each was capable of rotating (though with very great friction). When brought near each other they repelled each other forcibly. I experimented with these pieces for several minutes without perceiving any diminution in their electrification. Both sides of the paper seemed to be in the same condition. I then laid them down, and left the room to fetch a piece of sealing-wax to test the nature of the electricity. But by the time I returned, all trace of electricity was gone, and by no means could I repeat the experiment so as to get the slightest charge of electricity.

It is more than probable that the electricity was developed by the chemical action of combustion of the coals, and that the hot air rising up and brushing past the paper acted as a carrier of electricity of one kind to the paper, and of the opposite kind from it, until it acquired a very high potential. But it would be interesting to learn exactly in what manner this action takes place, and whether the electrification was positive or negative.

Andersonian College, Glasgow GEORGE FORBES

Strange Star.—Meteor

ON going out last Saturday evening about 8.55 P.M. my attention was arrested by a large deep red star in Serpens which I had never seen before. Its magnitude was greater than Arcturus, though its deep colour made it seem less bright. About ten minutes afterwards I saw it increase and diminish in magnitude two or three times producing the effect similar to a "flashing" light on the coast, after which it suddenly disappeared.

On the same evening, at 9.56, I saw a very fine meteor of a bright pale blue colour with coruscations of ruby colour at the nucleus. Its course was from Gemini over Aldebaran, disappearing below Pleiades. Of a long pine-cone shape, duration about three seconds. W. M.

Gunnersbury, March 19

SCIENCE IN GERMANY[1]

THIS book forms a continuation of the researches which in vol. i. treated of the season dimorphism as the result partly of exterior influences and partly of atavism. The present (second) volume comprises: (1) the origin of the markings upon caterpillars; (2) on the phyletic parallelism in metamorphous species; (3) on the transformation of the Mexican Axolotl into an Amblystoma; (4) on the mechanical conception of nature. The third treatise was published separately some time ago and was reviewed in NATURE; here we particularly wish to draw the attention of the lovers of natural science to the first paper. Weismann tries in the treatise in question to prove by his observations, and the deductions therefrom, that exterior influences and natural development or adaptation (Naturzuechtung) only can be the causes of the markings upon caterpillars. The observations referred to were made upon the caterpillars of several genera of *Sphingidæ*, and relate to the history of their development.

I. *Chærocampa*.—The caterpillars of *Ch. elpenor*, which have just left the ova, show no markings of any kind in this first stage, being of a uniform greenish colour; after the first change of skin (second stage) they show a bright longitudinal streak on each side, between the dorsal line and the line of breathing apertures (stigmata). To this first streak Weismann gives the name of "subdorsal streak." In the third stage eye-shaped spots form in the fourth and fifth segments, inside of these streaks, and these are completely developed in the following stages, *i.e.*, after the subsequent changes of skin, while at the same time the subdorsal streak decreases and leaves only imperfect traces. In the fifth stage the greenish colour changes to a brownish one, and the horn at the tail of the caterpillar becomes shorter. In the sixth and last stage the other segments begin to show eye-spots, but these are not developed to perfection. *Ch. porcellus* shows the same form and development of the larva, with the only difference that most of the phenomena occur one stage earlier than with *Ch. elpenor*. This conformity and accord of both genera in the order in which the markings upon the caterpillars appear and are developed, lead to the conclusion that the markings were acquired in the same order during the progress of development (phylogeny) of these caterpillars; the oldest form (*a*) therefore showed no markings at all even when perfectly developed; the following form (*b*) had only the subdorsal streaks; then in form (*c*) the eye-spots occurred in the fourth and fifth segments, and finally in all segments (form *d*). It is probable further, that of the two genera of caterpillars now living, *Ch. elpenor* is the original, *i.e.*, older form, on account of its still showing the different stages of development in their completeness; the younger or more advanced form, viz., *Ch. porcellus*, proves that each new marking, acquired during the progress of development, appears first in the later stages and then gradually extends to the earlier stages. The whole of this view is well supported by the markings upon the complete form of the other species belonging to the genus *Chærocampa*, of which the development of the larva is still unknown in its different stages. These other species may be divided into three groups, corresponding to forms *b*, *c*, and *d* of the phylogeny in such a manner that wherever the subdorsal streak remains in perfection, the eye-spots are not developed, and wherever these show themselves the subdorsal streak is decreasing. Form *a* (first group) is known in the full-grown caterpillars of three species (*Ch. syriaca*, *Daraspa myron*, and *D. chærilus*); to the second group (form *c*) belong the above described *Ch. elpenor* and *Ch. porcellus*, together with several others; the last group (form *d*), which shows completely developed eye-spots on all segments, is even more numerously represented by *Ch. bisecta*, *oldenlandiæ*, *alecto*, *actæus*, *tersa*, and *celerio*. The species of the genus *Chærocampa* which Weismann examined, therefore represent three phylogenetic stages of development, and it is interesting that the tropical species are the most advanced ones. It is probable, indeed, of one species, viz., *Ch. celerio*, that in Europe it shows form *c* in the markings of its caterpillars, while in India the larvæ of the same species have already attained form *d*.

