

observed dissociation. Such an effect can perhaps be understood from a theory on the predissociation of polyatomic molecules, as has been pointed out by Franck, Sponer and Teller<sup>2</sup>. According to these authors the spectral range of predissociation (which is identical with the range of the photochemically active light) even if quite small at low temperatures, can extend very much with increasing temperature. Thus at a high temperature the light of the hydrogen lamp, being photochemically active over a much wider range than at room temperature, could produce an appreciable decomposition of SO<sub>2</sub>.

A more detailed paper on this subject will appear shortly.

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<sup>1</sup> *Leipziger Vorträge*, 1931, p. 131.

<sup>2</sup> *Z. phys. Chem.*, B, 18, 88; 1932.

<sup>3</sup> *Martin and Jenkins, Phys. Rev.*, 39, 549; 1932.

### 'Protective' Adaptations of Animals

ON the subject of "ant-mimicry" Mr. Uvarov states<sup>1</sup> on McAtee's authority, "that more than three hundred species of American birds (out of the total number of about eight hundred species including non-insectivorous ones) feed on ants and some of them consume thousands of individuals." He does not seem to have noticed the consequences of McAtee's method in tabulating "the total number of identifications . . . from these stomachs, counting those of whatever degree, once for each time identified, irrespective of the number of individual specimens concerned"<sup>2</sup> (p. 7). Therefore a bird's stomach containing a single ant or a very small number, liable to be swallowed accidentally with other food, would lead to the obviously absurd conclusion that the bird feeds on ants. A woodpecker's stomach containing 2,000 ants (p. 93) supplies evidence which, on this system, is of no greater value than a stomach containing a single ant. It is much to be regretted that McAtee, with all this vast material before him, did not publish all the available data which would have enabled us to know more of the real and habitual enemies of ants as well as of other insects. Mr. H. B. Cott has done this work admirably in his paper<sup>3</sup> on the tree-frogs of the Lower Zambesi. Here we are given incontrovertible evidence that certain species regularly feed upon these powerful and aggressive insects. But who doubts that they have many enemies? Yet it will, I think, be clear to anyone who reads Mr. C. Elton's interesting paper on "Territory among Wood Ants", that insects mistaken for ants in Dr. T. G. Longstaff's bird sanctuary at Picket Hill would, on the whole, be benefited by the resemblance and that the chance of being eaten as an ant by the green woodpecker would be a risk well worth taking.

Those who maintain with Mr. Uvarov that because ants have many enemies there can be no advantage in the mimicry of ants might with even greater force argue<sup>4</sup> "that the danger would far outweigh the advantage of the well-known longitudinal stripes and green colour borne by grass-feeding larvae". Think of the larger mammalia whose existence is bound up with the grasses. How dangerous to resemble grass when such quantities are eaten at a single meal by these huge animals!

So far from the following line of argument, advanced

in 1898,<sup>6</sup> bearing the "aspect of a beautiful fairy-tale" I believe that it is reasonable and will not be lightly dismissed. "When one insect resembles an ant by the superficial alteration of its whole body-form, another by the modifications of a shield-like structure which conceals its unaltered body, another by having the shape of an ant painted, as it were, in black pigment upon its body while all other parts are concealed [by colour]; another by a further modification of its body, so that it represents not an ant only, but the object which the ant is almost always carrying—when the effect of all these results is heightened by appropriate habits and movements, we are compelled to believe that there is something advantageous in the resemblance to an ant, and that natural selection has been at work".

I certainly did not allege in a former letter<sup>7</sup> that Mr. Uvarov had willingly misrepresented the opinions of others. On the contrary, I expressed the conviction that he would not willingly do so. Nevertheless his statement, "taken almost verbatim from the original paper", that "A common objection to this [McAtee's] method is that anything found in a bird's stomach would be in an unrecognisable state" is inaccurate and misleading. This supposed "common objection" is not the only rash and incorrect statement or inference in McAtee's paper. Others were criticised at the International Congress of Entomology in Paris last July in a paper which will appear in the forthcoming volume of *Proceedings*. Fellows of the Entomological Society of London and their friends will have the opportunity of hearing further criticisms at the meeting of December 7.

I trust that those who are interested in these important and far-reaching questions will carefully study Dr. F. Morton Jones's paper on "Insect Coloration and the Relative Acceptability of Insects to Birds", which will appear in the forthcoming part of the *Transactions of the Entomological Society of London*.

I cannot conclude without commenting on one other statement in Mr. Uvarov's letter. Referring to the "great problem of natural selection", he writes—"it is time that attempts were made to elucidate it by an unbiassed accumulation of facts". He does not appear to know that one of the greatest problems of natural selection, forming the subject of this correspondence, has been elucidated, and successfully elucidated, by the careful and unbiassed observations of many naturalists, during the past thirty-six years. I need only mention G. A. K. Marshall,<sup>8</sup> C. F. M. Swynnerton,<sup>9</sup> and G. D. Hale Carpenter<sup>10</sup>—naturalists whose work has been undervalued or altogether neglected by McAtee, and now by implication in the above-quoted sentence by Mr. Uvarov.

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<sup>1</sup> *NATURE*, vol. 130, p. 697, Nov. 5, 1932.

<sup>2</sup> *Smithsonian Miscellaneous Collections*, vol. 85, No. 7, Washington, 1932.

<sup>3</sup> *Proc. Zool. Soc. Lond.*, p. 471; 1932.

<sup>4</sup> *Journal of Animal Ecology*, Vol. 1, No. 1, p. 69, May 1932.

<sup>5</sup> *Zoolog. Anzeiger (Wasman-Festband)*, 1929, Akademische Verlagsgesellschaft m.b.H., Leipzig, pp. 79-86.

<sup>6</sup> *Linn. Soc. Jour.—Zool.*, vol. 26, p. 595; 1898. Figures illustrating the diverse methods by which the resemblance is produced are given on pp. 589-594.

<sup>7</sup> *NATURE*, vol. 130, p. 202, Aug. 6, 1932.

<sup>8</sup> *Trans. Ent. Soc. Lond.*, pp. 287-584; 1902.

<sup>9</sup> *Linn. Soc. Jour.—Zool.*, vol. 33, pp. 203-385; 1919.

<sup>10</sup> *Trans. Ent. Soc. Lond.*, pp. 1-105; 1921.