

# Catalepsy in Insects

## Experiments Showing How Insects Pass Periodically into a Trance

By Percy Collins

RECENT experiments with a species of Phasmid, conducted by Peter Schmidt, Privat Dozent of the Imperial University of St. Petersburg, have brought to light the astonishing fact that these insects pass periodically into a state of catalepsy or trance. The species in question (*Carausius morosus*) is a native of Northern India and Afghanistan, but for some years past it has been bred extensively in the laboratories of Europe. It is exceedingly prolific, and is thus well adapted for purposes of experiment. In common with most other *Phasmidae*, its form is slender and stem-like, according in a remarkable manner with the twigs and branches of the plants upon the leaves of which it feeds. Its habits are almost exclusively nocturnal. During the daytime it rests motionless in a characteristic attitude—the fore legs being brought close together and extended in a line with the body. In this pose its stick-like form and green color combine to vest it with a most perfect concealing resemblance to its surroundings.

In the past, the long hours which this and certain other insects pass without evincing the slightest sign of animation have been regarded as periods of normal

without disturbing their death-like slumber. Schmidt points out that these results are entirely in accord with what we know of cataleptic phenomena in general, viz., that the subject does not feel pain, and that the muscles are not susceptible of fatigue. He also emphasizes the fact that the cataleptic state in Phasmids arises naturally, and from unknown *inner* causes. When in an active condition, the insects cannot be hypnotized artificially, as can be done with rabbits, crayfish, etc. For this reason he calls the phenomenon "autocatalepsy." He adds that from a biological standpoint the cataleptic state may be regarded as an accommodation to a highly developed protective resemblance. The insect becomes in no small degree a part of its environment, and completely subject to external factors. It is, for example, swayed by the wind, just as if it were really one of the stems among which it rests.

In order to awaken these Phasmids from their hypnotic slumber, prolonged excitation of the nervous system is needed. This may be effected mechanically by pinching the extremity of the abdomen with forceps, or by electric shocks from an induction coil. It is noticeable, however, that the stimulus must be very strong

with Huntington's Chorea. There were also 10,050 trait-surname cards in the files. These enabled the students to find all the data in the office on a given trait, classified according to surnames (the maiden names of married women are always used when available). There are now 8,655 trait-locality cards. These enable one to locate readily all the data in the files of the office on mechanical geniuses in Connecticut, or any town or city in that State, or on feeble-mindedness in Rockland County, New York, and so on. There are also 8,655 locality-trait cards, which collection performs, as its name indicates, the function of tracing the history of traits possessed by the families of a given locality. It is a sort of inventory of the blood of the community. Then there are the surname locality cards, and the locality-surname cards both numbering 8,150. The first constitutes a directory of the geographical distribution of a given family and the second serves as a directory of family names of a given community.

On January 22nd, 1913, there were on file in the Eugenics Record Office seventy-seven requests in which intelligent persons asked for instructions for making a study of the eugenical fitness of a contemplated mar-

