a horizontal direction. The axial relation $a : b : c = 1.1626 : 1 : 1.5320$. $\beta = 89° 40'$.

Thomsenolite. — This mineral occurs in far greater quantity than pachnolite. Its chemical composition, from analysis by J. Brandl, is $NaF \cdot CaF_2 \cdot AlF_3 \cdot H_2O$. Heated in the closed tube, it decrepitates violently, giving off acid water. The axial relation $a : b : c = .9959 : 1 : 1.0887$. $\beta = 89° 37\frac{1}{2}'$. Besides the perfect basal cleavage with mother-of-pearl lustre, a second cleavage parallel to the prism was observed. The habit of the crystals is prismatic, the prism striated horizontally.

Ralstonite. — This mineral occurs crystallized in isometric octahedrons; and thus far its constituents have been determined by a qualitative analysis made on a very small quantity, and one imperfect analysis, showing it to be a fluoride of aluminium, magnesium, calcium, and sodium, with water. Carefully selected material, submitted to analysis by J. Brandl, gave the following: F (57.12) . Al (22.14) . Na (5.50) . Ca (1.53) . Mg (3.56) . H_2O (10) = 99.85, corresponding to the formula, $3\,(Na_2MgCa)\,F_2 \cdot 8\,AlF_3 \cdot 6\,H_2O$. The mineral occurs intimately associated with the thomsenolite.

Chiolite. — This is a tetragonal mineral, resembling cryolite, occurring in the Ilmen Mountains, with axial relation $a : c = 1 : 1.0418$. It seldom occurs in well-developed crystals; and, when so, the crystals are small. Occasionally it is met with in snow-white clusters composed of an aggregate of minute crystals. The various older analyses of the mineral vary very considerably; and a new analysis, by J. Brandl, gives the following result: F (57.30) . Al (17.66) . Na (24.97) = 99.93, corresponding to the formula, $5\,NaF \cdot 3\,AlF_3$.

Arksutite. — This mineral, which has for a long time been regarded as a distinct species, is shown to be based upon an incorrect analysis, and is probably nothing more than a mixture of cryolite with pachnolite.

Fluellite. — This mineral, which is one of the rarest, is known in the form of minute sharp rhombic pyramids, occurring with wavellite and other minerals from Cornwall. With great trouble .12 gram was obtained quite pure for analysis. This gave J. Brandl the following: F (56.25) . Al (27.62) . Na (0.56) [H_2O (15.55)] = 100. This agrees closely with the simple formula, $AlF_3 \cdot H_2O$.

Prosopit. — This rare mineral, found at Altenberg, Saxony, but not since 1866, occurs mostly altered into kaolin, in some cases the crystals having a core of unaltered material within them, while a few are wholly unaltered. The crystals, while they have been converted into kaolin, have retained their form most perfectly. The crystals are monoclinic, with the axial relation $a : b : c = 1.318 : 1 : 0.5912$. $\beta = 86° 2'$. Pure material gave J. Brandl, upon analysis, F (35.01) . Al (23.37) . Ca (16.19) . Mg (0.11) . Na (0.33) . H_2O (12.41) . loss regarded as oxygen (12.58) = 100, corresponding to the formula, $CaAl_2\,(F, OH)_8$, in which fluorine and hydroxyl are isomorphous.

S. L. Penfield.

COLOR AND ASSIMILATION.

A new method of measuring the effect of rays of different degrees of refrangibility upon the assimilative activity of vegetable cells has been recently devised by Th. W. Engelmann of Utrecht. It will be seen that the method is simple, and probably of wide applicability. It consists in the use of a few uninjured cells, — for instance, of some filamentous alga, — placed in water which contains bacteria. If oxygen is evolved from the cells, as in assimilation, the bacteria, which up to that time may have been quiescent, become extremely active, and the activity is greatest close to the assimilating cells. If light be now withdrawn, the supply of oxygen is soon exhausted, and the bacteria again become quiet, resuming their activity as soon as the slightest trace of free oxygen is accessible to them. By their presence it is possible to detect, according to Engelmann, the one trillionth of a milligram of oxygen.

