

cates that the danger has been exaggerated." So far is this from being the case, and so great is the real danger, that I beg space for the presentation of some facts. The immediate cause of the present investigation was a letter published in the *Boston Herald* on Jan. 19, in which I gave a detailed account of sufferings in our own house due to arsenic in the wall-papers, and involving all the members of the household. Since that time many persons have published similar accounts in the Boston papers. Abstracts of twenty-two such letters appeared in the *Boston Advertiser* of March 2 and 12, fourteen of the same appearing in the *Boston Herald* of March 2; and in the four hearings given by the public health committee to the petitioners a mass of evidence was presented which must have convinced any unprejudiced mind. The committee have not yet made their report to the legislature, but it is expected that they will soon do so. The statement has already been published in the Boston papers, that the committee will recommend legislation, and it would be a matter of great surprise if they should do otherwise,—a surprise even to those who are trying to defeat legislation.

Science also adds, "Prof. C. F. Chandler testified, that, from careful experiments, under no conditions could arsenical poisoning occur through breathing arseniuretted hydrogen from wall-paper, and that the only source of danger would be from friction alone." In point of fact, Professor Chandler's testimony was much stronger than this. He not only stated that he believed the generation of arseniuretted hydrogen from arsenical wall-papers to be impossible, but he also said of this gas that he considered 'a small quantity comparatively harmless.' As to the legislation, for which those of us who have suffered were asking, he said that he was 'not in favor of any law on the subject;' that personally he was 'not afraid of arsenical wall-paper under any circumstances, with any quantity;' and that he considered the evidence of persons who suppose that they have suffered from wall-paper poison to be 'of very little value.' He also said that some years ago he investigated the whole subject of dangers from arsenical wall-papers, 'and concluded that there was nothing in it;' while his conviction that the generation of arseniuretted hydrogen from arsenical wall-papers is impossible was based on experiments made by two of his students in his laboratory six years ago.

As to all the essential points involved in the investigation, the petition is supported by the best chemical opinion in Harvard university, by some of the best medical opinion in Massachusetts, and by a body of evidence from actual sufferers unimpeachable and unanswerable. But I desire specially to call attention to the fact that Professor Chandler himself gives indirect support to the petition. As one of the original editors of Johnson's 'Universal cyclopaedia,' and one of the active editors in the revision now going through the press, Professor Chandler publishes in vol. i. (New York, 1886) an article on arsenious oxide, wherein he calls attention to the danger from arsenical paper. His language is, "Recent inquiry would lead to the belief that rooms covered with paper coated with this green arsenite of copper are detrimental to health, from the readiness with which minute particles of the poisonous pigment are detached from the walls by the slightest friction, are diffused through the room, and ultimately pass into the animal system. It is also said that arseniuretted hydrogen (H_2As), a very poisonous gas, is generated in damp weather."

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True, this language was first written for an earlier edition; but inasmuch as no expense was spared in the revision (see publisher's announcement), and inasmuch as Professor Chandler was one of the revisers, the language may be taken as the utterance of all that Professor Chandler considered it worth while to say at the time when the new volume was published. I have called this article an 'indirect support' to our petition, because, although the writer does not squarely state an opinion of his own, yet his language undoubtedly makes the impression that he considers the subject an important one,—one, indeed, which he has not investigated, and on which he therefore has not formed an opinion, but important enough to call attention to the danger.

It is also interesting to observe that one of the authorities whom Professor Chandler quotes against the theory that arseniuretted hydrogen escapes from arsenical wall-papers has subsequently changed his opinion. I refer to Watts's 'Dictionary of chemistry.' So far as I have been able to learn, the last expression of Dr. Watts on the subject in hand is found in the third supplement, which is vol. viii. of the whole work, in part i. p. 122 (London, 1879). There we read, "*Arsenic in the air of rooms.*—From experiments by H. Fleck (*Zeitschr. für biologie*, viii. 444), it appears that the air of rooms, the carpets or wall-papers of which are colored with Schweinfurth green, often contains arseniuretted hydrogen, produced by the action of moisture and organic matter on the arsenical pigment. The size, starch, paste, etc., used in hanging the paper, appear to be especially active in this respect."

Also another authority, whose opinion of 1862 Professor Chandler quotes against our petition, has long since given up that opinion. I refer to Dr. Hoffman of Berlin. Dr. Hoffman was one of the scientific men summoned a few years ago to aid the German royal sanitary commission in investigating the dangers from arsenic in objects of domestic use. Dr. Hoffman's present opinion is seen in the report of the commission, which resulted in a stringent law in Germany. The language bearing on this subject is as follows: "Wall-papers are deserving special attention, and also window-curtains, which frequently contain large amounts of arsenic. The injurious action of this is not only through the lading of the atmosphere with arsenical dust, but also from the continued formation of arseniuretted hydrogen, a gas extremely dangerous to health."

I am happy to state that the public health committee of the Massachusetts legislature have ordered the publication of the stenographic report of the hearings given on this subject, and this document cannot fail to be of value to the legislative committees of other states or of congress when the enormity of the arsenic evil shall become more widely known.

D. G. LYON.

Cambridge, Mass., April 24.

On two plates of stratigraphical sections of the Taconic ranges by Prof. James Hall.

In an article in the number for April, 1886, of *The American journal of science*, entitled 'On lower Silurian fossils from a limestone of the original Taconic of Emmons,' on p. 247, the author speaks of

a 'most welcome addition,' to the stratigraphy of the Taconic range, of two plates of stratigraphical sections' by Professor Hall, 'prepared by him forty to forty-five years since.'

