

The results may be inferred. I can exemplify them no better than by giving some of the actual answers to questions in physiology by high school candidates who had just been passed in physiology in the grammar grades.

'Pleurisy is a disease of the skin'—'an indication that some nerve has been affected.'

'Alcohol, tobacco and opiates thicken the blood of the nerves.'

'The respiratory center is in the heart.'

'The heart is the center of respiration.'

'Residual air is the air in the heart.'

'The body should be bathed frequent'—'should be bathed at least once a year.'

'Appendicitis and pleurisy is a condition of the throat.'

'The blood is carried to the liver through the right and left auricles.'

'The meatus auditorius is in the intestines'—'is an artery leading from the heart'—'is in the eye'—'is a tube in which the blood passes through before entering the stomach.'

'The patella is a network of small blood vessels'—'is the lining of the abdomen'—'is a tube in the chest'—'is a muscle over the knee.'

'The motores oculi is in the veins'—'is an organ of voice.'

'The mitral valve is at the lower end of the stomach'—'is located in the liver.'

'Excretion is mingling with saliva,' etc., etc.

Such absurdities are by no means rare in the Kansas schools. For several years it was the writer's duty to pass upon the papers in physiology of candidates for the State teachers' certificate, and many answers as ridiculous as any of the above, were observed. Thus: to the question 'Why does the human body cease to grow in stature after about the twenty-fifth year?' the reply was almost invariably, 'Because it has got its full-growth.' Four out of fifteen answered the question as to what the lymphatic system is by saying that it is a system of vessels that take up the impurities of the blood and discharge them into the kidneys! It was the rare exception that the papers came up to the standard of a respectable high school.

The worst of it all is that many intelligent people defend such ignorance by saying that

you must not expect teachers in the public schools to be experts in physiology. Is it not time that such 'science' is banished from the public schools? I do not know whether Kansas is an exception in this particular, as it is perhaps in some others, to the other States of the Union. Certain it is, however, that such defects cannot be ascribed to the public school system of the State in general, for I honestly believe that this stands on a higher plane than in a majority of the other States. Is public school physiology everywhere a farce?

S. W. WILLISTON.

SHORTER ARTICLES.

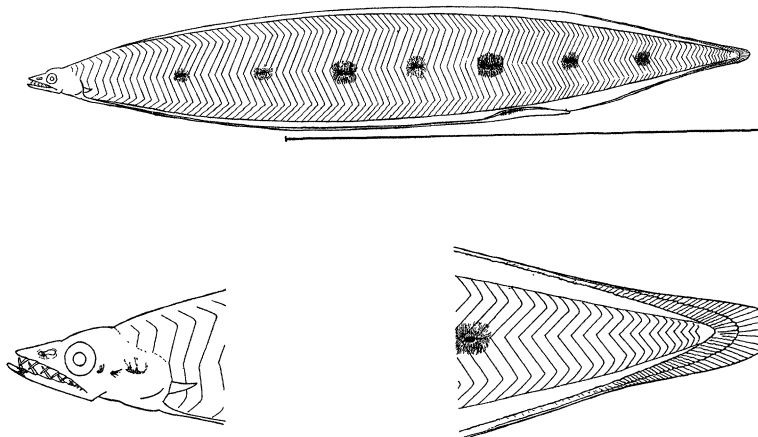
UNILATERAL COLORATION WITH A BILATERAL EFFECT.*

WHILE describing the larval eels or *Leptocephali* belonging to the United States National Museum two specimens claimed especial attention. Structurally these two specimens are very different and might readily be referred to distinct species. In one the nares are approximated, and the pectorals are well developed, in the other the nasal openings are wide apart and the pectorals have disappeared. The index that pointed to the probability that the two specimens were different stages of the same species is their unique coloration. There are eight large black spots much larger and much more conspicuous than the color markings of any other *Leptocephalus*. One of these is located over the alimentary canal a short distance in front of the anus. The others are along the side. Each one of these spots is formed by a single enormous chromatophore extending laterally over three or four somites. Sometimes a few minute chromatophores are to be found at the margin of the large one. There are three of these large chromatophores on the left side of the body and four on the right. In each case the spots of one side are arranged at irregular intervals, but in both cases the spots of the one side alternate with the spots of the other side, so that together they form, even in the alcoholic specimens of these transparent

* Contributions from the Zoological Laboratory of the Indiana University, No. 45.

creatures, a series of seven spots placed at nearly regular distances along the middle of the side. The effect is precisely the same as if the seven spots were repeated on the two sides.

In opaque animals the color markings of the two sides approach bilateral symmetry. In the present case the markings are strikingly asymmetrical in that there are three spots on one side and four on the other. This asymmetry in the number of spots on the two sides and their positions at irregular distances from each other makes it quite certain that their arrangement



on opposite sides so as to alternate and form a series at more or less regular intervals is not accidental but the normal condition, *i. e.*, a mutual adaptation in the location of the spots of the two sides. This adaptation of the two sides to each other is emphasized in the younger specimen where the first two spots are on the right side, leaving the first forty segments of the right side without a spot.

