the same as books, whether they are kept separate or bound together in volumes of convenient size. For small special libraries it is well for the owner to devise his own classification, for the subject classifications in common use may not be detailed or up-to-date enough for his purposes. For example, Dewey's decimal system, which seems to be the favorite one with public libraries in this country, lumps geography and history together, arranges the families of plants by the Bentham and Hooker system, which was abandoned by most botanists about twenty years ago, and provides only one number (634.9) for forestry, which has become a pretty complex subject in recent years.

For taking care of the pamphlets on the shelves there are several methods, some of which are mentioned by Mr. Storer and some are not. The most logical is to put each one that is not part of a series in separate stiff covers, which can be done quickly and cheaply by means of some devices that are on the market. The principal objections to this method are that it more than doubles the bulk of the average author's separate, and unless the gum on the binding strips is supplemented by staples or stitching the pamphlet is liable to become detached from its paper cover or outer pages after a little handling. Furthermore, with thin pamphlets standing on shelves the titles can not be read without pulling them out a little way. A compromise might be made, however, by putting separate covers only on those exceeding a certain thickness, say a quarter of an inch.

Binding a number of pamphlets together, unless they belong to a closed series or are all on one subject, by the same author, and of the same size, is almost sure to lead to regrets later. For as a library grows or the owner's interests become more specialized its contents will need to be classified more and more minutely, and papers once thrown together will preferably be separated. And it is exceptional too for a bunch of independent pamphlets on the same subject to be of so nearly the same size that they can be trimmed alike to make a smooth-edged book.

For a growing collection of pamphlets on a given subject, not yet numerous enough to bind into a volume, or for current numbers of serials, there are various kinds of temporary bindings, suitable for reference libraries that have several dozen users. One of the cheapest of these consists of a pair of flexible pieces of cardboard of proper size, with two to four holes reinforced with metal eyelets near one of the vertical edges, and a small shoestring to go through the holes. Each pamphlet is then perforated with an awl, to correspond with the holes in the covers, and they are tied together with the string. The awl-holes do not weaken the pamphlets, and are scarcely noticeable after the collection is bound into a book. But such an outfit makes a rather ragged appearance, and the title can not very well be marked on the back of it. A more temporary method, that consumes less time and mutilates the pamphlets less, uses a piece of stiff paper for a cover, held on by a pair of strong spring clips. These, however, do not allow much variation in thickness, so that one using them at all must keep a large stock of assorted sizes on hand.

Pasteboard pamphlet cases of the type recommended by Mr. Storer (and also by Witmer Stone in SCIENCE for July 14, 1905, p. 53) are most convenient for private libraries and those that are used by only a few persons, all of whom can be trusted to put things back promptly and in the right places after using them. As a rule they should be large enough to hold both quarto and octavo pamphlets. (Those larger than quarto are best bound separately, for otherwise they are liable to be damaged if stood on end for any length of time.) Smaller sizes may be used to advantage for holding current numbers of octavo periodicals or bulletins, and also to contain complete volumes of the same, if the expense of binding is prohibitive and they are not likely to be used much. It is a good idea to have in each pamphlet case devoted to a particular region or subject a large envelope in which can be kept photographs, newspaper clippings and manuscript notes pertaining to that subject, for ready reference, instead of keeping such things in separate departments, as is commonly done.

I heartily endorse Mr. Storer's recommendation that all pamphlets should be marked with the date of accession; with the amendment that the practise should be extended also to periodicals, but is not important in cases where the publications are known to be several months or years old when received. Scientific publications dated a few weeks or months earlier than the facts warrant are deplorably common nowadays, and hereafter whenever the date of a book or magazine is suspected to be wrong the author, editor or publisher should be challenged to produce witnesses who can testify to having received it on or about the actual date of distribution.

Authors who order separates of their papers can lighten the burdens of librarians and other recipients considerably by insisting on a few simple precautions, until all printers of scientific publications get in the habit of doing the right thing without special orders. Some printers who ought to know better make separates by simply ripping the magazines apart, and if a paper happens to be unsymmetrically disposed with respect to the middle of a signature some of its leaves will then be separated, and must be fastened with paste or lateral staples, making a pamphlet that will not open out flat and is awkward to bind with others.