II. In a similar way the author shows that markings upon the larvæ of the genus *Deilephila*, to which the well-known *D. euphorbiæ* (commonly called Sphinx) belongs, have passed through seven phylogenetic stages of development, viz., (1) caterpillars without markings; (2) with a subdorsal streak; (3) with a ring-shaped spot upon the last segment but one; (4) with similar but not altogether perfect spots upon all segments; (5) with eleven perfect ring-spots upon the subdorsal streak; (6) with these ring-spots but without the streak; (7) with a double row of ring-spots. Nowhere in the development any deviation from this order is noticed, and the living species of this genus form five groups, the markings of their full-grown caterpillars corresponding to the phylogenetic forms Nos. 3 to 7.

III. A somewhat smaller number of stages of development is apparent in the genera *Smerinthus*, *Macroglossa*, *Pterogon*, *Sphinx*, *Anceryx*, which Weismann investigated less extensively than those mentioned before; however, he points out that upon their larvæ the simple subdorsal streak combines, in the course of development, with other longitudinal or oblique streaks, or becomes less distinct as the others increase in intensity.

Now Weismann considers that the remarkable conformities in the development of all the larva markings he investigated is the surest proof that we are dealing with a phenomenon of inheritance. Indeed three laws may be said to be established by these conformities, viz., (1) the development begins with the simple and progresses to the more complicated markings; (2) new markings first appear in the last stage of individual development; (3) these new markings then gradually pass backwards to the earlier stages and thus replace the older ones, causing them to disappear entirely. Weismann gives the following explanation of the phenomenon referred to in the second law:—Supposing that the respective markings are of use to the caterpillars, that therefore they are retained in subsequent generations by natural adaptation, this use can only be real if the caterpillars are big enough to resemble the different parts of the plants on which they feed, and thus escape being noticed by their enemies; and if a sufficient lapse of time is given for carrying this protection into effect. Both these conditions, however, are united in the last stage of development, where the caterpillars have attained the necessary size, and which is the longest of all stages. The use of the colour of caterpillars, and the markings upon them, is also perfectly evident. The younger ones are green as long as during the day they remain on the leaves of the plants they feed on; they do not then form a contrast with the colour of the leaves themselves. The older caterpillars remain green if the thick foliage of the plants protects them under all circumstances; if, however, the foliage is less dense, so that the caterpillars, as soon as they have grown bigger than the leaves, can be easily distinguished among them, they leave the green leaves in the day-time, and try to hide on the stems of the plants and among withered leaves; in that case, to complete the protection, their colour changes from green to brown. The biological value of the characteristic markings upon caterpillars, quite independently of their colour, may be recognised from the fact that

[1] Weismann, "Studien zur Descendenztheorie" ("Researches on the Descent Theory"). Vol. ii. On the last Causes of Transmutations.