paratus are in use, the knowledge of which would be of great value both as time savers and as means of encouraging better teaching of botany. Why should there not be a free exchange of such methods and ideas through the medium of publication in one of our universally distributed journals such as SCIENCE? The writer suggests a special department, in such a magazine, devoted to technique where not only successful experiments in teaching are reported but also where negative results shall be stated. A magazine devoting space to such a department would do much toward advancing the technique of science. It may be objected that such notes do appear from time to time in various magazines. This is true, but the writer is convinced that only a very small number of such notes appear as compared with the total number of helpful suggestions which should be the common property of men working in the same science. In this branch of educational work at least there should be no selfish "patent" upon such matters to be used as a "drawing card" for the department or institution. Such a department devoted to notes upon technique would save all teachers of science much time which they now spend in fruitless testing out of methods which some other institution has already demonstrated to its own satisfaction to be unsatisfactory. There would also be a marked improvement in the teaching in the smaller institutions at least, by the introduction of newer and better technique.

ERNEST SHAW REYNOLDS
AGRICULTURAL COLLEGE, N. D.

GENERIC LIMITATIONS

THE deductions of Professor Robertson on this subject in SCIENCE for October 11 seem to be based upon questionable premises. Of the factors which influence the number of species in a genus, he mentions only the antiquity of the group. Other important factors are: specific limitations; size of group considered; area, location and diversity of territory included; degree of perfection of our knowledge of the species. These are illustrated in the following list:

	Species	Genera	Average	Poales
Cat. N. Am. Pl., Heller, 1900[1]	16,673	2,027	8.2	6.2
Gray's Manual, 7 ed., 1908.	4,079	1,001	4.1	6.7
Fl. S. E. U. S., Small, 1903.	6,364	1,494	4.4	6.7
R. Mt. Man., Coult. & Nels., 1909	2,733	649	4.2	4.2
R. Mt. Fl., Rydberg, 1918..	5,897	1,038	5.7	7.3
Fl. Colo., Rydberg, 1906 ...	2,912	702	4.2	4.7
Fl. N. Mex., Woot & Stand, 1915	2,903	848	3.4	4.1
Pl. of Conn., 1910	1,942	621	3.1	5.2
Fl. Mich., Beal, 1892	1,746	554	3.2	4.2
Fl. N. D., Bergman, 1918 ..	963	448	2.2	3.1
Fl. of Fargo, N. D., 1918...	520	295	1.8	2.3
Fl. Vigo Co., Ind., Blatchley, 1896	853	423	2.0	2.6
Bees of N. Mex., Ckll., 1906	561	72	7.8	—
Bees of Boulder Co., Colo., Ckll., 1907	175	42	4.1	—

It will be noted that the averages vary in proportion to size and diversity of territory. On account of this and narrow specific limits Rydberg's "Rocky Mountain Flora" is one of the highest, notwithstanding his narrow generic limits. New Mexico runs low on account of many Mexican genera entering the state.

Since the bees are but a suborder we may scarcely compare them with larger groups. The *Poales* are perhaps the most nearly comparative group of the plants, although relatively larger. The genus *Carex* is more nearly comparable than any other to the bee genus *Andrena,* the number of species being about equal.

From Robertson's list we find the bees of New Jersey are 2.7 per cent. of the total insect list, while those of Carlinville are 23.0 per cent.; similarly, the Lower Aculeata are 4.9 per cent. and 16.2 per cent. From this and our knowledge of the extent of his work on these groups we might conclude the averages for other groups to be low on account of their many unknown species.

Recognition of many small genera would seem to necessitate the elevation of old genera and larger groups to higher rank, thus greatly increasing group names. Classification serves two purposes. Names have been often called "handles," while the system presents the state of our knowledge of relationships. For the

[1] Includes varieties; others do not.

taxonomist, large numbers of names present little difficulty because he uses them frequently, but for others it is different. Thus probably not less than 90 per cent. of science workers are "beginners" and the others, outside of their special fields, are also. The writer believes in the recognition of small groups but doubts the necessity of forcing them upon every one. Would it not be feasible to have our floras and faunas in two parts, the first leading to collective groups, the second continuing through the smaller groups?

O. A. Stevens
Agricultural College,
North Dakota

FIREFLIES FLASHING IN UNISON

To the Editor of Science: I was much interested in Mr. Fremont Morris's letter regarding the "Fireflies Flashing in Unison" on page 418 of the last volume.

I was employed by the Philippine Bureau of Forestry during 1902 and 1903. In the spring of 1902, I was stationed for some weeks at Pagbilao, Tayabas Province. It is on a small tidewater river about half or three quarters of a mile from Lagimanoc Bay. I had occasion to go across this bay on February 22 and did not return until after dark. As the banca in which I was travelling entered the mouth of the river, I was attracted to the flashing of the flies which appeared in great numbers a short distance above the mangroves which covered both banks of the stream.

The majority of the fireflies were flashing in unison but there were some which did not time their flashes with the majority. The light from the fireflies with the reflection of the light from the water made a very distinct illumination and one never to be forgotten by one who has seen it.

P. T. Barnes
Pennsylvania Department of Agriculture

NEGATIVE RESULTS FROM ATTEMPTED QUEEN BEE MATING IN A DOUBLE TENT INCLOSURE

Following out suggestions from previous work of Cole and Miller, Rhode Island, and from bee behavior observations in an artificially lighted double tent at University of Wisconsin, by the writer, an attempt was made the past season to mate a Virgin queen bee in an available double tent inclosure.

The tent was made of double canvas, 4 feet in diameter, 7 feet high at peak, with about 8 inches space between the canvas walls.

A nucleus, containing workers, drones and a five-day-old virgin was placed in the tent and observations taken.

No natural mating flights occurred. The virgin appeared to fly naturally in the tent, returning unaided to the hive, when removed from the nucleus and thrown into the air. The drones appeared to fly naturally, more so at first than after several days confinement in the tent.

The queen failed to mate.

L. V. France
University of Minnesota,
University Farm, St. Paul

SPECIAL ARTICLES

SPECTRUM PHENOMENA DUE TO MOVING MOTES

In connection with my regular work I incidentally came upon a curious phenomenon which seemed to repay special investigation. To describe it, it will be advantageous to first indicate the disposition of apparatus used, as is done in Fig. 1. Here L is a pencil of white light (preferably from a collimator and wide slit) impinging on the thin cylindrical glass shell G, about 10 cm. in diameter and containing a solution of mercury-potassic iodide, about half an inch deep and not quite concentrated. The rays are thus both refracted and dispersed, and on emerging enter the strong objective of a short-range telescope (magnification above 15) of which PP' is the principal plane and $r'b'$ the narrow spectrum seen in the ocular of the telescope. Properly focusing the latter, the spectrum may be contracted to a vividly colored vertical line.

If now a strong direct-vision grating g is inserted in front of the objective, and the telescope is focused anew, a *sharp* solar spectrum may be obtained. This was a surprise to me, as the cylinder[1] G, though thin and clear, was

[1] The present use of a cylinder as a collimator is well worth noting.