

of novelty or originality. If so, I can but humbly acknowledge my ignorance, adding once more that this unhappy condition merely strengthens my case!

FRANCIS B. SUMNER.

ULTRA-VIOLET LIGHT IN PHOTO-MICROGRAPHY.

TO THE EDITOR OF SCIENCE: Apropos of Dr. Cleveland Abbe's letter in a recent issue of SCIENCE, I would call the attention of your readers to the fact that the developments in the use of ultra-violet light in photo-micrography with apparatus designed at Jena is described in some detail in *Engineering* (London), for December 2, 1904, page 760.

CLIFFORD RICHARDSON.

HOW DOES ANOPHELES BITE?

IN a recent number of SCIENCE Professor Washburn, in the course of some remarks on the mosquito exhibit at St. Louis, prepared by me for the New Jersey State Museum, questions the accuracy of a figure of *Anopheles* in the act of biting. I do not understand him to say positively that the figure is inaccurate, only that it had been his belief that the biting position resembled the resting position more nearly. The figure in question, which was a large colored one calculated to attract the attention of the passers-by, was intended to duplicate the picture given by Nuttall and Shipley in their work on *Anopheles*, its structure and habits. It is really a very accurate copy of their plate and the position in my chart is just exactly as published. This is an explanation, not a justification; if the figure is wrong it should not have been put on exhibition in that way; but is it wrong?

When I read Professor Washburn's note I tried to recall my own experience with *Anopheles*. I recall distinctly, watching specimens bite on several occasions, and particularly at Cape May, where *Anopheles crucians* was very plentiful in 1903 and bit freely during the early morning hours. This habit is unusual in the genus and attracted my attention, so that I gave the insects every opportunity to bite; yet, while I can recall distinctly all the surrounding circumstances, I do not recall just what position the insect assumed when biting. I questioned in turn

every member of the field and office force, and found that they were equally uncertain in the matter. All of them had been bitten and all of them were able to recall specific occasions where they watched the insect bite, yet none of them would say positively just what the biting position of the insect really was.

During the summer of 1902 Dr. Herbert P. Johnson studied *Anopheles* for me near Newark, N. J., and kept a number of the insects in confinement, allowing them to bite from time to time, and of course watching the operation. I wrote him to the St. Louis University, where he is at present engaged, and received an answer as follows: "While I have not so distinct a mental picture of the operation as I would like to possess I am very confident he [Professor Washburn] is wrong. The biting attitude he mentions would be a most extraordinary one, and for this reason: it is obvious that the mosquito pumping apparatus must penetrate the epidermis before any blood can be drawn and the epidermis is made up of many layers of cells. To thrust its lancets in obliquely is evidently to encounter more resistance, do more work, and with less prospect of success than to thrust vertically through the many layers of cells of the epidermis. If there is an easy way of doing a thing, nature does not ignore it for a more difficult way. The only way in which *Anopheles* could introduce its bill vertically and still keep it in line with its body, would be for the body to assume the vertical position, which I have never seen it do. It is always somewhat oblique."

Mr. Henry L. Viereck, who spent the entire summer at Cape May for me and who especially studied *A. crucians*, writes: "In biting *Anopheles crucians* stand like *A. punctipennis* as shown in Berkeley's figure 17; that is, with the body and beak nearly in a straight line and at an angle somewhat greater than 60° to the surface. The disposition of the legs during the act I can not recall exactly, but I feel quite sure they were very much as in the figure I have referred to."

These communications were hardly satisfactory and we looked up every reference that was available, only to find that no one who