

Tenacity to Life in Insects

By Robert Cunningham Miller

THE unusual success of insects in the struggle for existence has been a subject of much discussion in scientific circles. Just why it is that these little creatures have survived the ravages of birds and other enemies, as well as the ingenious contrivances of man for their destruction, and form to-day the most numerous class of animals on the face of the earth, leaves a wide field for argument and conjecture. Two important reasons for this have been pointed out by naturalists, i. e., their prolificacy and their extraordinary adaptation to environment. Another just as potent reason, which has received less attention, is their amazing tenacity to life, many species being able to survive injuries which would cause almost instantaneous death in the higher forms of animal life.

The writer's attention was first particularly directed to this fact by observing the vitality of a moth, and this led to a further study of the same phenomena in other insects. The moth in question was caught by one of my assistants and, after being chloroformed in the usual manner, was brought to me. In order to make death doubly sure, I plunged a red-hot needle through its thorax and afterward mounted it upon the setting board. One evening, four days later, I looked at it again. It appeared quite stiff and dead, and I thought that it would soon be ready for the cabinet. Imagine my surprise the following morning to find that it had laid several dozen eggs during the night!

About the same time a similar thing happened with another moth of a related species. As the specimen appeared quite dead, I stretched it out upon the setting board and placed it away to dry. A few nights later I was awakened by a violent fluttering on the table where specimens were prepared for mounting, and, upon examination, found that the moth had revived, worked the pin loose from the board in its struggles, and beaten its wings to pieces in fluttering about.

Spiders also share this unusual vitality. I have in my collection a large trap-door spider who appeared as lively as ever for some days after being chloroformed twice and pinned through the cephalothorax.

Certain species of Coleoptera, such as the sacred beetle (*Ateuchus sacer*), are almost impervious to the effect of chloroform, and must be subjected to its fumes for several hours to insure death.

Some aquatic species of Hemiptera, particularly members of the family Belostomidae, can perform the ordinary functions of swimming and crawling for some time (occasionally several hours) after the head has been severed from the body. In this case, however, the motion is probably merely reflex nervous action, rather than an indication of conscious existence.

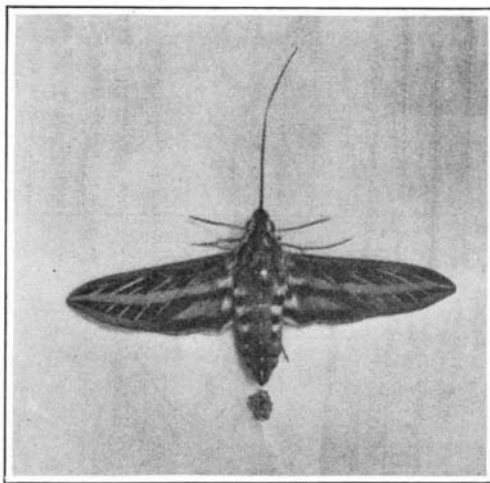
These examples certainly tend to prove that insects are liable to survive all ordinary accidents which are likely to befall them, and thus have a great advantage over the members of the animal kingdom which are more advanced in the scale of life. Entomologists know that it is quite common to find imperfect specimens of insects. In fact, it is almost the exception to find perfect specimens of certain kinds of warlike beetles and delicate-winged moths. Numerous tiger beetles are found with an elytron or two or three legs missing. Maimed crickets, the battered heroes of many a battle royal, are often caught in the collector's net. Bugs and beetles frequently escape from birds with the loss of several important appendages, and still live to destroy our trees and gardens.

After considering a few facts like these we cease to wonder that creatures which can live just as comfortably with one wing as two, with three legs as six, and even lay eggs after living five days upon a pin, have been the most successful in the struggle for existence and have come to surpass in numbers all other animals of the earth.

Physiological and Pharmacological Studies on Coal Tar Colors

THE action of the following dyes was investigated: Benzeneazo- γ -naphthylamine (Yellow AB), tolueneazo- β -naphthylamine (Yellow OB), benzeneazobenzeneazo- β -naphthol (Sudan III), benzeneazo- β -naphthol (Sudan I), benzeneazodimethylaniline (Butter Yellow), benzeneazophenol (Oil Yellow), benzeneazoresorcinol (Sudan G), and aminoazobenzene (Spirit Yellow); these were administered subcutaneously, intraperitoneally, intravenously, and by mouth to rabbits, and, in a few cases, to cats and rats. The effect of renal disturbance on the elimination of the dyes was determined by the administration of zinc malate and of chenopodium oil. It was found that the dyes were eliminated in the urine and in the bile, but that the elimination in the urine was usually inhibited in poisoning with zinc or chenopodium oil. The greater part of the dyes was deposited in the adipose

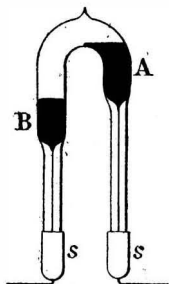
tissues; staining of the nervous tissue, the kidney, and muscle was also noticed in some of the experiments. Dye was still present in the blood 15 hours after the intravenous injection of 25 miligrams of benzeneazoresorcinol per kilogram of animal. Two of the compounds of benzeneazophenol and benzeneazoresorcinol, which were isolated from the urine of rabbits, proved to be conjugated with glucuronic acid. The toxicity of the various dyes was not pronounced even when large doses were administered.—*Note in Journal Society of Chemical Industry from a paper by W. Salant and R. Bengis in the Journal Biological Chemistry.*



A moth that laid eggs five days after being chloroformed and pinned to the setting board

A Cadmium Vapor Lamp

IN a recent issue of the *Electrician* is described a novel cadmium vapor lamp. It consists of a quartz tube, AB, shaped like an inverted U, terminating at each end in a thick walled capillary tube attached to a tungsten electrode, S. The chamber AB of the tube forms two unequal compartments, the smaller, A, connecting with the cathode, and the larger, B, with the anode. These contain a certain amount of cadmium, sucked in in a liquid state through the capillary tubes in order to free it from every trace of oxide or other solid matters which would make it adhere to the glass and crack the latter.



