THE WELLESLEY COLLEGE SCIENCE CLUB.

AT the November meeting of the Wellesley College Science Club, Dr. J. C. Bell presented a paper on the 'Reactions of the Crayfish to Sensory Stimuli.'

His experiments show that the animals react negatively to white light of different intensities in the proportion of two to one. Difference of intensity, within the limits used, causes no change in the proportion. Increase of temperature slightly increases the proportion. Green, yellow and blue, when compared with white light, show only a slightly greater number of reactions, but in the combination red-white the red has 73 per cent. of the reactions.

Experiments upon the chemical sense, which are still in progress, go to show that the animals are sensitive to chemical stimuli over the whole surface of the body, but particularly upon the anterior appendages. There is no evidence whatever of hearing, and the animals depend chiefly upon touch for the seizure of food.

GRACE E. DAVIS,
Secretary.

THE BERKELEY FOLK-LORE CLUB.

THE second regular meeting of the club during 1905–6 was held in the Faculty Club of the University of California, on Tuesday evening, November 28. President Lange called the meeting to order.

The minutes of the last meeting were read and approved. The following new members were elected: Professor H. A. Overstreet, Mr. A. H. Allen and Professor W. F. Bade.

Professor F. B. Dresslar read a paper on 'Some Studies in Superstition,' based on superstitions known to and in part credited by advanced school students on the Pacific coast. Special attention was paid to the degree of credence given to superstitions. Particular attention was also given by the speaker to the subject of mental preference for odd numbers. At its conclusion Professor Dresslar's paper was discussed by the members.

The meeting was adjourned.

A. L. KROEBER,
Secretary.

THE CHEMICAL SOCIETY OF ST. LOUIS.

THE St. Louis Chemical Society held its usual monthly meeting on January 8. Mr. H. E. Wiedemann presented a paper entitled 'The By-products of the Packing House.' Special emphasis was laid on the successful work of the chemist, which has transformed the waste-heap of former days into a large number of useful products.

C. J. BORGMAYER,
Secretary.

DISCUSSION AND CORRESPONDENCE.

PLEASE EXCUSE THE KELEP.

TO THE EDITOR OF SCIENCE: It is naturally a deep disappointment to learn from a recent number of SCIENCE that my efforts to elucidate the habits of the kelep have fallen so far short of the high ideals of entomological literature which Professor William Morton Wheeler advocates. This is largely my own fault, no doubt, as Professor Wheeler seems to intimate. But with sufficient scolding one must needs improve. The devotion of so many columns of SCIENCE to this missionary effort is certainly to be appreciated. That Professor Wheeler has felt it worth while to resume his admonitions constitutes also a welcome assurance that the future no longer appears altogether hopeless, for the last of his previous instalments closed with a despairing vow of eternal silence 'until the Greek Kalends,' or something to that effect, if I remember correctly.

Nevertheless, my efforts are largely foredoomed to failure, on account of the very backward and unscientific habits of my insect pets. Unlike true, civilized ants, they have not learned the gentle art of regurgitation, but persist in going about with large, round drops of nectar on their bills. They regularly carry it into their nests in this way, and feed it to their friends and families without having once swallowed it, or spewed it up again. This incredible conduct is very easy of observation. It has been witnessed by a dozen or more of my colleagues, and I have no doubt that Professor Wheeler will be able to verify it whenever he has time to undertake an investigation of the subject.

In the matter of breeding habits, too, there is no longer a hope of meeting Professor Wheeler's wishes. The queens seem never to leave the nest voluntarily, or to fly about, as ants should. Instead of raising an annual brood of sexual individuals, there are young males and females in the nests at all seasons of the year. Males were seen at many different times going about freely in the kelep-protected cotton fields of Guatemala, and were sometimes captured by workers and taken down into their nests. Copulation inside the nest has been observed by Mr. Argyle McLachlan at Victoria.

It is needless to multiply such fatal discrepancies between the habits of the kelep and those ascribed to the insects which Professor Wheeler has studied. There remains only to beg for mercy for these misguided creatures, and for one who is made to suffer so much embarrassment for having placed on record facts which do not coincide with 'the literature of the subject.'

My mistake with *Leptogenys* was especially stupid and careless, for, as Professor Wheeler reminds us, he had already published, in three different papers, the statement that the queens are indistinguishable from the workers, except by their distended abdomens. But to me they appear to be distinctly larger insects, of a distinctly more reddish color, resembling in these respects the queens of the keleps. Can it be that Professor Wheeler had only laying workers of *Leptogenys,* and not true queens? Such a possibility might naturally suggest itself, but one must hesitate to believe that Professor Wheeler could repeat for a fourth time a statement which might prove so easily to be erroneous. Of course, one would not make such minor discrepancies the basis of a general criticism of Professor Wheeler's excellent work on Poneridæ and ants; it is mentioned now only because his own reference to it appears somewhat inconsiderate.