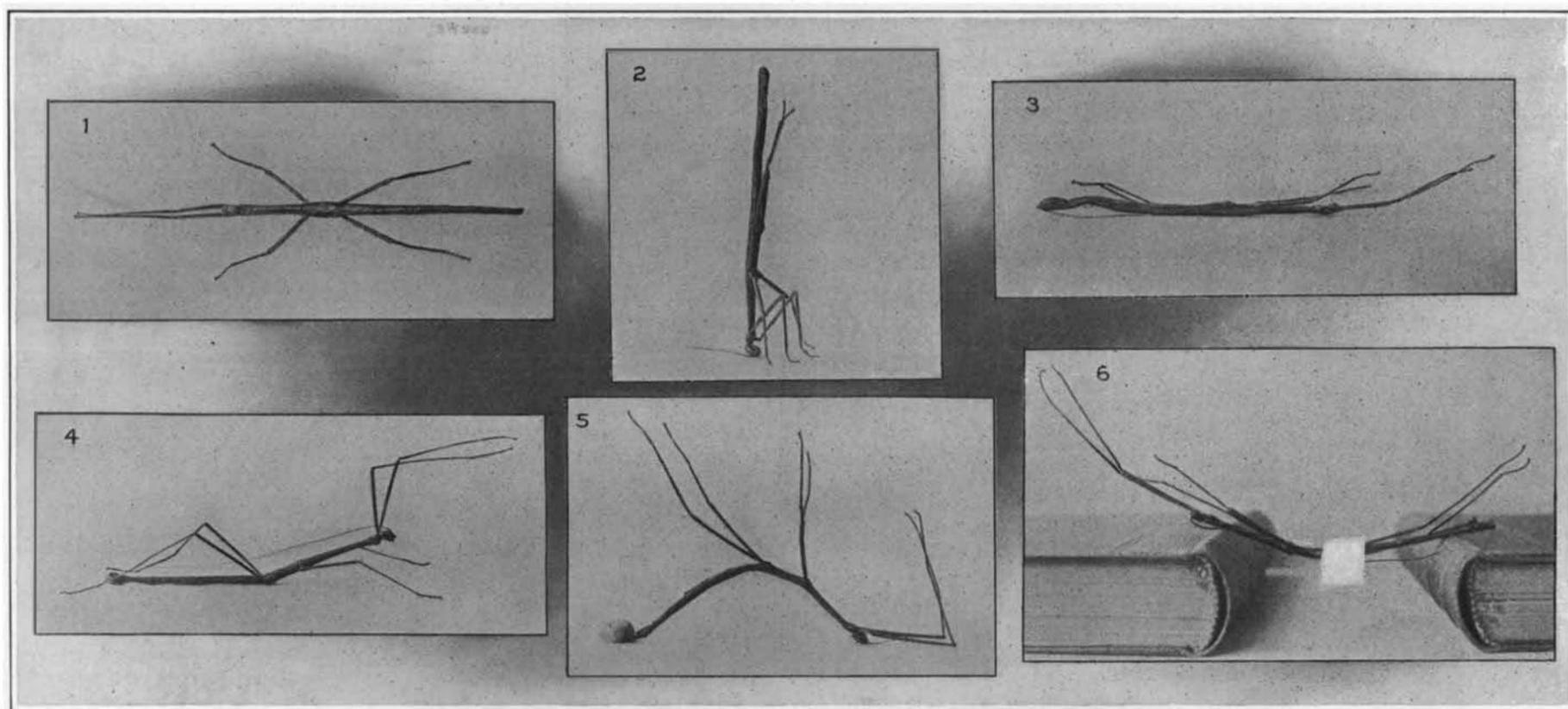


Fig. 1.—Normal resting attitude of the insect *Carausius*. Fig. 2.—Standing on its head. Fig. 3.—Extended on its back. Fig. 4.—Nautis, or seahorse-like pose. Fig. 5.—What Prof. Schmidt calls the wrestling "bridge." Body bent and supported by small stone. Fig. 6.—Insect as bridge between two books. Its body weighted by means of paper slips.

### Catalepsy in insects.

slumber, or as due to instinctive promptings calculated to enhance the protective value of the creature's physical endowments—such as its shape and coloration. But Schmidt has demonstrated that the quiescent condition—at least in the case of *Carausius*—is the outcome of catalepsy. All his experiments have shown that the muscles of the insect are in that state which physiologists term *flexibilitas cerea*, i. e., wax-like flexibility. They are strained, but not extremely so, and if they are further stretched, they remain in the new position. Exactly the same state of the muscles is observed in the case of catalepsy or "hypnosis" in the higher animals, and in mankind.

Schmidt found that he was able to arrange the Phasmids, when in a cataleptic state, in uncouth and abnormal poses, and that they would subsequently remain absolutely motionless for long periods of time. For example, he placed some on their heads, and they remained thus for as long as four and a half hours. Others were poised bridge-wise between two books, the middle area of the body being weighted by means of paper slips to such an extent that the whole insect became bow-shaped. Even more remarkable was the posture which Schmidt designates the "wrestling bridge." This, as well as numerous other strange attitudes were maintained by the Phasmids for one or more hours; nor was it possible to detect the slightest sign of fatigue or even of vitality. Finally, some of the insects were subjected to the ordeal of mutilation; and it was found that their legs, antennae and heads might be cut off, and their bodies sliced into fragments,

or long continued to be effective. In normal circumstances the insects regain animation at the hour of twilight, probably as the result of stimuli connected with the processes of nutrition, though of this nothing is certainly known.