Every reprint from a serial should show on its cover or in some other appropriate place the volume number, page numbers, and date (not only year but month), so that it can be cited correctly without the original. If the original pagination is retained, as is usually (and ought nearly always to be) done, no additional statement about the page-numbers is necessary. Some reputable magazines still issue reprints without any indication of the volume-numbers, however, and such omissions encourage the common slipshod practise of giving incomplete citations in bibliographies. The volume number should be in Arabic figures, regardless of ancient traditions or the usage of the magazine, to save the reader the annoyance of translating the obsolescent Roman numerals which some periodicals still inflict on their readers.

The first page, or cover as the case may be, of a reprint should always bear the title and in most cases the author's name, besides the name of the magazine, etc. In sorting out large piles of pamphlets I have many times been provoked by having to stop and look inside one with a blank cover to see what it was about; and three times within the past year I have received from different printers (who had not previously done work for me) separates in which the article began on a left-hand page (which could not be foreseen when I read the proof) and the first page was left blank, necessitating writing the titles by hand or having it done by a local printer.

In ordering reprints from SCIENCE authors can accommodate their friends with no extra trouble to themselves (for they are given the choice) by having them made up in single-column or octavo form, unless they contain tables or diagrams that extend across both columns. For articles in SCIENCE do not usually make many pages, and if reprinted in the original quarto form they are rather thin, and easily torn or crumpled when filed in a case

with octavo pamphlets. The publishers of some other periodicals are equally accommodating, and I have had quarto and octavo reprints made from one that has folio pages, with no extra charge.

Even before an article is set up the author can take some precautions for the benefit of his readers. It would be too much of a digression to point out many of them here, for this is not an essay on how to prepare manuscripts for publication;[2] but attention might be called to one desirable reform, namely, restricting the number of joint contributions. Every book or paper by two or more authors, especially if new species are described in it, makes extra trouble for librarians, bibliographers, biographers and others, as long as a copy of it exists (which may be for several centuries). Usually most or nearly all of the writing of a joint paper is done by one of the authors, and the assistance of the other can be fully acknowledged without putting his name on the title-page. In cases where one author is much older or better known than the other the latter doubtless feels honored in having his name publicly associated with the more noted man's; but reputation is a scientist's most precious possession, and no true scientist should wish his to be mixed with any one else's. (Nearly all the great masterpieces of science are each the work of one man.)

For the benefit of librarians I will close with a protest against the common custom of discarding the covers and advertising pages of magazines when they are ready to be bound. The stock excuse for this is that it is done to save space; but few scientific libraries are so cramped for space that they can not spare a few inches more a year for advertising pages. It is very interesting to look through the outer pages of old numbers of Science, for instance, and see what text-books and apparatus were in use at a given period, and sometimes one can get valuable evidence of dates of publication in that way.[3] There is perhaps no better place than the advertising pages of the popular literary magazines to trace the historical development of bicycles, automobiles and innumerable other familiar articles.

Covers help to locate articles in a volume quickly when one knows the month but not the page, and they often bear dates, tables of contents, and other information that is not given in the magazine proper. On the third cover page of the *American Journal of Science* for January, 1877, an important astronomical discovery was announced, but those who do not preserve the covers can trace it back only to the February number, where it was printed again on the regular pages. Early in the history of the same magazine the covers of some of the numbers bore a list of places where it was kept on sale, which is of considerable interest, including as it does some towns that have now almost disappeared from the maps.

Roland M. Harper
College Point, N. Y.

[2] For some valuable suggestions along this line see W. M. Davis, *Pop. Sci. Monthly*, 78, 237–240, March, 1911.

[3] See *Torreya*, 7, 170 (footnote), Aug., 1907.

SPECIAL ARTICLES

EXPERIMENTS ON MOTOR NERVE REGENERATION AND THE DIRECT NEUROTIZATION OF PARALYZED MUSCLES BY THEIR OWN AND BY FOREIGN NERVES

During the past three years, I have been investigating the question of the physiological regeneration of motor nerves when directly implanted into paralyzed muscles, and the possibility of the reestablishment of normal neuro-motor connections. In these experiments a remarkable difference in the behavior of the muscles' own nerve and that of foreign nerve was found.

The experiments were made upon the nerves and muscles of the thighs of rabbits. For the electric stimulation a weak current from a Porter induction coil was used, and the nerves and muscles were always freely exposed, so that the effect of the direct stimulation of one or both could be carefully controlled. It is hardly necessary to state that experiments of this kind must be done with great care, that regeneration of divided nerves must be prevented when so desired by extensive resections of the nerves, and that the operator must be certain