

alten Lebensbedingungen wandert die Art in ihre früheren Flugplätze zurück, ohne Vertreter in den Notwohnsitzen zurückzulassen. Die Möglichkeiten zu 2 und 3 werden sich nicht selten kombiniert finden. Von dem einen Notwohnsitz aus wird eine Rückwanderung erfolgen, von dem anderen auf Grund von mehr oder minder zufälligen Ursachen nicht. Möglich ist auch, daß von demselben Ort aus einige Stämme zurückwandern, die anderen zurückbleiben. Hier stoßen wir auf eine der Grundlagen für die Bildung von Rassen, vor allem von Höhenformen. Der unter 1 erwähnte Fall gänzlichen Unterganges einer Art bringt uns die wichtige Erklärung für die oft erhebliche, nahe Verwandtschaft anscheinend ausschließende Verschiedenheit bei im System jetzt nebeneinander stehender Erebienarten. Die Zwischenglieder sind eben ausgestorben. Bei dieser Annahme brauchen wir dann nicht zu oft unsere Zuflucht zu der Unterstellung sprunghafter Entwicklung oder gar wiederholten Eingriffes einer Schöpfermacht zu nehmen. — Es würde den Rahmen dieser Arbeit überschreiten, wenn ich hier irgendwelche Hypothesen ausklügelte, wie die einzelnen Eis- und Zwischeneiszeiten die Erebien beeinflußt haben. Allein wesentlich erscheint die teilweise oben schon gemachte Feststellung, daß in den Fluggebieten der Erebien sowohl vor Beginn der ersten Eiszeit, wie in der letzten Zwischeneiszeit ein wesentlich wärmeres Klima geherrscht hat, wie heute, und daß nach der letzten, der Würmeiszeit, also vor etwa 25 000 Jahren, das Klima zunächst ein rauheres war (Steppenklima nach HORMUZAKI) und erst allmählich milder geworden ist.

(Fortsetzung folgt.)

Mimikry.

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(conclusion.)

A still greater complexity is exemplified by the relations between different species of *Planema* and various forms of the marvelously polymorphic species *Pseudacraea eurytus* which closely resemble the species of *Planema* peculiar to any area in which they are found. It has been found that on different islands of the Sese Archipelago in Lake Victoria the proportions of the species of *Planema* vary, the predominance of one species being reflected in the corresponding forms of *eurytus*.

The islands are so close together that it seems out of the question that environmental differences could cause these differences in the butterfly fauna, but there is a more convincing point still. Collections of large numbers made on one island in 1914 and 1918 showed that when *Planemas* outnumber *Pseudacraeas* very greatly the standard of resemblance in the latter is very high, but that

when the *Planemas* are much fewer in number it appears as if their protective influence is not strong enough to keep the *Pseudacraea* true to type, and large numbers of forms intermediate between the typically mimetic forms are found.

Sundry papers by the writer on this subject may be found from reference 7.

The several species of *Planema* may have both sexes alike or quite different, and yet in *one species of Pseudacraea*, as has been proved by breeding, forms may occur of either sex, or alike in the two sexes, according to the species of *Planema* they so closely resemble. How can this varying form in one locality be ascribed to coincidence? The conditions which are supposed to have produced several different species of *Planema*, by acting on *one species of Pseudacraea* have produced the same appearances as in the *Planema*, the males sometimes being like their females, and sometimes different; yet all occurring in the same locality and all capable of arising from eggs laid by one female.

It must not be thought that Professor HEIKERTINGER is being charged with the crude suggestion that colour and markings are merely a kind of picture of the climate, soil, humidity, food. etc.; a criticism which he takes pains to meet in advance. His point is that environment cannot cause these modifications but that tendencies to develop along similar lines will be most likely to be successful in similar environment. Therefore, if there are any independent similar directions of growth, or convergence, they must appear most frequently in animals of the same habitat. This does not seem to help us much: it is assumed that a tendency exists but how can such a tendency be proved? The experiment of putting organisms with the supposed similar tendency into a new environment has been done by nature in the case of *cynorta* and *epaea* in Abyssinia, with the results that have been discussed above.

HEIKERTINGER says that his argument is so simple: it does not seem quite so simple to the writer. Let us contrast two cases. A large group of soft-bodied beetles, the *Lycidae* is distributed all over the warm parts of the world, and wherever Lycids occur they are resembled by insects of other orders, which reveal the same simple orange, or red, and black, coloration. These colours however have been laid down during the larval stages of the insects which are spent in very different habitats, and receive utterly different types of food. Yet all agree in the adult stage in resembling Lycid beetles, even being modified in some cases in superficial form, but not in anatomical characters, to agree with the shape of the *Lycidae*.