In conclusion it remains to be said that the remarkable results which have attended Schmidt's experiments should induce many students to undertake similar investigations. If one species of Phasmid is subject to cataleptic seizures, then in all probability other species will be found to exhibit like phenomena. Moreover, it may well be found that the protracted periods of quiescence which many insects periodically sustain are really instances of catalepsy. This may be the case, for example, with the strange, stick-like caterpillars of the geometrid moths whose habits resemble so closely those of the *Phasmidae*. Again, it has already been shown experimentally that a pin may be passed through the body of a sleeping moth without awakening it. Surely this suggests that the insect is not merely reposing, but rather that it is in a cataleptic seizure.

### The Progress of Eugenics

DURING the past twenty-seven months more than 2,400 persons have exchanged letters with the Eugenics Record Office of Cold Spring Harbor, N. Y., on matters concerning some phase of eugenical studies. Up to January 20th, 1913, there were ten thousand and fifty surname traitcards in the files of the office. These are for use in locating all persons of the same surname with the same trait—as for example, all the Smiths

riage, all of which letters were received within a space of four months.

Of late the subject of eugenics has become a popular one for newspaper discussion. Unfortunately the American reporter does not trouble himself to find out the truth concerning the aims and methods of eugenical study. Anything even remotely related to sex hygiene, infant mortality, birthmarks, baby culture, sex control, prenatal influence, or to the care, "cure" or treatment of defectives, is given a heading entitled "eugenics"—this or that. Some day they will learn that it is only one of the sciences devoted to the promotion of human welfare. Eugenics is no more concerned with defectives than with genius. Both are legitimate objects of eugenical study. Eugenics does not seek to undo or to modify one's traits—that is a task for the educator—but it does seek to prevent in the future eugenically unfit matings. It is not—as one paper recently called it—"the latest social upheaval." It does not propose to undermine the existing social and moral order, or to destroy love, but its programme does call for the eugenical education of the intelligent classes and for the intelligent management of defectives.

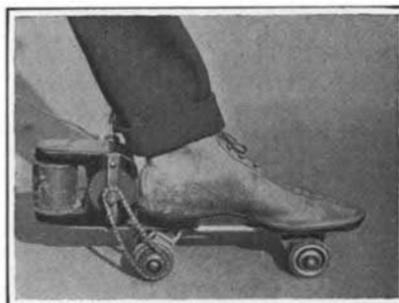
Funds for the Mawson Expedition are now probably sufficient to complete its work and bring the explorers home, the Commonwealth of Australia having just added £5,000 to its previous donations. The press report recently published to the effect that Mawson and his companions had been brought away from Adelie Land was erroneous.

### Motor Roller Skates

ONE of the interesting novelties to be seen at the recent electrical show at the Grand Central Palace, New York, was a pair of motor roller skates, adapted to be driven by electricity obtained from a battery carried by the wearer of the skates. The inventor of this machine demonstrated the practicability of the skates by making exhibition runs around the building and also on the sidewalks outside. As shown clearly in the photograph, each skate is provided with an extension to the rear, on which is supported a small two-pole motor. The armature shaft carries a sprocket pinion, which is connected by chain to a sprocket wheel on the rear roller axle of the skate. The motors may be connected to one or both cells of the battery as desired by means of flexible wiring. Our illustration shows the two cells of battery supported by a strap running over the skater's shoulders. However, in the preferred form the battery is strapped to the back of the skater. Current to the motors is controlled by two button switches, one for each motor, so that the skater may conserve his battery by cutting out one or the other skate, depending upon which is idle. It will be understood of course that the skater may merely stand on the skates, letting them be propelled by the motors, or he may skate on them in the ordinary way, using the motors to give him a much greater speed.



Electrically driven roller skates.



How the motor is mounted.



The "egg" in the Giants Causeway.

of wooden crosses with a short mast or pin projecting from the junction of the cross. To provide a good bearing on the glass, each arm of the cross is shod with a strip of rubber. Usually four of the wooden crosses are used on a window, but the number and position depend upon the size of the pane. When the wires are stretched across, both inside and outside of the window, they convert the window pane into a truss which is greatly strengthened against the explosion waves.