The following are the details of the distribution of the spots on the somites, counting from the pectoral backwards:

Number of segments between the centers of successive spots.	Number of the segments and the sides on which the spots occur.
YOUNGER SPECIMEN :	
12	15-16-17 R
13	27-28-29 R
11	40-41-42 L
11	51-52-53 R
14	62-63-64-65 L
15	76-77-78 R
	91-92-93 L

OLDER SPECIMEN :

12	12-13-14 R
12	24-25-26 L
12	36-37-38 R
10	48-49-50 L
13	58-59-60 R
17	71-72-73 L
	87-88-89-90 R

The two specimens differ structurally as follows:

AA. Body more elongate than in *AA*; pectorals a mere ridge; nostrils remote from each other

for a distance nearly equal to the diameter of the eye; leptocephalous teeth wanting; lower jaw projecting, its tip rounded and entering the profile; no pigment spots about the head; depth $8\frac{3}{8}$ in length, head distinctly more than half the depth of the body, nearly 11 in the length; eye 7 in head, $1\frac{1}{2}$ in snout; segments $73 + 43$. One specimen 51 mm. long. New Providence (type).

AA. Body elliptical: pectorals well developed: nostrils not yet separated: leptocephalous teeth: jaws nearly equal: a pigment spot near the end of the lower jaw, another within anterior nares, two succeeding each other between the lower margin of the pupil and the lower margins of the auditory capsule: depth 6 in the length: head little less than half greatest depth: eye five in head: segments $76 + 38$.

One specimen 38 mm. long. Albatross Station 2566.

The *Leptocephalus* has not been referred to

its adult form and may be termed *Leptocephalus diptychus*.

C. H. EIGENMANN,
CLARENCE KENNEDY.

UNIVERSITY OF INDIANA.

VELOCITY OF IONS FROM ELECTRIC ARCS AND FROM HOT WIRES.

MUCH interest is being shown at present concerning ionization of gases and 'electron' theories of electricity. An investigation now in progress promises to throw further light on this subject, in fact to change one idea which has been held. It has been stated by eminent authorities that in the case of discharge through gases the negative ions always go faster than the positive under the same conditions. The present investigation shows that this is not always the case and a brief account of it may not be amiss.

The work had its origin in an attempt to explain the phenomena of the electric arc. It was shown in the *Physical Review** that all the phenomena of the arc could be explained by assuming, first, that the current in the arc was carried by ions, and second, that the positive ions move the more rapidly. The second part of this hypothesis did not at first seem probable, since in all cases which had previously been investigated the negative ions had been found to move the more rapidly. Two sets of experiments were, however, given as tending to substantiate that hypothesis, but neither of them could be considered conclusive.†

More recently experiments have been performed with ions drawn out from an arc by a charged body in the neighborhood.‡ The positive ions in this case were found to have the greater velocity. Quite recently the same fact has been shown by an application of a

method used by Zeleny* for finding the velocity of ions produced by X-rays. These methods are entirely independent and the agreement of the results in the two cases leaves little reason to doubt the correctness of the conclusion that the positive ions here move the more rapidly.

Of course, this is not a proof that the positive ions in the arc itself move more rapidly than the negative, but since such an assumption would explain the phenomena of the arc and since the positive ions just outside the arc do have the greater velocity, it seems reasonable to assume that they do also within the arc.

It opens up, however, a still more interesting field of inquiry, *i. e.*, that concerning the condition under which the positive ions show this peculiarity. The discharge from hot platinum and iron wires was accordingly investigated. It has long been known that positive electricity escapes from hot metals easier than negative. An examination of the velocity of the ions from the hot metals showed that here also the positive ions move the more rapidly. Both the methods used in the previous investigation led to the same conclusion.

But in all these cases the action is complicated by the fact that both gases and solids are present. For example, in the case of discharge from hot platinum wire atoms of platinum are no doubt given off, since it is a well-known fact that platinum wire when heated to a white heat decreases in weight.† It may be that because of some contact difference of potential the negative ions of the metal never escape from the metal. A comparison of positive ions of one substance with negative of another would not be of great value. One would wish to know whether the positive ions move faster than the negative ions from which they have been separated.

The case of the arc is still more complicated, for many different solid and gaseous substances enter into the arc. The investigation by Arons‡ on the arc between metals in *H* and *N* at different pressures shows that both the terminals of the arc and the gases about it must be considered.

* *Phil. Trans. Roy. Soc. Lon.*, 195, 193.

† *Wied. Ann.*, 37, 319.

‡ *Drude Ann.*, 1, 700.

* *Phys. Rev.*, 10, 151.

† Since publishing the above-mentioned article I find that part of the work there described had already been described by Dewar (*Chem. News*, 45, 37). My own work was performed without knowledge of that done by Dewar, and the method used was not the same as his. The results of the two investigations agree fully. The explanation of the results offered by myself was not suggested in his article.

‡ *Phys. Rev.*, 12, 137.