

to a place among carbohydrates as derivatives or modifications of the same.

E. Fischer proposes to apply the name "sugars" to all the members of this homologous series, to which he has lately added the glycol-aldehyde $C_2H_4O_2$ as the simplest possible example. The popular conception of the properties of a sugar are not, however, easily reconciled with the properties of some of these bodies, while "carbohydrates" at least possess some reference to their empirical composition. With regard to glycol-aldehyde, moreover, its optical inactivity would exclude it from the list under the conditions here proposed, although its constitution undoubtedly satisfies the requirements.

ELECTRICAL NOTES.

Variations in Resistance.

IN a recent article in the *Philosophical Magazine* appears a paper by Mr. Fernando Sanford, entitled "A Necessary Modification of Ohm's Law." Why it should have been given this title does not appear, for it nowhere calls in question the law which goes by Ohm's name. A better title would have been "On the Variation of Resistance of a Conductor with Change of the Medium Surrounding It." The facts observed are of interest, though not new, as it has long been known that the resistance of a wire changes when immersed in different gases. Chatelier, for example, found that the resistance of a silver wire changed enormously when immersed in hydrogen gas, and that if left in it for some time its temperature coefficient changed also. Mr. Sanford has extended the list considerably, his experiments, though made with a wire of one metal only, i.e., copper, embrace a great variety of mediums, both liquid and gaseous. That the variation is due to the causes noticed in the experiments of M. Chatelier and not to heating of the conductor, as proposed by some, is probable from the following considerations. The total heat generated in the wire, using the ordinary coefficients of emissivity for polished copper, would not raise the temperature of the wire more than the one ten-thousandth of one degree centigrade, and the increase of resistance from this cause would be inappreciable. But the effect of a thin film on the wire would be far different. It was first pointed out by Mr. Kennelly to the writer that the extremely thin film of tin on electric conductors was sufficient to lower the resistance of moderately small wires as much as five per cent. If we suppose that when a wire is placed in a gas like SO_2 a thin film of a compound of the copper and the gas is formed, only the one twenty-five-thousandth of an inch in thickness, it will account for all the phenomena observed by Mr. Sanford. For, as the wire experimented on was one millimetre in diameter, the formation of a layer $\frac{1}{25000}$ of an inch thick would reduce the cross section of the copper by two-tenths of 1 per cent, and therefore increase the resistance by 0.2 per cent, or nearly the maximum change observed by Mr. Sanford. This thickness of film is not much greater than the thickness of the films which cause the iridescent colors on steel, being about three to five times as thick; so that we see that the slightest action of the gases on the surface of a wire would change the resistance quite appreciably, and on exposure to air the wire would recover itself again. It should be added, moreover, that such films would not necessarily be visible.

An easy way of settling the question would be to use wires of different diameters. With a wire whose diameter was .0035, or No. 40 B.W.G., and which is furnished for commercial purposes, the resistance should vary as much as one and a half per cent, while with a wire one centimetre in diameter it should be inappreciable.

R. A. F.

A JOINT meeting of the Scientific Alliance of New York, in memory of Professor John Strong Newberry, will be held at Columbia College, Monday evening, March 27, 1893, at 8 o'clock. An address will be given by Professor H. L. Fairchild, "A Memoir of Professor John Strong Newberry." Remarks will be made by others, and a number of letters regarding Professor Newberry will be read.

LETTERS TO THE EDITOR.

* * * Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.

On request in advance, one hundred copies of the number containing his communication will be furnished free to any correspondent.

The editor will be glad to publish any queries consonant with the character of the journal.

Does the Ether Absorb Light?

WHETHER or not light is absorbed in any degree by the ether through which it passes has been argued a good many times, and to-day is not settled on any experimental basis. That it is not so absorbed to any considerable degree is evident from the light from such distant stars that reaches us. From theoretical considerations some have concluded that many more stars would probably be seen by us if in some way their light was not stopped by the ether, and that the midnight sky would or should be brighter than it really is.

In all the treatments of the subject which I happen to have seen, there is one important element which has not been considered at all, and to me it seems as if that one would account for the limit to the number of stars we see without assuming that the ether possesses the ability to transform energy within itself, which would be the case if the energy of waves like light waves were changed into any other kind of energy not capable of affecting our eyes. This fact is, that, in order to see, some energy is needful. I mean that there must be some limit to the amplitude of the vibratory movement beyond which we could not see, simply because the energy of the wave is insufficient; so that no matter what the intrinsic brightness of a given light may be, if it be far enough removed from an observer it will cease to be visible, simply because the energy of the waves is too small to excite the sensation. As the energy of such radiant energy on unit area varies inversely as the square of the distance, and as the amplitude of the vibrations at the initiating atoms or molecules can at best not exceed the diameter of the atoms or molecules, the extreme minuteness of the amplitude at the distance of the fixed stars from us shows how exceedingly delicate is the eye for perceiving it at all. The enormous frequency of the waves gives them a degree of energy they could not otherwise have; but if there were no amplitude there would be no energy, and it is to be conceived that if space be illimitable and the number of stars be infinite, yet with eyes constituted like ours only the light of stars within a limited space would be visible, and such optical data would give no reason for holding that what could be seen was the whole, nor for the conclusion that the light from more distant stars was absorbed by the medium through which it was distributed.

The photographic work done in this field testifies to the same conclusion when we are presented with the image of a star which had never been seen. The photographic plate acts cumulatively and if one minute's exposure is not enough, take ten minutes or ten hours, but the eye cannot so act; if one cannot see an object in a second, he can see it no better by continued looking. I conclude, therefore, that we have no evidence that the ether absorbs any of the energy of the ether waves.

A. E. DOLBEAR.

Tufts College, Mass., March 9.

Natural Selection at Fault.

IN your issue of Feb. 17, Mr. Richard Lees replies to the rather misleading article of Mr. J. W. Slater in your issue of Jan. 20, and takes, it appears to me, the right view of the case as regards the *Felidæ*, but misses it when he attempts to account for the hen's cackle. No one reason will account for the latter. Frequently the hen that is a member of a large barn-yard flock may be observed cackling at the top of her voice prior to the laying of the egg, and it has been my observation that in 9 cases out of 10 this is due to the fact that she has found a usurper in her nest in the person of another hen engaged in egg laying. Close observation, covering many years, leads me to think that the cackling after the egg is laid has nothing whatever to do with nest-disclosure or nest-hiding, but is simply a notification to the cock of the flock that the important task of the day is accomplished.