### The "Egg" in the Giants Causeway

MANY of the readers of this article have visited that strange formation in the north of Ireland known as the Giants Causeway, so called on account of a legend that a Scotch giant boasted that, did he not have rheumatism, he would cross to Ireland and destroy the pretensions of a certain Irish giant. Erin's giant showed his disbelief in this by building a causeway so that his rival for pugilistic honors could come over without wetting his feet. The battle resulted in defeat for the visitor, whose boasting ceased, and the part of the causeway in the sea, now no longer needed, was destroyed. Up high in the cliff, past the part usually visited by tourists, is the "egg" pictured herewith. What part this had in the argument is unknown. It is a large round stone about two feet thick and four feet long, and is inclosed in a shell of material resembling lava. Around this shell is another of similar material. Part of both shells are broken away—probably by slides of rock—revealing the stone inclosed therein long ages ago.

### A Convertible Touring Car Tractor

IN the present enlightened age, agricultural tractors are comparatively common and they bid fair to be still more common in the not far distant future. Also, ordinary touring cars are very common, though it is very seldom indeed that one encounters a vehicle in which the cardinal features of both are combined. Manifestly, it is not easy to combine a touring car and a farm tractor in one vehicle and to do so without sacrificing the advantages of either in its respective sphere. And yet that is exactly what has been done by a western manufacturer, and the result is shown by the accompanying illustration.

The car, it may be seen, is an ordinary every day touring car—when the great tractor wheels are left off, of course. The only alteration in it that has been made consists of the addition of a pair of spur gears to the hubs of the driving wheels. These spur gears mesh with much larger gears on the tractor wheels, and with the automobile in "high gear" and a single reduction at the tractor wheels, the speed of the machine is four miles an hour; there is a second speed reduction, for heavier hauling, which gives a maximum speed of only two miles an hour. The whole tractor mechanism is quite separate and distinct from the automobile proper and is merely bolted in place when the farmer desires to convert his pleasure vehicle into a working vehicle. Because of the slow rate of progress and the heavy work imposed on the engine, an auxiliary water tank, to insure proper cooling of the cylinders, is carried. A power shaft for stationary work also is provided.

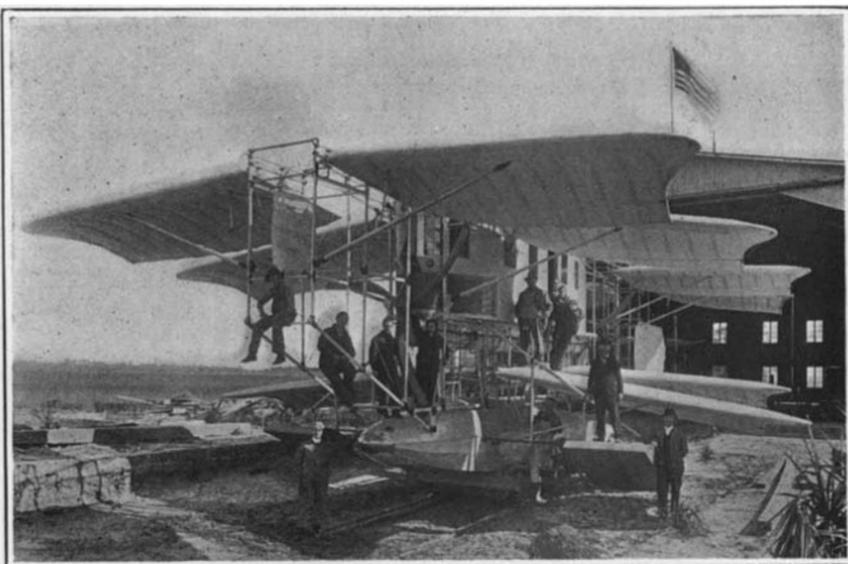
This novel touring car tractor is designed to draw, and actually does draw, three sixteen inch plows in soft or wet ground, and, it has been estimated, replaces from six to nine horses.