Supposing a long filament of some alga is thus arranged under the microscope, and light passes through the slide, the character of the light is seen at once to have a very marked effect upon the movements of the bacteria. If the light has first been passed through a direct-vision spectroscope placed *under* the stage of the microscope, so that the filament lies in the length of the spectrum thus produced, the bacteria are seen to cluster immediately in certain parts of the spectrum, to the exclusion of the others; and the inference is not unfairly drawn, that they go where oxygen is most abundant. To the facts thus presented in an earlier paper, Engelmann adds, in the *Botanische zeitung* (Jan. 5 and 12, 1883), some curious observations regarding the assimilative power possessed by vegetable cells of different colors. In brief, his results are the following: only those cells which contain chlorophyll or its equivalent in the protoplasmic body have any power of evolving oxygen; a colorless cell, or one which has coloring-matter only in the cell-sap, cannot evolve oxygen under the influence of any rays of light. This has a direct bearing upon the so-called 'screen' theory of Pringsheim, according to which the pigment acts only as a screen to diminish the otherwise too intense effect of light. It may be stated that Pringsheim suggested, that, by passing through a thin layer of solution of chlorophyll-pigment, the light would be so tempered as to bring about assimilation in colorless protoplasm. Engelmann shows that this is not likely to happen under any conditions of screening.

Furthermore, in experimenting upon algae of different colors, he found that the assimilative activity is not in the same part of the spectrum for all cells. For instance: the greatest activity for red cells is in the green; for green cells, in the red; for bluish green, in the yellow; and, for yellowish brown, in the green and red; or, *in general, in the color that is almost or completely complementary to the color of the cell.* To state this in another form, it may be said that the rays of the spectrum which effect the work of assimilation are identical with those which are absorbed by the chlorophylline coloring-matter.

It may be added that a large number of Engelmann's experiments were made by the use of Edison's lamp. In *Pflüger's archiv* for Jan. 10, the same author has a paper on a bacterium which he has found to be extremely sensitive to light, and which has been named B. photometricum. There are a few points in that communication which are not wholly in harmony with the facts stated above; but, as they are of minor consequence, they may be passed over now without further mention. Geo. L. Goodale.

LARVAL STAGES AND HABITS OF THE BEE-FLY HIRMONEURA.

Nothing is yet known of the first larval stage of the bee-flies. I have expressed the belief that future observation would show that there is a parallel between the Meloids and the Bombyliids, in that the first or newly-hatched larva of the latter would differ from the clumsy, partially parasitic, full-grown larva, by being more active, and somewhat different in structure (*Rep. U. S. ent. comm.*, ii. 267). Mr. Adam Handlirsch of Vienna has recently published[1] a most interesting account of the life-history of the European Hirmoneura obscura Meigen, which tends to

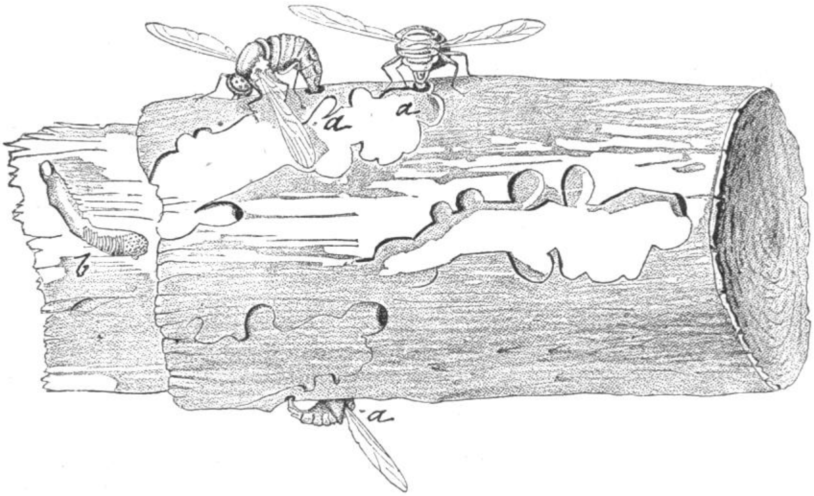

FIG. 1.— *a, a, a*, females ovipositing in burrows of Anthaxia; *b*, eggs at bottom of burrow. Natural size. (After Brauer.)

confirm this opinion. Hirmoneura is the only genus we have in the United States belonging to the Nemestrinidae, — a family so closely allied to the Bombyliidae, that Mr. Handlirsch's observations are of especial interest in this connection. I condense from it the following facts, and borrow the chief figures illustrating them.