If one were to generalize on this series of entomological episodes the deduction would be that adequate ignorance of literature is a necessary qualification for learning the habits of a new insect like the kelep, for at each important step the investigation has been met by Professor Wheeler's *non possumus.* Last year he was quite as unable to believe that the keleps would kill boll-weevils as he is to credit now their failure to regurgitate nectar. After surviving so many of these literary dangers it is only natural that one become a little reckless, and venture even to hope that in the course of another year the additional facts, at present so objectionable, will receive due credence, having now become a part of 'literature of the subject.'

Regarding the classification of the poneroid insects, Professor Wheeler can be entirely reassured. The kelep does indeed have some habits comparable with those of honey-bees, but these traits have not seemed to require its removal from its systematic position next to the Poneridæ. The several families of unexpectedly diverse insects which have been included hitherto in the Poneridæ still constitute a natural group, of higher systematic rank, coordinate on the one hand with the drivers, and on the other with the series of families which may be referred to still as 'true ants,' though these may prove to be an artificial assemblage, their phylogenies not having been traced. The differences of social organization appear to forbid a close alliance of the true ants with the poneroid series, or a derivation from them. Ants and keleps are similar, it is true, as all hymenoptera are, but many of the resemblances prove to be superficial and indicative of parallel development rather than of any recent community of origin. Biological history abounds in such instances where groups popularly supposed to be closely alike have been found to be essentially different.

To permit the new facts and modifications of doctrine to be properly assimilated, it is now highly desirable that peace be restored in the happy family of entomology. If I promise to be very careful to write future papers on the kelep as well as ignorance and other limitations permit, it may be that Professor Wheeler will deem it safe to renew and abide by his former pledge of silence; not, indeed, till any too remote a period like the Greek Kalends, but perhaps until he has seen and studied some living keleps, or at least some

other members of the family Ectatommidæ. The mistakes he would then discover would be, I realize, still more embarrassing than those he has detected at so much longer range, but the discussion of them might have a correspondingly greater scientific value. And yet it may be that even in this I am still begging the question or asking an unfair advantage, for increasing knowledge often sets cruel limits in the free fields of literary sport.

O. F. COOK.

VICTORIA, TEXAS,
December 16, 1905.

SPECIAL ARTICLES.

A NEW THEORY OF SEX-PRODUCTION.[1]

THE last volume of the *Proceedings* of the German Zoological Society contains an interesting address by Professor Richard Hertwig in which is developed a new theory of sex-production based on his long-continued experiments on protozoa and applied to the interpretation of the results of new experiments by himself on amphibia and those of his pupils Issakowitsch and von Malsen on daphnids (*Simocephalus*) and on *Dinophilus*. Professor Hertwig's conclusions demand especial attention, since they are on the whole antagonistic to the view, which has been widely accepted in recent years, that sex is already determined in the fertilized egg, though he does not deny that such early determination may exist in some cases.

The new experimental results brought forward are as follows: The work of Issakowitsch (since published in full in the *Biologisches Centralblatt*) proves that in *Simocephalus* sex-production shows a definite reaction to temperature changes. At 24° C. a parthenogenetic production of females, with only the occasional appearance of a male, continues until the culture dies out; while a reduction to 16° quickly leads, and reduction to 8° immediately leads, to the appearance of males and later (sometimes immediately) to the production of winter eggs. Issakowitsch also shows that a similar effect may be produced by starvation without change of temperature, and hence he concludes (like Nussbaum in the case of rotifers) that the change of temperature probably acts indirectly through its effect on nutrition. Von Malsen's work on *Dinophilus* shows that in a culture maintained for months at 10°–12° C. male and female eggs are produced in a ratio of 1:3, while at 25° the ratio rises to 1:1.75, and sometimes reaches 1:1. Both these cases seem free from the objection that applies to so many of the earlier experiments on sex-modification that the statistical results may be vitiated by different rates of mortality in larvæ of different sexes. Unfortunately the same can not be said of Professor Hertwig's own experiments on frogs, ingenious and interesting as they are. Experiments with changes of temperature gave no really satisfactory result, though Hertwig seems inclined to believe that higher temperatures favor the production of females. On the other hand, either over-ripeness or under-ripeness of the eggs (a condition obtained by artificially delaying or hastening fertilization) led in every case to a large excess of males. Like those of earlier observers, these results are not very convincing, owing to the high mortality of the larvæ, which must be reared to the time of metamorphosis before the sex can certainly be determined. The most satisfactory results appear to have been obtained from a culture of over-ripe eggs in which 20 per cent. to 30 per cent. of the fertilized eggs were reared to this period, the result being 317 males to 13 females; and in one case of under-ripe eggs 40 larvæ that were successfully reared were all males. These results can hardly be ascribed to accident; but the dubious character of the statistical data obtained by rearing tadpoles and other larvæ through long periods of time has been so clearly shown by the experience of many other observers that the true interpretation of the facts in this case seems by no means clear.

Hertwig's general theory of sex-production was primarily suggested by his own earlier experiments on the relation between nucleus and protoplasm in the protozoa. These experiments led him to the conclusion that the

[1] R. Hertwig, 'Ueber das Problem der sexuellen Differenzierung,' in *Verhandlungen der Deutschen Zoologischen Gesellschaft*, 1905.