placed with a yard or two of glass tubing to get a higher lift. This whole outfit can be set up and show a rise of several inches to a foot or more within the usual forty-five minute period. It is free of complications necessarily present in the egg or parchment; it holds the interest of the students; it simplifies the problem and facilitates understanding. And it really takes less time than the other demonstrations. Bags prepared in this way in advance may be kept indefinitely suspended in sterile water, with the rubber stoppers in place ready for instant use.

BENJAMIN C. GRUENBERG

NEW YORK, N. Y.

DISCUSSIONS AT SCIENTIFIC MEETINGS

THIS is to voice the sentiments of many scientists with whom the undersigned has spoken concerning the machine-like method with which our scientific meetings are conducted. Time was and not far distant in the past when each paper was given critical examination and rarely indeed did a conclusion escape open-air discussion, with the result that erroneous conclusions did not bear the weight of conviction from having been presented to some august society and the conclusion not challenged. In the days when the Society for Experimental Biology and Medicine was enlivened by the searching criticisms of men like Lusk, Jacoby, Meltzer and others, both profit and pleasure resulted. It is common, at the present time, for the presiding officers of our societies to announce that eight minutes are available for the reading of a paper and two for discussion. The logical method would be to reverse this program.

Any attempt to limit the number of papers entails difficulties, but they are not wholly unsurmountable. If we keep clearly before us what value we expect from the reading of papers, our criterion is set. Then we may entrust to a selected group of men (or to a single member) the designation of a relatively few papers bearing the stamp of importance, or of some especial virtue such as promise, or even to further the work of some young and promising worker. There are always men who will place their own benefits above those of the majority, and they will be offended by not having their papers selected. There will always be papers embodying important factors which, because they are not evident, are passed by. However, in the long run, ten papers critically examined are preferable to double the number passed through the program like the film in a movie.

A decigram of discussion is worth a kilo of pulpwood paper required to print erroneous conclusions and faulty technique.

W. M.

LANSDOWNE, PA.

HEARING AND NOISE

IN the article on "Graduated amplifiers as an aid to hearing" in the June 20th number of SCIENCE appears this statement: "The fallacy that deafened persons can hear better in noisy surroundings was disposed of by Dr. Fletcher," etc.

The truth of the matter is that people who are deaf because of fixation of the foot plate of the stapes often do hear better in noisy places, as every otologist knows.

I recall one man who was so deaf I had to shout to make him hear, yet he stated that he could hear a pin drop in a boiler shop. Another patient, who was also quite deaf, said she could hear perfectly if the piano were being played.

G. W. BOOT

EVANSTON, ILLINOIS

SOME REMARKS ON THE LITERATURE OF RUST FUNGI

WHILE reading various mycological publications, the writer has noticed certain errors and omissions in reference to matters of fundamental importance, to which he wishes here to call attention and also to add some comments that may be of interest, bearing upon the same or similar subjects.

On page 202 of Harshberger's text-book,[1] which, by the way, is one of the best books of its class that the writer has read, it is stated that the black stem rust of wheat (*Puccinia graminis tritici*) occurs seldom on barley, whereas it is the common stem rust of barley, as well as of wheat, in the United States. Eriksson is evidently meant to be authority for the statement, as it is repeated on page 562, and there directly credited to him. Nevertheless, in 1899 the writer published results,[2] showing that barley stem rust and wheat stem rust are the same. (This publication is not included in the bibliography of the book.) Dozens of investigators have since confirmed these results, and yet others have made this same error of statement. To state an elementary fact, that should be generally known, but apparently is not, there are in the United States (1) a form of black stem rust very common on barley and wheat, (2) another distinct form on rye and rarely on barley, and (3) a third distinct form on oats, each of these being found

[1] Harshberger, John W., "Mycology and Plant Pathology," XIII + 779 pp., 271 ills., P. Blakiston's Son & Co., Philadelphia, 1917.