On the other hand consider the large population of insect larvae that feeds within a dead tree-trunk, on approximately the same food and under comparatively similar conditions of temperature and humidity. How different in appearance may be the adult insects which emerge.

Professor HEIKERTINGER in this paper draws all his conclusions from butterflies alone: his emphatic statement that butterflies are not attacked by birds to a degree of selective value therefore is of no force if mimetic insects of other orders are considered. If butterflies are left out of consideration altogether mimicry is not affected as a problem to be explained: there are other vertebrate enemies, and other insects, observations on which, indicating selective preferences, can be found in publications. But it may be pointed out that there is being accumulated real evidence of the attacks of birds upon butterflies as shown by the imprints of beaks upon the wings, and many specimens are available for inspection in the Museum of the University of Oxford. Such specimens, being imperfect as a cabinet exhibit, are not to be expected from the hands of professional collectors and are rare in museums, but now that it is known that they have a scientific value it is hoped that collectors will look out for them. Records will be found in the publications of the Royal Entomological Society of London especially during recent years.

Fault is found with the hypothesis of Mimicry for not explaining the origin of colour and markings, and especially in the species claimed to be models. Why should it be asked to do so? According to the hypothesis Mimicry results from the operation of Natural Selection upon material offered to it by Variation. The problem is in two parts: I Production of Variations II The action upon these variations of Natural Selection; it is the latter half of the problem with which Mimicry deals. The origin of the patterns and colours is a problem for the physiologist and geneticist.

Finally, the theory of Mimicry is disposed of altogether by the argument that thousands of forms exist which are not mimetic. A similar line of argument would demonstrate that evolution cannot have occurred because primitive forms like *Peripatus* still exist in the presence of more highly developed species, or that wings cannot have been developed as advantageous variations because not only have many insects never developed them but some, descended from ancestors that had acquired them, have even lost them again.

Professor HEIKERTINGER does not attempt to deal with such interesting facts as the following, which are well known to all field observers and are in accord with the demands of the theory of mimicry.

How is it that the particular insects which are resembled by others are so often bold and sluggish in demeanour, allowing themselves to be captured, and proving to be tough and resistant to injury to a degree far exceeding that shown by the insects which resemble them?

Why do they so often gather together in masses whereby their conspicuousness is greatly increased?

Why do we not find typically bark-like or leaf-like or stone-like

insects possessed of the power of exuding bright-coloured or strongly smelling or even corrosive fluids, while insects that do so are usually possessed of the attributes mentioned in the preceding two paragraphs?

The divorcing of the case of Mimicry from other closely allied phenomena and the application of arguments to it alone rather hinders than aids the study of it: the writer has long been convinced that the phenomena fall into line with many others for the whole of which no explanation so suitable as Natural Selection has yet been found.

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Insektenvorkommen in Ankara.

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(Fortsetzung von S. 283, Jahrg. 1934.)

Es sei hier nur kurz festgestellt, was die Papilionidenfauna Ankaras in ihrem Verhältnis zu der in andern gleich gearteten Biotopen bedeutet. Wie sich die *Papilio* s. s. vertreten durch *machaon* und *alexanor* verhalten, haben wir bereits charakterisiert. Für den ersteren, den *machaon*, stellt Ankara ungefähr den Mittelpunkt des südlichen Zentralteils in seinem Vorkommen dar; *alexanor* zieht sich in einem dünnen Streifen an der Nordküste des Mittelmeers entlang. Die *Cosmodesmus*-Gruppe, durch *podalirius* vertreten, überdeckt das ganze gemäßigte Europa und Asien bis Tibet. Bei allen dreien dürfen wir somit ganz typische Formen erwarten und würden schwer verstehen können, wenn sich, ohne daß auffällige topographische Außergewöhnlichkeiten in die Augen fallen, in Ankara besondere Abweichungen von den jeweiligen Typformen finden ließen. Danach dürften sich die oben genannten »Abarten«, »Rassen«, »Lokalformen« usw. mehr als Zufälligkeiten und damit als nicht sehr belangreich erweisen. Die anderen Papilioniden-Genera, die dort vorkommen, verlangen aber, von einem anderen Gesichtspunkt aus betrachtet zu werden. Vor allem die *Thaïs*.

Niemand wird verkennen, daß die Gattung *Thaïs* einen besonders eigenartigen Tagfaltertyp darstellt. Steckt in einer Ausstellung aller europäischen Rhopalozeren eine *Polyxena*, so strahlt ihr Bild

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