Herr Handlirsch first succeeded, in July, in observing the act of oviposition; the female fly inserting her ovipositor deeply into the old burrows of small wood-boring insects (probably Anthaxia) in a pine fence surrounding a pasture. The eggs, laid in clusters, were actually found within these burrows. Upon investigation, however, it was found that the fence-rails did not contain galleries sufficiently large to have been made by the Hirmoneura larvae; but hundreds of its pupae and pupa skins were discovered in the pasture, protruding from the ground, and mostly held upright by their terminal hooks. Male and female flies were also observed issuing from these pupae; while, in the ground under the pupae, the exuviae of the full-grown Hirmoneura larvae were, in every instance, found at a depth of about one-half decimetre. Still deeper were found the remains of the pupa of a large-sized lamellicorn beetle, which proved to be the common Rhizotragus solstitialis. In one instance Mr. Handlirsch also found the full-grown Hirmoneura larva just issuing from the abdomen of the Rhizotragus pupa. Finally he succeeded in following up the early history of the young larvae. They issued in great numbers from the aforementioned burrows in the pine fence, and, placing themselves in an upright position at the entrance of the burrows, allowed themselves to be blown away by the wind. They have so far not been followed from this point to full growth as a parasite on the pupa of the Rhizotragus; and some interesting facts yet remain to be discovered. The newly-hatched larvae can live a long time without food, as one of them, hatched on Aug. 17, was kept in confinement until Oct. 29.

But the most interesting point in connection with these discoveries is the structure of the young larvae. It is unnecessary to enter into the descriptive details given by Mr. Handlirsch. I merely wish to point out, that the young Hirmoneura larva is distinguished from the full-grown larva by its slender form, somewhat different structure of the mouth-parts, but principally by the presence of ventral pseudopods bearing long and hooked setae. Joints 6–12 are each provided with one pair of these pseudopods, bearing a stout seta hooked at tip, with the hook pointing backward; while the thirteenth joint bears two pairs of similar setae, but with the hooks directed forward, thus assisting the larva in taking a firm hold, and in assuming an erect position. There is no trace of these setae in the full-grown larva, which strongly resembles those I have figured of the Bombyliids.

It is probable that this young Hirmoneura larva moves quite readily by the aid of these ventral appendages, and that it clings to the female Rhizotragus, and

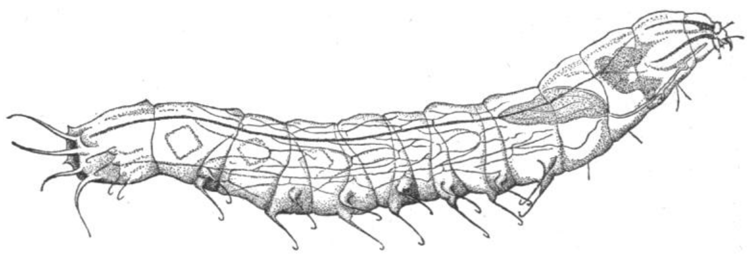

FIG. 2.— Newly-hatched larva, greatly enlarged. (After Handlirsch.)

is carried into the ground by her when she enters the same to oviposit; and it is highly probable that the newly-hatched Bombyliid larva has similar organs that facilitate locomotion. I am inclined to believe that the hooked setae of Hirmoneura would rather impede than facilitate burrowing, and that they perform rather the same service as the tarsal ungues and anal spinneret of those Meloid triungulins which fasten to burrowing-bees in order to be carried where

[1] Die metamorphose und lebensweise von Hirmoneura obscura Meig., einem vertreter der dipterenfamilie Nemestrinidae. — (*Wien ent. zeit.*, 1882, 224–228; 1883, 11–15, tab. 1.) See also Dr. Fr. Brauer's Ergänzende bemerkungen, etc. — (*Ibid.*, 1883, 25, 26.)

they will find their food-supply, and opportunity to develop. In this view of the matter, the development of such non-homologous parts for analogous purposes is of great morphological interest. The analogy with the young Meloïds will doubtless be found to go still farther, in that the young Bombyliid

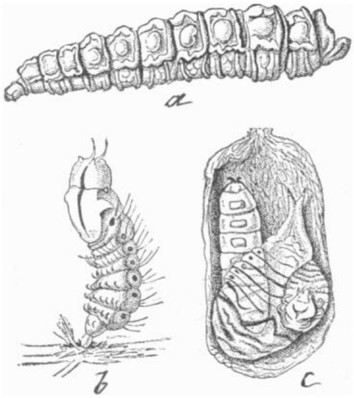

FIG. 3. — *a*, full-grown larva; *b*, pupa-shell; *c*, larva issuing from pupa of Rhizotragus. (After Handlirsch.)

will hibernate and otherwise live for a long time without food, waiting patiently for the hatching and growth of its intended victim, which growth may be very rapid among lamellicorns and pectinicorns, as I have shown in the case of Passalus cornutus (*5 Mo. ent. rep.*, 55), in which full larval development from the egg requires but six weeks. C. V. RILEY.