[2] Carleton, Mark Alfred, "Cereal rusts of the United States, a physiological investigation," U. S. D. A. Div. Veg. P. & P. Bull. 16, 74 p., 1 fig., 4 col. pl. Bibliogr. pp. 70–73, 1899.

also on various wild grasses. This leaves out, of course, the various sub-forms of each of these that are being constantly found. In Sweden, the barley-rye form is apparently the common one on barley, rather than the barley-wheat form, probably because of the greater proportion of rye to wheat grown in that country than in the United States. Even in the latter country, the barley-rye form may be more frequent on barley to the northward, where there is proportionally more rye grown, though Fraser, in a recent publication in Canada,[3] gives it no emphasis and does not state that it is found on barley at all. A rust may specialize geographically as well as with reference to host plants. Stakman, Levine and Bailey call attention[4] to an additional instance in the fact that the oat stem rust is exceptionally virulent in Sweden. In view of these facts, and the writer supposedly having done careful work, why should other American writers follow the presentation of specialized forms proposed by Eriksson, applicable only to Sweden, rather than that proposed by him applicable to the United States?[5]

The point raised is not at all a minor one, but of the greatest practical importance, for a large share of responsibility for the spread of wheat stem rust may belong to the occurrence of this rust on barley and particularly on wild barley. Wild barley is common and widely distributed in all the Great Plains from Texas to Canada, and nearly always carries the wheat stem rust, frequently in great abundance, when growing near wheat fields. This and certain other wild grasses may especially provide a means for the over-wintering of the rust in the spring wheat district. The writer found germinable spores on wild barley near Fargo, N. D., late in November. Fraser states[6] that he is still investigating methods of over-wintering, and that he has no evidence that spring infection arises from the barberry. Several wild wheat grasses also carry the rust, of which the most important is probably *Agropyron tenerum.*[7]

[3] Fraser, W. P., "Seasonable hints," Prairie Edition, No. 26, July, 1923, p. 7, Ministry of Agriculture, Ottawa.

[4] Stakman, E. C., M. N. Levine and D. L. Bailey, "Biologic forms of *Puccinia graminis* on varieties of Avena spp.," *J. A. Res.*, 24: 1013–1018, 4 pl., 1923.

[5] It may be worth while to state here that, while the discovery of biologic specialization of rusts must be credited to Eriksson, because of priority of publication, his and the writer's investigations, covering almost exactly the same ground, were absolutely independent of each other and practically simultaneous. The writer was unaware that any other one was doing the same kind of work, until his own data were ready for the press.

[6] Anonymous, "Breeding wheat to resist rust," *Northw. Miller*, 126, 296, 1921.

On pages 191 and 561 of the same text-book above mentioned, there is much confusion and error of statement in respect to the amphispore. This spore form, discovered by the writer, is in no way identical with the urediniospore, as there stated, but, as its name implies, apparently assumes the functions of both the urediniospore and teliospore. It is quite distinct from any other known spore form of the uredinales. In the writer's own experience, there is only the one instance of its occurrence,[8] that is, in the species *Puccinia vexans* on mesquite grass, but Arthur[9] has since described other instances of its occurrence in other grass and sedge rusts. It is claimed by no one, in the writer's knowledge, that either the amphispores or the urediniospores are responsible for the over-wintering of the wheat stem-rust, as intimated in the pages above cited—not the former, because they do not occur in that species of rust, and whether or not the latter are so responsible is a leading question, the correct answer to which will be of wide interest.

In another book, written by Stevens,[10] which also the writer has found to be a good book in several respects, there are nevertheless errors, as might be expected in such a book, whoever the author. The chief error, of concern to the writer, is at bottom of page 382, where the author says, under description of *Puccinia triticina,* "This species is combined with *P. triticina,* by Carleton," in which sentence he evidently meant to say *P. rubigo-vera,* it being a typographical error. However, the entire paragraph is not clear, and, taken in connection with the author's acceptance of *P. triticina,* but not of *P. dispersa,* and his statement under *P. glumarum,* which is generally considered to be quite distinct from any other species, makes it difficult to determine what idea it is intended to convey as to these forms. It may be well to state here, for the first time, the idea of the writer as to the relationship of these two rusts, in his publication

[7] It must not be inferred from these statements that the writer is skeptical as to good results from the barberry eradication campaign, as such campaign, on the part of the U. S. Government, was initiated by him, and he, in company with Bolley, Stakman and Buller, framed the first state law (in North Dakota), since that of Massachusetts, to compel the destruction of that plant. Also, he alone (in absence of a state pathologist) drafted a similar one for South Dakota, which was approved by the experiment station agronomist, but whether or not this draft is the one later enacted as law is not yet known to him.

[8] Carleton, Mark Alfred, "Investigations of Rusts," U. S. D. A. Pl. Ind. Bull. 63, 1904.

[9] Arthur, J. C., "Amphispores of grass and sedge rusts," Bull. Torr. Bot. Club. 32, 35–41, 1905.