### Protecting Store Windows from the Shock of Blasting

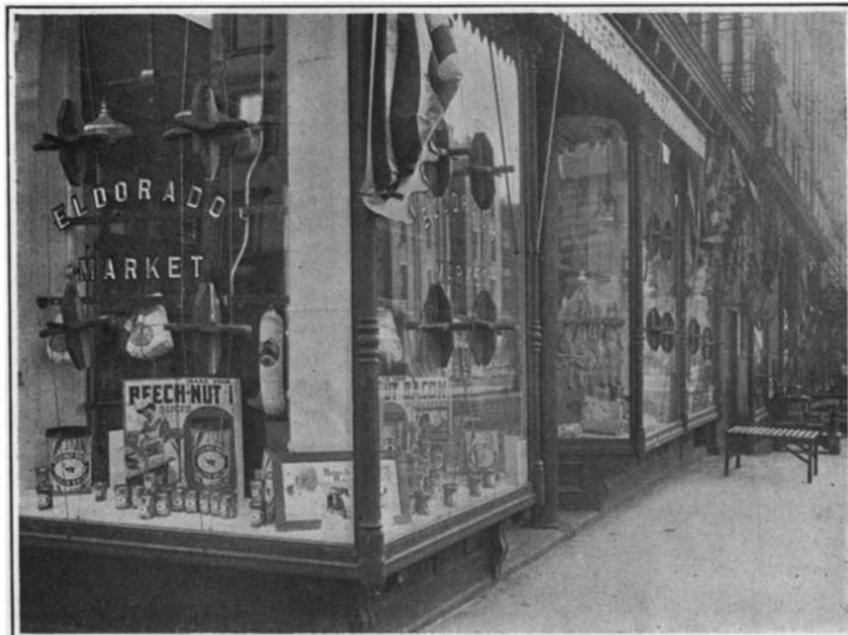
IN excavating for the new subway running up Lexington Avenue, New York, a large quantity of rock has had to be blasted. The shock of the dynamite explosions has worked havoc with plate-glass store windows along the line, and the contractors have found it necessary to reinforce the windows. This has been done in a very effective way by the use of wooden supports on each side of the glass, which serve as spreaders for wires that run across the glass to opposite sides of the window frame. The spreaders consist



A motor car converted into a tractor.



A two and one half ton hydro-aeroplane built to fly across the ocean.



Store windows reinforced to protect them from the shock of blasting.

### An Aero Yacht

AN enormous flying machine has recently been completed at Dutch Island, near Savannah, Georgia, by Capt. Matthew A. Batson, United States Army, retired. The construction of the machine occupied seven months, and it cost \$50,000. It weighs 5,000 pounds, and the inventor of it claims an additional lifting capacity of two tons. The machine is equipped with twelve large wing planes, one pair having a spread of 39½ feet, and four pair with a spread of 37½ feet, while a sixth pair has a spread of 30 feet. The wings are peculiarly designed with the purpose of guiding the air currents inwardly toward the body of the machine and there banking them under the base portion of the wings, which are concaved underneath and carried back along the chassis, so that the currents of air are conducted along the parts nearest the chassis. Any wing or set of four wings or all twelve may have their angle of incidence changed at the will of the pilot by the turn of a wheel while the machine is in full flight. The machine is equipped with three Emerson aeroplane engines, of six-cylinder type, installed in the floor of the pilot house. Combined, these engines will supply 350 horse-power, driving the propellers at 1,000 revolutions per minute. Any one of the engines may be thrown out of or into action by the operation of a clutch. The cabin of the machine is 27 feet long, and is constructed of cypress paneling ¾ of an inch thick, over which is a covering of canvas. The lifeboat is made of three-ply cypress and ash with inter-layers of canvas. The length of the machine is 74 feet and of the boat 33 feet. It is by far the most elaborate hydro-aeroplane ever attempted. The inventor expects to fly across the Atlantic in this machine. We have yet to learn what it will do in flight.

**A Mineral Prospecting Apparatus.**—Benjamin Andrews of Houston, Texas, has secured a patent No. 1,071,199 for a mineral prospecting apparatus which includes a bit and a double drill stem formed of two concentric pipes, air being forced down through the outer and into the inner pipe with the lower end of the inner pipe open and disposed to receive the material removed by the bit so it can be forced up through the inner pipe by the current of air.