To put the lamp in service it is necessary to heat the tube over a Bunsen burner until the liquid metal is volatilized and an electric arc set up in the vapor formed.

The lamp is attached to a circuit of 100 or 200 volts in series with a resistance calculated to give a current of 5 to 7 amperes. The tension at the poles is about 30 volts.

Tone Reproduction in Photography and Its Limitations

THE possibility of obtaining a correct continuous tone reproduction, i. e., one in which the tone values bear the same relationship as in the original, is dependent upon the luminosity range of the object, the qualities of the plate used for taking the negative, and the quality of the printing medium. The total range of most subjects is less than thirty to one and this range is easily obtained on the "correct exposure" portion of a good negative plate. The total range of photographic papers, including the "under-" and "over-exposure" periods, varies from about sixteen to one with matt surface development papers up to fifty to one with glossy development papers, and reaches as high as two hundred to one with glossy P. O. P. The curves of a number of papers obtained by plotting logarithms of exposures against reflection-densities, are given. A special instrument was designed for measuring reflection densities, the paper surface being illuminated at 45 degrees and viewed at 90 degrees to avoid the interference of specular reflection. Curves are given illustrating the results obtained by reproducing through a given plate on to a given paper. It is easily seen that scientifically correct reproduction is not obtainable except for a very limited range and using only the

middle tones of both plate and paper. The problem as to whether scientifically correct reproduction is also artistically correct is then considered. Numerous facts are collated dealing with the sensitiveness of the eye under different conditions to lights of varying luminosity. The normal eye sees correctly over a range of about twenty to one in bright diffused daylight and approximately correctly over a range of about one hundred to one. Outside these limits—from ten thousand to one million foot-candles luminosity—departures from correct seeing are increasingly greater, a given range of luminosities appearing less than it is. The exact relationship which should exist therefore between the range of luminosities in the original and the range of tones in the reproduction is dependent upon the actual values of the former and also to some extent on the conditions under which the reproduction is to be viewed. The varying qualities of plates and papers give the photographer a certain control over this relationship which would be absent if the "correct-exposure" portion were the whole of the characteristic curve.—*Note in the Journal of the Society of Chemical Industry from a lecture by F. F. Renwick in Phot. Jour.*

Antagonistic Action of Salts in Plants

IN the author's experiments natural conditions were attained by growing the plants (maize) in earth contained in pots with perforated bottoms through which the roots passed into the prepared solutions below. Under these conditions solutions of the chlorides of sodium, potassium, and magnesium and magnesium sulphate, above certain concentrations, were strongly poisonous, calcium chloride to a much less extent. Even with concentrations of 3–25M the toxic action of sodium and potassium chlorides was annulled by the addition of only 10 c.c. of calcium chloride solution (3–25M) to 1138 c.c. of their solutions; the magnesium solutions required considerably more. The antagonism found by Osterhout between sodium and potassium chlorides, and between sodium chloride and magnesium sulphate was not confirmed with certainty, and in any case it is very small compared with that of calcium chloride. The calcium salts have a special function which can be undertaken by no other salt. The work of other investigators on this point, in particular that of Loew and Hansteen, is discussed. The contradictions there found may be explained on the ground that these authors drew their conclusions from quite different plant types, and it is not permissible to generalize on results obtained from one species any more than to assume any parallelism in the antagonistic salt action in plants and animals. A feature common to all antagonistic action, however, is that it is a colloidal reaction, and the calcium ion undoubtedly has a special function in this respect, both in the animal and vegetable kingdoms. In practical agricultural investigations, when the plants are growing in the natural soil, great difficulties, underestimated by Loew and his collaborators, are experienced, particularly since sufficient knowledge is lacking of the way in which the roots exert their functions.—*Note in Journal Society of Chemical Industry on a paper by J. G. Maschhaupt in Verslag, Landbouwkund, onderzoek.*

Cork Fabric for Featherweight Raincoats

CORK fabric is a recent French production, the result of a new French process. It is waterproof, a non-conductor of heat, and unbreakable. By using a special machine, thin slices of cork of an even thickness are obtained from a block of cork. The slices are placed in chemical baths in order to remove the resinous parts, which make cork a more or less brittle substance. Upon their removal the cork sheets become flexible, and may be compared in this respect with thin leather. In fact, the sheets can be folded and bent without breaking. By combining the cork sheets with any suitable cloth, preferably a thin and strong cloth of good color, an excellent waterproof material is obtained. An adhesive preparation is employed to glue the cork to the cloth; or, if a stronger garment is desired, the cork sheets are placed between two layers of cloth.

A Gas Pressure Reducer

IT often happens that the gas supply in the mains is at a too high pressure to be used with economy in gas stoves, and in any case there is danger of using considerably more gas than is really needed, so that a device for reducing the pressure will prevent waste of gas in quite a number of cases. A simple device of this kind has one end connected by hose to the mains, while the gas comes out of the other end and goes by a second hose to the burner. Between the high and the low pressure sides is placed a partition containing a set of fine holes, so that the gas can only pass through at a reduced rate, and this is found to lower the pressure very effectively.