exceedingly, he never remarked that they anticipated it spontaneously, or had a thought of it before witnessing his preparations to go. From this, Houzeau concluded that dogs could not count the days. But when actions repeated daily at fixed hours were in question, the dogs knew when the time came. Broderip's dog and the Santo Domingo pelican had learned, in the course of years, that the same succession of events took place every Sunday. It was not, therefore, by an isolated fact, but by an aggregation of facts, that they became aware of the return of that day; for not only did certain things take place regularly in the family, but Sunday noises, like the ringing of the bells, and unusual comings and goings, occurred in the place. After continued experience, the animals acquired knowledge of the succession of the events, and governed their conduct accordingly.

Houzeau also learned that some animals are capable of measuring lapses of time that particularly interest them. He says that female crocodiles abandon their eggs in the sand for ten or fifteen days, according to the species, and return to the spot at the exact time when they are to be hatched. It is easily conceivable that animals have, in general, a more precise measure of periods which concern the needs of their organic or specific life, than of the more artificial periods to which they have become habituated in the domesticated state or in consequence of their relations with man, because an hereditary habit has always more force than habits acquired by education.

Houzeau cites facts showing that some animals can count the number of similar objects or acts, provided the numbers are not too high. When a magpie is watched by a company of hunters, it will not move till they go away. If they go one after another, it cannot be deceived by one of them staying behind unless there are more than four of them. Another story of similar bearing is that of the tramway mules at New Orleans, which are relieved and fed after making five trips. They make their trips patiently and quietly till the end of the fifth, when they give evident signs that they expect their usual refreshment. The horses in the coal mines of Hainault make thirty trips a day, taking their places again, after every trip, at the head of the train, in readiness for the next trip; but at the end of the thirtieth trip they turn their heads in the opposite direction, or toward the stable.

Facts of this kind ought to be tested by most precise experiments bearing upon the conditions under which they are produced, and upon different subjects. Are not the horses warned at the end of their stint by some exterior sign, such as a change of conductors, the departure of a squad of workmen, or the arrival of the horses that are to take their places, or by the meal hour? Is not the conclusion that they count the number of their trips arrived at too quickly?

It would predicate a very high degree of development to suppose that a horse could count up to thirty in any given number of hours. A man in such case would nearly always make mistakes, unless he had some means of registering the trips as they were completed.

It is nevertheless established that some birds and quadrupeds are capable of counting up to four or five, and perhaps more. It cannot be disputed that the higher limit of this faculty may vary according to species, and also to individual traits, since the mathematical faculties of men are very great in their variations. But we have reasons for believing that the geometrical faculty in animals supersedes the arithmetical faculty, and that the latter has been developed in man under the influences of industrial civilization and commercial exchanges, which have, in nearly all cases, caused the notion of numbers to be substituted for that of measure. — *Translated for the Popular Science Monthly from the Revue Scientifique.*

[AMERICAN CHEMICAL JOURNAL.]

ON THE OCCURRENCE OF SOLID HYDROCARBONS IN PLANTS.

By HELEN C. DE S. ABBOTT and HENRY TRIMBLE.

WHEN many plants of the higher botanical orders are exhausted with petroleum-ether, crystalline compounds may be separated from the extracts which have not been previously noticed. The compounds are also obtained when alcohol or ether is used as a solvent; but it is preferable, on account of the greater number of constituents extracted by these menstrua, to employ petroleum-ether, and thus avoid certain difficulties of separation. Among the plants in which to this time these compounds have been discovered, may be mentioned *Cascara amarga*, *Phlox Carolina* and the *Phlox* species, and in other species of three or four natural orders.

The crystals from these petroleum-ether extracts were first noticed in 1884 and were announced in 1886 as a "camphor-like body."

Subsequent investigations proved this body to be a mixture; and by extracting 25 and 20 kilos of *Cascara amarga* and *Phlox Carolina* respectively, a satisfactory quantity was obtained. The method adopted to purify was, after removal of fats and coloring matter, to crystallize from boiling absolute alcohol. By fractional crystallization at least three different compounds have been separated. One only of these has been studied. It melted at 196·2° C. to 196·4° C.; at higher temperatures it was decomposed, with an odor like sandal wood. It was soluble in petroleum-ether, ethylic and acetic ethers, benzol, chloroform, hot alcohol, glacial acetic acid, acetic anhydride, and linseed oil. From most of these solvents it readily separated in silky acicular crystals, often two to four centimeters in length.

The first ultimate analysis of this purified product from *Cascara amarga* gave the following results:

	I.	II.	III.
C	86·30	86·29	86·33
H	12·96	12·96	12·83
	99·26	99·25	99·16

These figures pointed strongly to the conclusion that the compound was a solid hydrocarbon. Liquid hydrocarbons are abundant in the plant kingdom, but a similar occurrence of this class of compounds in a solid or crystalline condition appears not to have been noticed.

By further purification of an additional quantity of the mixture the following results were obtained:

I. 0·1058 gramme gave 0·3413 CO_2 and 0·1133 H_2O.
II. 0·1113 gramme gave 0·3588 CO_2 and 0·1193 H_2O.

	I.	II.
C	87·97	87·89
H	11·89	11·90
	99·86	99·79

Fifteen kilos of *Phlox Carolina* were exhausted, the compound separated and repeatedly crystallized. Its ultimate analysis gave the following:

I. 0·1117 gramme gave 0·3600 CO_2 and 0·1208 H_2O.
II. 0·1314 gramme gave 0·4228 CO_2 and 0·1421 H_2O.

	I.	II.	Theory for $(C_{11}H_{18})x$.
C	87·90	87·76	88·00
H	12·02	12·02	12·00
	99·92	99·78	100·00

ELECTRICITY NOT A FLUID, BUT A MODE OF MOTION.

IN a recent paper read before the New York Electrical Society, Dr. P. H. Van der Weyde says: "Heat and light will both pass through a vacuum perfect enough to obstruct absolutely the passage of electricity. If there were such a thing as an electric fluid, it would surely pass through any empty space, and we are therefore driven to the conclusion that the presence of matter is as absolute a condition for the transmission of electricity as the presence of air is an absolute condition for the transmission of sound; and there is as little necessity to accept the hypothesis of the existence of an electric fluid as there is for the hypothesis of a sonorous or caloric fluid."

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Scientific American Supplement.

PUBLISHED WEEKLY.

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TABLE OF CONTENTS.