

containing one of the following ions, Ag^+ , Cu^{++} , CNS' , and $\text{Fe}(\text{CN})_6^{''''}$. The radulae were then washed so that the ions were only retained where they had combined with the chitin. The presence of the combined ions was readily detected by the usual reagents, the silver going black on development with hydroquinone, the copper being converted into the brown ferrocyanide by $\text{K}_4\text{Fe}(\text{CN})_6$, and the CNS' and $\text{Fe}(\text{CN})_6^{''''}$ giving the usual red and blue colours respectively with ferric chloride.

Since an amphoteric substance is basic on the acid side of the iso-electric point and acidic on the alkaline side, the basic copper and silver ions should combine with it only if the solution is more alkaline than the iso-electric point. Conversely, the acid ions CNS' and $\text{Fe}(\text{CN})_6^{''''}$ will only combine with the substance on the acid side of its iso-electric point.

The results of a typical experiment are shown in the table.

Ion present	P_H of Solution.					
	1.0	2.2	2.6	3.0	3.6	
Ag^+	All deep black					Chitin A
	White	Faint grey	Grey	Black	Deep black	„ B
$\text{Fe}(\text{CN})_6^{''''}$	All deep blue					Chitin A
	Deep blue	Blue	Pale blue	White	White	„ B

Chitin A and chitin B are seen to be very different. Whereas chitin A combines with both anions and cations irrespective of the P_H , chitin B appears to be an amphoteric substance with an iso-electric point at about P_H 2.6: in a more acid solution it is basic, and combines with the ferrocyanide anion but cannot combine with the silver cation; in a more alkaline solution it is acidic, and combines with the silver cation but cannot with the ferrocyanide anion.

Identical results were obtained with fresh radulae and with those which had been previously boiled in strong potash to remove adhering tissue.

From these experiments, the change undergone by chitin A on conversion into chitin B appears to be profound.

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Ball Lightning Phenomena.

AT dawn on the morning of the last day in 1924 there occurred in the neighbourhood of Aberystwyth, in Cardiganshire, a thunderstorm of short duration but of unusual violence, and people were alarmed at what they saw and heard. News reached me that a "ball of fire" had been seen during that storm at a village called New Cross, some 4 miles south-east of Aberystwyth. On hearing this I went over to interview the observers. I found three at once; Mr. and Mrs. Pugh and Mr. Morgan at the inn. Mr. Pugh's attention was first attracted by a terrific noise. On looking out his bedroom window what he saw he described as "falling lumps of fiery material" and as a "scattering of fire as from a centre" about level with the ground, and, apparently, not far from the house. The house shook, and the effect was alarming. The three did not venture out for half an hour after the event. At Penywern, a farm-house near by, a window pane shown to me was cracked by the explosion.

I found another observer, Mr. Davies. He said that whilst dressing he looked out to see what kind of weather it was, and whilst at the window saw a brilliant ball of fire at some height from the ground

in a direction 30° or 40° from the horizon. The "ball" was more or less round but with luminous protuberances. The direction in azimuth tallied with that of Pugh. It is likely, therefore, that Davies saw the same object as was seen by Pugh but at an earlier epoch. Unfortunately Davies withdrew his gaze, involuntarily, owing to the startling brightness and strangeness of the vision and, consequently, saw no more. Had he continued observing the story might have been complete.

Whilst at New Cross I was told that strange things had been seen by Mr. Edwards, of Glanrhos, four and a half miles away in direct line. I proceeded there, and Mr. Edwards very kindly and readily described all he had seen and experienced. Many things happened on the premises, but the following is the most important. Mr. Edwards was in the barn when the crash happened. He was thrown bodily backward but not in any way damaged. On looking out he saw what appeared to be three distinct luminous masses dropping on the manure heap in the yard. This was followed by a column of smoke or vapour rising from the place of impact. This occurred during a shower of hail. The hailstones were unusually large—half an inch or even an inch across, and of very irregular shape.

In these accounts there appears to be one point of interest common to both. Mr. Edwards saw the luminous volumes *after* he had been thrown. At the instant of being thrown he was in the act of bending to lift into a vessel some chaffed material that was lying on the floor of the barn, and had his eyes fixed on the job. Similarly Mr. Pugh also, he *heard the crash first* and on looking out saw the luminous objects. There was an interval, therefore, between hearing and seeing in both cases which cannot be explained on the assumption that what occurred was an ordinary single electric discharge. Either there must have been at least two discharges with an interval between, or something happened in a much more leisurely manner than an ordinary electric discharge. Are these luminous objects likely to be identical with the ball lightning? It is not suggested in the account given that the luminous objects were solid bodies.

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Sound Production by Insects.

UNDER this heading in NATURE of March 21, p. 437, there was a short notice of a paper published by Dr. F. E. Lutz in the Bulletin of the American Museum of Natural History, vol. 50, p. 333, 1924. I have not been able to avail myself of the original paper, but the review brings forward several interesting points. The view expressed is: that our present knowledge does not furnish good grounds for believing that the few cases in which we hear insect sounds are exceptions to a rule, namely, that insects do not communicate by that means; that in the case of Orthoptera the presence of extreme specialisations for making sounds, accompanied by what appear to be definite ears, are grounds for thinking that here communications may be carried out by sound; but the fact that termites, *which are not known to stridulate*, have the same sort of ear as that possessed by crickets and long-horned grasshoppers, weakens the argument somewhat.

I should like to direct attention to a recent paper which I published in the Trans. Ent. Soc. Lond., Parts III. and IV., p. 492, 1924, on the habits of Brazilian insects. In the course of this paper I mentioned that I had observed termite soldiers making