## Correspondence.

### The Creeping of Belts.

*To the Editor of the Scientific American:*

I called the attention of our head engineer to the article "A Belt Problem," in your SCIENTIFIC AMERICAN of October 4, and he said at once:

"The lacing wasn't properly done. The outer belt was probably laced tighter than the inner, and as there was, of course, a greater strain on it the rivets were not strong enough to make up for the difference in tension, and pulled through. If the belts had been glued together and then riveted, there would have been no trouble." A. W. B.

[This does not settle the question of the disposition of belts to creep when doubled, although proper gluing and riveting does prevent it; for unless strongly held together in every part of their contact their nature is to creep by virtue of the pressure of the outer belt upon the inner one while in contact with the pulleys. All belts creep on the face of the pulley, caused by the compression of the inner side of the belt by bending over the curve of the pulley. With a siding belt not perfectly fastened to the inner belt, the same effect takes place with a pull equal to the stress upon the belt.—EDITOR.]

### Filling Hot Stuff into Glass Jars or Bottles.

*To the Editor of the Scientific American:*

In reply to query No. 2435, J. B. Rosenberger, of St. Cloud, Minn., gives an undoubtedly good method for putting hot preserves into glass jars or bottles; but it has one drawback. It takes too much time to stop and rinse or even to empty the bottles of their cold water contents before filling, to say nothing of chilling the hot liquid by its contact with the cold vessel. In bottling anything while hot it is essential that its temperature be as little reduced as possible, and the cover or cork put in place as quickly as may be.

My plan of procedure is certainly much simpler and fully as effective. I take a kitchen towel or dishcloth, wet it thoroughly in water either hot or cold, fold it 4 or 6 ply, and stand my bottle to be filled on this pad thus formed. It is impossible to heat any liquid hot enough to crack or break a glass bottle or jar when this precaution is taken.

The bottles can be previously washed and drained dry, and when filled and immediately corked, will be ready to put away without any further attention. Ketchup put up in this manner will require no cording or wiring of corks, as it never works. Corks should be kept in hot water until used, thus rendering them soft, and closing the bottles in an airtight manner.

New York City. JENNIE BIEGER.

### Natural History Notes.

*Causes of the Ascent of Sap.*—In the *Revue Generale des Sciences Pures et Appliquées*, Mr. A. Herbert criticises a memoir by Mr. Boehm on the causes of the ascent of sap, published in the proceedings of the Berlin Botanical Society. The causes of the ascent of sap in plants, says Mr. Herbert, is one of the most controverted questions that have been studied in recent times. Mr. Boehm, proceeding to the examination of this question by the method of elimination, discusses in succession the forces that cause the ascension of sap: (1) Osmotic pressure; (2) the difference of the pressure of the air inclosed in the dead elements of the wood; (3) capillarity.

The first cause he discards on account of the slowness of the phenomena of osmosis, and for the reason that a plant whose roots have been killed by boiling water does not dry, as would happen if the absorption of the water were due to osmosis.

Mr. Boehm, in a former theory, had indicated the difference of pressure of the air contained in the dead elements of the wood as a cause of the ascension of sap. He no longer regards such pressure as the principal motor of the liquid column, but he nevertheless considers it as a secondary cause that acts as follows: Suppose a cell containing water and an air bubble. If the latter drives the water to an upper cell, it will expand and the water contained in a cell below will compress it anew, and add to it also the air that it holds in solution. These differences of pressure therefore cause displacements of water, but they are much too slow to be the sole motor of the ascent of sap. The learned botanist maintains that capillarity is the most important cause of the ascent of sap. On this subject Mr. Vesque (*Annales Agronomiques*) remarks that Mr. Boehm's results and those that he himself has obtained from analogous experiments show simply that capillarity suffices to keep up the normal transpiration of a plant a few inches in height, but he asks whether, with the elements furnished by Mr. Boehm's memoir and those known up to the present, we can conclude that capillarity, joined to the effects of differences of pressure of inclosed air, suffices to cause the water to rise to more than three hundred feet, the height reached by certain large trees.

