

Among accessory apparatus will be found that used by Messrs. W. H. Dallenger, and J. J. Drysdale, M. D., for the continuous observation of minute organisms. Those who read the *Monthly Microscopical Journal*, know what valuable results were obtained by its use. Would that the faculty to make use of instruments could be sold to the many purchasers.

Microtomes, for cutting sections, are here in great variety and of all sizes. One with a marble basin larger than an ordinary washing-basin. In some of the microtomes the knife is fixed and worked by a piece of mechanism like a lathe rest, such as that made by W. Apel, mechanician to the University of Göttingen. In another microtome the preparation is pressed forward by a micrometer screw, against a circular knife, set in motion by a lathe. This instrument is from the University of Prague.

United States opticians and manufactures are totally unrepresented, which is much to be regretted, as in this section they could have made an excellent show, — perhaps have carried off the palm.

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#### MIMICRY IN BUTTERFLIES EXPLAINED BY NATURAL SELECTION.

**F**RITZ MÜLLER, whose contributions to science are always worthy of special attention, endeavors in a recent German periodical<sup>1</sup> to show how the phenomena of mimicry in butterflies may be explained by the theory of Natural Selection. He bases his inquiries upon the species of *Leptalis* found in southern Brazil, and although, as will appear below, he adduces reasons for believing the primitive stock to have been banded, and not like most of the family to which this genus belongs, simple white butterflies, he commences by showing how even such an extreme change could be wrought out by the survival of the fittest in the struggle for existence.

“Should,” he remarks, “the first unimportant variations from the original white color (of the Pierids) be useful only in attracting to their possessors, at a little shorter distance, the attention of enemies flying carelessly overhead, they would become more and more useful, and cause their possessors to become continually more abundant in proportion to the type; they could therefore serve as the basis for the gradual formation of a resemblance fit to deceive even the sharp eyes of birds scanning the swarms of *Ithomias* (the butterflies imitated by some *Leptalids*) for booty.”

<sup>1</sup> *Jenaische Zeitschrift für Naturwissenschaft*, x. i., February, 1876.

Farther on he asserts that "the acceptation, as the starting-point in the origin of mimicry by natural selection, of a resemblance having its beginning at such a distance can scarcely be shaken by a single known case. It should, moreover, not escape attention that the sharp-sightedness of enemies is itself also a quality at first gradually acquired in the struggle for existence, and one which must increase, from the very fact that by protective coloring, mimicry, etc., the persecuted species escapes the less sharp-sighted pursuer. This ever-increasing sensitiveness and sharp-sightedness of the pursuer on the one hand explains the wonderful completeness of many natural imitations, and on the other makes the acceptation of an originally very slight resemblance the less hazardous."

Fritz Müller insists, as all writers on the subject have done, upon the similar geographical distribution of the imitating and the imitated species as a necessary concomitant of mimicry; but instead of believing with other authors that the *Leptalids* have become poor flyers in their imitation of the feeble-winged *Ithomia*, he holds that the wretched powers of flight possessed by the species of *Leptalis* have been the very cause of mimicry; the insects needed mimicry the more the poorer flyers they were.

Mimicking species of course stand between their original type and the mimicked species; and since mimicry is often confined to the female, we should expect in such cases to find the following series: original form, male of mimetic species, female of same, species mimicked.

In his vicinity, Müller has found five species of *Leptalis*, of which only four are common, and are discussed by him. Of these four, *Lept. Melia* mimics nothing; all the other three are imitative species and mimic distinct groups of butterflies; *Lept. Astynome* resembling a Heliconian-like Danaid, *Mechanitis Lysimnia*; another, which he calls *Lept. Thalia*, mimicking an Acraean, *Acraea Thalia* so closely, that Müller at first supposed it to be an Acraean; and the last, *Lept. Melite*, bearing a close resemblance to the female of one of its own family, *Daptonoura Lysimnia*.

A comparison of the form of the wings of these different insects shows the following series:—

- (1.) *Pieris* or *Daptonoura*, *Mechanitis Lysimnia*, *Leptalis Astynome* ♀, *Leptalis Astynome* ♂, *Leptalis Melia*.
- (2.) *Pieris* or *Daptonoura*, *Acraea Thalia*, *Leptalis Melia*.
- (3.) *Pieris* or *Daptonoura*, *Leptalis Melite* ♀, *Leptalis Melite* ♂, *Leptalis Melia*.

In all these series, *Pieris* (or *Daptonoura*) stands at one end and *Leptalis Melia*, a banded species, but one which, as already remarked, does not imitate any other butterfly, at the other. The mimicking species always stand between the species they imitate and *Leptalis Melia*, and where there is a difference in the sexes, the females resemble most the imitated species, the males *Leptalis Melia*. From this Müller reasonably urges that the original *Leptalis* stock, from which the mimicking species were derived, was allied to *Leptalis Melia* rather than to a *Pieris*, or *Daptonoura*, and that therefore, at the very start, natural selection had the advantage of finding a pliable stock already resembling not a little the bird-shunned *Ithomias*.

From this he proceeds to a comparison of other relations between the mimicked species, the mimicker, and the non-mimicking *Leptalis*, and discovers that in every instance, and in each particular, the mimicking *Leptalis* stands between *Leptalis Melia* and the mimicked Danaid, Acræan, or Pierid; even in one instance the venuration of the mimicking species is decidedly altered, showing how seriously the structure may be affected by mimicry. Müller studies separately the form of both fore and hind wings, the pattern and coloration of all, entering into many very interesting details, and elucidating the different points by the aid of simple but sufficient illustrations, which our readers will find well worth examining.



## PROGRESS OF ORNITHOLOGY IN THE UNITED STATES DURING THE LAST CENTURY.

BY J. A. ALLEN.

EARLY PAPERS.

PRIOR to the year 1808, when the first volume of Alexander Wilson's great work was published, little had been written on American birds by Americans. A few lists of the birds of limited portions of the United States that appeared during the last fifteen years of the eighteenth century constituted our whole ornithological literature at that date. The first of these was a list of about one hundred and twenty species, published by Thomas Jefferson in 1787, in his celebrated Notes on Virginia. This is a catalogue of the species described by Catesby, with the addition, in parallel columns, of the Linnæan and common names, and of the popular names of a few species not described by Catesby, — merely a nominal list of no special importance. This