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.*]

The Lake-Superior rocks.

IN SCIENCE for Feb. 9, Mr. Selwyn refers to what he regards a 'mistake' of mine, in quoting him as believing that the trap and sandstone of Lake Superior are of the age of the Huronian. The statement was made on the authority of his report for 1877–78, p. 14 A., where, in his general classification, he has placed in the Huronian "the typical or original Huronian of Lake Superior, and the conformably — or unconformably, as the case may be — overlying upper copper-bearing rocks." I could not, of course, in 1881, state what Mr. Selwyn may believe in 1883, regarding the trap and sandstone of Lake Superior. A fair inspection of the Tenth annual report of the Minnesota survey, which he criticises, would have shown him that that opinion was quoted from him in 1877–78, since his report for that year is given as authority for the statement on the following page. Still, I am very glad to be re-enforced in the views which I have advocated in my reports since 1872, first promulgated by Messrs. Foster and Whitney, by the distinguished authority of the director of the Canadian survey. I concur with him in the sweeping affirmation, "that there is, at present, no evidence whatever of their holding any other place in the geological series" than that of the 'Potsdam and primordial Silurian;' and I would also add, that there is much incontestible evidence that they *can hold no other*.

In SCIENCE for March 9, Mr. Irving has misquoted and misrepresented my views in three respects: 1. That I have *strenuously refused* to believe in the unconformability of the sandstone and trap at Taylor's Falls in the St. Croix valley; 2. That, after my visit to the valley in 1881, I *confess to the unconformity;* and, 3. That I have *argued a difference of age* between the 'eastern sandstone' of the south shore of Lake Superior, and that of the St. Croix valley.

In respect to the first of these, it is only necessary to refer to the First report of the Minnesota survey (p. 69, 70), where the unconformity of the St. Croix sandstone on the trap and sandstones is made a strong point in the argument for separating the two under different names.

Secondly, I should hardly regard that a 'confession,' in 1881, which is the same that I advocated in 1872, and, in the interim, on all suitable occasions.

Thirdly, as to the difference of age between the sandstones of the St. Croix valley and those of the eastern southern shore of Lake Superior, probably Mr. Irving has misapprehended my argument in the Tenth report, Minnesota survey. Instead of ranking them of different age, I have grouped them as of the same age (p. 134), and call special attention to the fact, that the late investigations of Dr. Rominger, as well as the paleontological discriminations of Mr. Billings, go to show their identity. I have, however, a strong inclination to concur with Mr. Irving in the opinion that the 'Animikie group' of Thunder Bay is the equivalent of the original Huronian, and have already expressed reasons for such a supposition (Tenth report, p. 95). Some further examination in the northern part of Minnesota is still necessary to establish the parallelism. N. H. WINCHELL.

Minneapolis, Minn., April 2.

Venturesome spiders.

In the summer of 1882, while engaged for the U. S. coast and geodetic survey in the triangulation of New Hampshire, I witnessed an exhibition of tight-rope, or perhaps I ought to say slack-rope, performance, that somewhat surprised me at the time, and which may, perhaps, be of interest to your readers. It was upon the summit of one of our New-Hampshire hills, some 1,400 feet above sea-level, bearing the name of Blue Job. The air was clear, and the sky partially overcast with cumuli clouds, with a very light breeze from the east. After completing a series of measurements upon an angle, I stepped for a moment to the western side of my observatory (a small wooden structure, with shutters opening breast-high for observation); and, standing near the north-western corner of the building, I observed, starting out suddenly, and at almost the same instant, three spiders, each spinning out his single thread as he went, lying, back downwards, upon nothing but the air, and sailing off at an angle of, perhaps, 10° to 15° above the horizon, as if bound to some other sphere. The rate of motion was not more than a third or half metre per second; and as the air was very clear, and I soon had the advantage of a bright cloud for a background, I was able to watch the dark specks for a long distance. One of them made a partial failure, if his object was a long voyage, for he came to the ground within ten or fifteen metres; while the other two went on and up as far as the unaided eye could follow them, or perhaps I should say one of them did, for at last I was obliged to relinquish one, to be sure of holding the other in view. The distance to which the one was followed could not have been, I think, less than fifty metres.

The question arises, How did they do it? They went, it is true, in the direction of the wind, what there was of it; but this was so light that I judged at