It seems, says Mr. Herbert, that we have not as yet sufficient data to solve this problem, and new experiments are necessary. We can only applaud the ingenuity of the methods of investigation employed by Mr. Boehm to verify his opinion that capillarity is the sole efficient cause of the ascent of sap. On the other hand, the objection offered by Mr. Levesque is a serious one, for it does not seem as if capillarity alone can cause sap to rise to a height of more than three hundred feet. We would ask whether it is not in a calorific phenomenon that we must look for the explanation.

Generally speaking, it is through the vacuum produced by the transpiration of the leaves, aided by capillarity, that sap rises. This vacuum is exerted throughout the entire surface of the tree, producing upon it the effect of an immense cupping glass. There is therefore produced upon this surface at the same time, in consequence of the latent heat removed by evaporation, a depression of temperature. On the contrary, in the earth surrounding the roots, and especially through the ligneous tissues, there occur chemical actions that develop heat.

We have therefore at once, from bottom to top, a calorific-electric current, osmosis and capillarity.

*Nepenthes not Carnivorous.*—A communication from M. Dubois to the Academy of Sciences challenges the so-called carnivorous character generally attributed to the pitcher plants on the assumption that a liquid secreted by them in the pitchers possesses digestive properties (*Compt. Rend.*, cxi., 315). M. Dubois bases his objection upon the results obtained in a large number of experiments made upon plants of *Nepenthes Rafflesiana, Hookeriana, coccinea, phyllamphora, distillaria, hybrida* and *maculata*. He states that the pitchers of these plants, before the opening of the operculum, were all filled with a limpid slightly acid liquid, but in the open pitchers the liquid was generally turbid, contained insect debris, and sometimes exhaled a strong putrefactive odor. When the liquid was withdrawn from a closed pitcher, or one just ready to open, by means of a sterilized pipette, it remained clear for months, it was free from micro-organisms, and had no effect upon cubes of coagulated albumen placed in it, the angles of which remained intact after several days. The liquid taken from pitchers opened a very short time was also still clear, but it attacked albumen at the ordinary temperature, and very vigorously at a higher temperature. The liquid became turbid and contained numerous micro-organisms. In some cases it developed a putrefactive odor and gave some of the reactions of peptones. Many of the pitchers contained insects, not in the course of digestion, but of putrefaction. M. Dubois concludes therefore that the *Nepenthes* liquor does not contain any digestive constituent comparable to pepsin, but that the phenomena of disaggregation, or false digestion, observed by Sir Joseph Hooker, were due to the activity of micro-organisms coming from outside, and not to a secretion of the plant.

*Respiration of Insects.*—Mr. Contejean has studied in the grasshopper the little known phenomenon of the respiration of insects. He finds that, contrarily to what occurs in vertebrates, the movement of inspiration is passive, while that of expiration is active. The air is expelled from the insect's body by a contractile effort. The result is that if the animal be wounded, we observe blood to flow at every expiration. Decapitation does not arrest the respiratory movements, no more than does the absorption of curare, which in man produces an immediate cessation.

*The Cat in Antiquity.*—At a recent meeting of the Academy of Inscriptions, Mr. Saglio discussed the interesting question as to whether the cat of to-day was known to the ancients. We take from the *Temps* the following abstract of Mr. Saglio's remarks:

Was the cat known to the ancients? If so, should it be considered as having been with them a domestic animal or as a tamed one, like the monkey or the gazelle, for example? Such is the question that arose incidentally at the Academy some time ago. At that time, some of the members inclined toward the first hypothesis, while others, taking as a basis the differences established by Virchow, of Berlin, between the Egyptian cats (thousands of mummies of which are found in the necropolises of Egypt) and the cat that we know to-day, claimed that the animal of antiquity and that of our time were no more the same animal than are the mouse of the present and the mouse of antiquity. The cat of antiquity, according to some, was slimmer, and resembled the weasel more than it did any other animal.

Mr. Saglio presented to his audience the figure and the fac-similes of various monuments in support of an observation that he made at that epoch on the subject of the domestication of the cat among the ancients. These were, primarily, paintings on Etruscan tombs in which cats are represented in the interior of dwellings. In one of them, especially, a kitten, during a repast, is seen playing with other animals under the couches upon which the guests are reclining. We find the cat figured also in the paintings on Greek vases of the fifth century before Christ. Upon two pitchers in the British Museum, the paintings on which seem to be due to the same hand, are to be seen domestic cats in the interior of a school of music. One is tied up by a string, and the other stands upright on a stool, and a young man is offering a cake to it. All these, and similar fac-similes, perfectly authentic, reproduce the image of a cat, perhaps a little slimmer than ours, but exactly like the animal that we now designate by the name.