Those two plates, or rather five plates, for that is their exact number, were freely distributed by Professor Hall as far back as Lyell's second visit to America, 1845-46, and are well known on both sides of the Atlantic.

Professor Emmons refers to them in one of his letters, dated Raleigh, N.C., Dec. 28, 1860, of which I published an extract in 'The Taconic system and its position in stratigraphic geology' (*Proc. Amer. acad. arts and sciences*, vol. xii. p. 128, Cambridge, 1885), as follows: "You are aware that [Professor] Hall prepared five long sheets of sections illustrating his views, and which extended from the Helderberg to the Connecticut River, and from the Lake Champlain to the Connecticut valley. . . . They were designed to sustain his peculiar views. I have copies, and I wish you had them. They are curiosities in their way."

It is evident that the views entertained by Professor Hall, contesting the conclusions of Dr. Emmons, have been placed before geologists in the United States, Canada, and Europe since the appearance of 'The Taconic system' in 1842.

JULES MARCOU.

Cambridge, Mass., April 23.

A carnivorous butterfly larva.

One of the most interesting of our butterflies is that known as *Fenesica tarquinius*, — a unique lychnid having the wings above brown-black in color, with conspicuous orange markings both on primaries and secondaries. It has a wide geographical range, occurring very generally over North America, as also in Asia.

Donovan, in his 'Insects of India' (pl. xlv. fig. 1), illustrates the butterfly rather poorly, but says nothing about the larva; Boisduval and LeConte (*Hist. des lep. et des chen. de l'Amer. Sept.*, p. 128, pl. 37) figure the larva, pupa, and imago under the name of *Polyommatus crataegi*, and simply quote Abbot as stating that the larva lives in several species of *Crataegus*; Scudder (*Proc. Essex inst.*, iii. p. 163, 1862) treats of it under the name of *Polyommatus porsenna* (*Syn. list of Amer. rurales*, Bull. Buff. soc. nat. hist., iii. p. 129, May, 1876), giving the food-plants of the larva as *Alnus*, *Ribes*, *Vaccinium*, and *Viburnum* (later, in the *American naturalist* for August, 1869, he gives the food-plants as follows, — 'probably arrow-wood, elder, and hawthorn'); Grote (*Trans. Amer. ent. soc.*, ii. p. 307) first proposed the generic name of *Fenesica*, but says nothing about its larval history; Strecker (*Butt. and moths*, etc. — Diurnes, p. 103) repeats simply from Scudder; while William H. Edwards, in his admirable life-histories of butterflies, has not, so far, treated of this particular species. In short, so far as the published records go, it has been generally assumed that the larva feeds upon the plants named.

The object of this brief communication is to show that in this larva we have one that is truly carnivorous, — a fact which is extremely interesting, because, so far as I can find, there is not another recorded carnivorous butterfly larva; and Mr. Scudder, who has given great attention to the butterflies, writes me in a recent letter, in reply to an inquiry on this point,

that he cannot recall any mention of such. Quite a number of heterocerous larvae are known to be carnivorous by exception, and not a few are so as a rule. These are chiefly found among pyralids; and it is not necessary, for my present purpose, to refer to the cases in detail.

For some years, now, I have been studying the remarkable life-habits of the Aphididae, and especially of some of the gall-making and leaf-curling species of Pemphiginae.

In collecting material and making observations, I have been assisted by Mr. Th. Pergande, who has, on a number of occasions since 1880, found the larva of this *Fenesica* associated with various plant-lice. Among the species with which it has been thus found associated are *Pemphigus fraxinifolii* Riley, which curls the leaves of *Fraxinus*; *Schizoneura tessellata* Fitch, which crowds upon the branches of *Alnus*; and *Pemphigus imbricator* Fitch, which congregates in large masses on *Fagus*. All these species produce much flocculent and saccharine matter.

The frequency with which this larva was found among these plant-lice justified the suspicion that it feeds upon them or derives benefit from them; yet up to 1885 the presumption was that it benefited from the secretions of the plant-lice rather than from the insects themselves. Last fall, however, Mr. Pergande obtained abundant evidence that the *Fenesica* larva actually feeds upon the aphids, and I thought it worth while to call attention to this positive proof of the carnivorous habits of the species. That the different species of plant-lice are the normal food of this larva, is rendered more than probable for the following reasons: —

1. Attempts to feed the larva upon the leaves upon which it was found have proved futile, the larva perishing rather than feed upon them.

2. The food-plants given by the authorities are such as are well known to harbor plant-lice.

3. Mr. Scudder's authorities, as he informs me, were picked up here and there; and one of them for alder, which he recalls, 'found it more commonly on a limb among plant-lice.'

4. Mr. Otto Lugger has frequently observed the larva around Baltimore among *Pemphigus imbricator* on beech, but never disassociated from the lice; and Judge Lawrence Johnson also found it in connection with the same species around Shreveport, La., last fall, and surmised that it might feed upon the *Pemphigus*; but neither of these observers were able to get positive proof of the fact.

C. V. RILEY.

Combined aerial and aquatic respiration.

In investigating combined aerial and aquatic respiration in vertebrates, the following questions have presented themselves for solution, — questions which, so far as we have been able to ascertain, have not been previously answered by physiologists: —

1. Is the aerial part of the respiration like that of animals with an exclusively aerial respiration?

2. Is the aquatic part of the respiration like that of animals with an exclusively aquatic respiration?

In answer to these questions, we offer the following facts and conclusion: —

1. Observations upon the aquatic respiration of soft-shelled turtles (*Science*, vi. p. 255; and *Amer. nat.*, 1886, p. 233) showed that the air taken from the lungs of a turtle that had been immersed several hours, had been almost completely deprived of its