[10] Stevens, F. L., "The Fungi which Cause Plant Disease," VIII + 754 pp. 449 ills. The Macmillan Company, New York, 1921.

first referred to above, which was as follows: The complex previously known as *P. rubigo-vera,* having been found to include frequently two distinct species, it did not become necessary thereby to establish *two* new names where there was only *one* new species. Accepting, therefore, the name *P. glumarum* for the new species, the writer simply retained the old well-known name *P. rubigo-vera* for the common brown rust of wheat and rye, proposing, however, the two names, *P. rubigo-vera tritici* and *P. rubigo-vera secalis,* for the respective biologic forms on these hosts.

In *Botanical Abstracts* there is reference to a paper by Mains[11] on the seed carriage of Euphorbia rust, which recalls very similar experiments of the writer, reported in 1904 in his paper last above cited, pages 28–29. Not having seen the entire article of Mains, it is not known to the writer whether or not his experiments are referred to in that article, but it is true that the writer demonstrated, in careful greenhouse work, the carrying over of rust in the seed of *Euphorbia dentata,* thus proving the existence of a perennial rust in an annual host, the first time in the United States. One other case had at that time been reported from a foreign country.

As already evident from these notes, it seems to the writer a matter of the greatest importance to study the relationship of the rusts of wild grasses, and of these rusts to those on the cereals. Even where the barberry is an important factor between cereal crops, a perennial grass may receive the rust first, from which it will pass on to the cultivated cereal. However, the grass is probably of most importance in over-wintering the cereal rust. It is gratifying to note that already more attention is being given to these grass rusts than previously. Mains[12] has made a good study of Puccinia montanensis and similar species on Elymus and other grasses, and, although heteroecism is the chief subject of discussion, he brings out the important point of over-wintering, apparently unaware of the fact, however, that positive results of observations in that respect had been reported by the writer some time ago in his publication last cited. Mains says:

> The geographic distribution of *P. montanensis,* as indicated by specimens in the herbarium, is British Columbia, Wisconsin, Indiana, southward to New Mexico and southern California, while *Berberis Fendleri* (the aecial host) is limited in its distribution to the mountains of Colorado and New Mexico. Such a difference in distribution, however, would be explained, if this rust is not dependent upon its aecial stage, but is able to overwinter in the uredinial stage. Mr. Bethel has made observations in Colorado which indicate that such an over-wintering may occur there.

In 1898 the writer observed that this rust wintered in the uredo stage on the University Farm at Lincoln, Nebraska. No urediniospores were germinated, but the mycelium was vigorous and spreading rapidly, and the spring had well begun. This subepidermal rust, though not occurring on cereals, is a very interesting one, and, in mode of life, is the most similar of all rusts to *P. glumarum,* in the writer's experience. It had been under the writer's observation for a long time previously in Kansas and Nebraska, and its perennial nature suspected.

MARK ALFRED CARLETON
CUYAMEL, HONDURAS

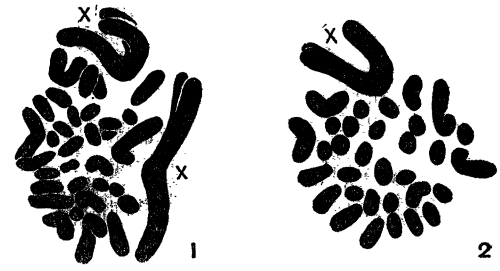
[11] Mains, E. B., "Evidence of the seed carriage of the Euphorbia rusts, *Uromyces proeminens* and *U. dictosperma,*" Proc. Indiana Acad. Sci. *1921*: 137–139, 1922.

[12] Mains, E. B., "The heteroecism of *Puccinia montanensis, P. koeleriae* and *P. apocrypta,*" *Mycologia,* 13, 315–322, No. 6, Nov., 1921.

LABORATORY APPARATUS AND METHODS

MATERIAL FOR DEMONSTRATIONS OF ACCESSORY CHROMOSOMES

IN most male Orthoptera the accessory chromosome may readily be recognized both in spermatogonial and spermatocyte divisions, but in females the paired accessory chromosomes are usually very difficult to identify. In order to find material suitable for demonstrations of the accessory chromosomes in both sexes the cells of many species of long-horned grasshoppers (Tettigoniidae) have been examined. Since such demonstrations seem to be quite widely desired for class use in zoology and for other purposes, it may be of value to report the result of this examination.



Spermatogonial cells from the testis and follicular cells of the ovary of *Orchelimum concinnum* and *Orchelimum vulgare* were found to be especially favorable. Although the number of chromosomes is rather difficult to determine, there are probably 33 in the male (Fig. 2) and 34 in the female (Fig. 1). The accessory chromosomes are V-shaped and three or four times the size of the largest autosome, as can be seen in the figures (X). Other undetermined species