*Sexual Selection in Spiders.*—Mr. G. W. and Mrs. E. G. Peckham, in the Occasional Papers of the Natural History Society of Wisconsin, give an account of their observations on sexual selection in spiders of the family Attidæ. However satisfactory Mr. Wallace's explanations may be when applied to birds and butterflies, they fail when applied to spiders. His theory would only partially explain the following facts: Among the Attidæ the males are more brilliant than the females, young males nearly always resemble adult females, the males, when they differ from the females, depart from the general coloring of the group, and females, when they depart from the general coloring of the group, approach the coloring of the males. Mr. Wallace's assumption that the male animal is constitutionally more active than the female is not true of spiders. On the contrary, it is the female that is the more active and pugnacious. In neither sex is there any relation between development of color and activity. When the male is distinguished by brighter colors and ornamental appendages, these adornments are not only so placed as to be in full view of the female during courtship, but the attitudes and antics of the male are at that time such as to display them to the fullest possible extent.

*Myrmecophilous Plants.*—In the concluding part of his work upon this subject, Professor F. Delpino enumerates as many as 3,030 species distributed through 292 genera, with extra floral nectaries or other contrivances for inviting the visits of ants. The natural orders in which the greatest number of myrmecophilous species occur are Mimoseæ (663), Euphorbiaceæ (482), and Bignoniaceæ (342). The prevalence of the phenomena in any district is nearly proportional to the average temperature. The Central American region produces the largest number (653). The author believes that both ants and myrmecophilous plants came into existence in the cretaceous period.

*Secretion of Silk by the Silkworm.*—Professor G. Gilson is of the opinion that the silk of the silkworm is a regular secretion product. He bases this view on the facts that the glandular tube is covered internally, throughout its length, with a transparent membrane. This contains circular threads, and the spaces between them are filled with a network formation. As the silk is always separated from the cells by a membrane, it cannot be the result of the direct transformation of the protoplasm. In the next place the silk is not, as a rule, to be detected by any reagents in the body of the cell, but in some cases it becomes really visible. At the end of larval life, certain shining spherules were formed in the cells, and the reactions of these were just the same as those of silk. If one impedes the excretion of the silk at the end of larval life, the cell body becomes quite burdened with silk spherules. It seems that the silk is made up within the protoplasm, and is cast out through the meshes of the net-like membrane. A selection is probably made by the membrane itself among the several substances that are mixed with the liquid part of the protoplasm and the silk, and the substance that becomes the silk is cast out. The special apparatus of the silk duct seems to regulate the diameter of the thread, which is often very irregular before it has passed through it, and probably also to regulate the thickness of the thread.

*The Smallest Flowering Plant.*—The smallest flowering plant is *Wolffia microscopica*, a native of India. It belongs to the duckweed family. It is almost microscopic in size, destitute of proper stem, leaves and roots, but having these organs merged in one, forming a frond. There is a prolongation of the lower surface, the purpose of which seems to be to enable the plant to float upright in the water. The fronds multiply by sending out other fronds from a slit or concavity, and with such rapidity does this take place that a few days often suffice to produce from a few individuals enough similar ones to cover many square rods of pond surface with the minute green granules. Small as these plants are, they bear flowers. Two are produced on a plant, each of them very simple, one of a single stamen and the other of a single pistil, both of which burst through the upper surface of the frond.

GAS pipes from paper are made from strips of manila paper equal in width to the length of the pipe to be made, which is passed through a vessel with melted asphalt, and then wrapped firmly and uniformly around an iron core until the required thickness is attained. The pipe is then subjected to powerful pressure, after which the outside is strewn over with sand, and the whole cooled in water. The core is then removed and the inside of the pipe coated with a waterproof composition. These pipes are claimed to be perfectly gas tight and much cheaper than iron pipes, and very resisting to shocks and concussions. The claim as to greater cheapness than iron is probably an error.