as many young are produced as there would be if the nymph were reared upon a vigorous young plant. I have seen mother Aphids, on old plants, which were not larger than nymphs after their second moult on young plants. In the 12th generation this point was well illustrated. Here we have the record of two nymphs, the first, isolated Sept. 17 on an old pot-bound plant, did not become a mother until Nov. 15, or 29 days after; while a nymph, isolated 10 days later on a young, vigorous plant, attained motherhood in 14 days. The 19th generation presents a similar case. Nymphs born of these dwarfed and retarded mothers and placed on young plants have become normal-sized mothers in from 15 to 18 days in my cages.

In one instance (54th generation) a nymph became a mother in 7 days, while one of the 14th generation was 35 days in attaining the adult stage. I believe, that by carefully watching the Aphids and always isolating the first nymphs born upon young, vigorous plants, that at least thirty generations of this *Achyrantes* Aphis could be produced in a year. In 1890, Mr. W. J. MacNeil, while studying a black chrysanthemum Aphis, at the Insectary, reared, in 13 months and 5 days, thirty-two generations of the insect, all agamic wingless females. As the table shows, I have reared from twenty to twenty-five generations of the *Achyrantes* Aphis in a year.

As the experiment progressed, many other interesting facts were learned which could not be included in the table. I will now briefly discuss some of them.

The mother Aphids were often caught in the act of giving birth to a daughter. The operation required about five minutes, and in every instance the nymph was born tail end first in a thin transparent sheath or pellicle. Before being entirely delivered from the mother, however, the nymph begins to work the pellicle off; the antennæ and first pair of legs are freed about the same time, then follow the remaining legs and the honey-tubes, and the pellicle appears as a minute whitish mass about the tail of the nymph. The nymph remains attached to the mother until its appendages are free and the little creature is able to stand alone.

There seems to be no published record of the young of wingless agamic female Aphids being born in a pellicle as just described. Buckton gives five or six instances in as many genera where the young of winged agamic females are born thus. I believe, however, that this manner of giving birth to their young is as common among the wingless as among the winged agamic forms of Aphids. I have observed it many times in the case of *Myzus achyrantes*, and several times in the field among other common species. Mr. MacNeil showed it to be true of the black chrysanthemum Aphis; and Mr. W. E. Rumsey, while studying the woolly apple-louse, *Schizoneura lanigera*, here at the Insectary, watched under a compound microscope one of the wingless agamic females giving birth to a daughter, and there was no doubt that the nymph was born in a pellicle. This last case is contrary to the observations of Mr. L. O. Howard as published in Comstock's Report as U. S. Entomologist for 1879, p. 259; but the fact remains that a wingless agamic female of *Schizoneura lanigera* here at the Insectary has been clearly seen in the act of giving birth to several nymphs, each enveloped in a pellicle.

The nymphs begin to suck the sap of the plant very soon after birth, and as they increase in size moults occur. The minuteness of the insects and the delicacy of their cast skins renders the observation of the numbers of the moults very difficult. I worked nearly five months before I satisfactorily settled the fact that the *Achyrantes* Aphis moults four times during its lifetime. My method was to use a small plant with a few leaves and place a piece of stiff black paper close around the plant on the surface of the soil. This was necessary, as the delicate white cast skins frequently fell from the plant and would have been easily lost unless this smooth black surface had caught them.

The records of four nymphs of the 7th, 9th, and 15th generations show that the first moult occurs from 3 to 4 days after birth; the second from 2 to 5 days after the first; the third from 1 to 3 days after the second; and the fourth from 3 to 5 days after the third. In one instance, when the growth of the nymph was retarded by a stunted plant, its moults occurred about one week apart. It requires from 15 to 20 minutes to complete a moult.

The nymphs of a black chrysanthemum Aphis and of *Schizoneura lanigera* also moulted four times, as recorded in the theses of Messrs. McNeil and Rumsey. *Pemphigus filaginis* and *Tetraneura ulmi* are also recorded as moulting four times; thus four seems to be the normal number of moults among plant-lice.

Under the more even temperature during all the seasons in a green-house, plant-lice there do not show such a wonderful fecundity and rapidity of production as has been recorded from field observations. The table above shows that the seasons have no material effect upon the rapidity with which the generations are produced in a green-house.

To ascertain whether the fecundity of the Aphids diminished through the successive generations of the agamic females, I counted the number of nymphs born of a single mother in several instances. During the 1st and 2d generations, 37 nymphs were born of a single mother. In the 3d generation, 3 to 4 nymphs were born each day of a single mother for 14 days in succession. A mother of the 18th generation lived 63 days and gave birth to 59 young. In the 20th generation a mother gave birth to 62 daughters in 19 days, or at the rate of three a day. Sixty-one nymphs were born of a mother of the 35th generation in one month. A mother of the 46th generation gave birth to 15 young in 3 days. Fifty-four daughters were born to a single mother of the 41st generation. And in the 54th generation a mother gave birth to 55 young. It is thus seen that the reproductive power of the agamic females has not decreased through nearly 60 generations.

Mr. MacNeil had one wingless agamic female of the black chrysanthemum Aphis which gave birth to 70 young in 34 days; at one time 7 were born in 27 hours. Mr. Rumsey reared in one instance 68 nymphs in 65 days from a wingless agamic female of *Schizoneura lanigera;* this female lived 12 days after the birth of the last nymph, and was nearly three months old when she died. From another female Mr. Rumsey reared 86 young in 55 days. Several of the agamic females of the *Achyrantes* Aphis have lived two months after becoming mothers.

To learn whether winged females might not be produced if the plants became overcrowded with the Aphids, I allowed, in several instances, reproduction to go on undisturbed in the cages. Several hundred wingless females would accumulate on a small plant, and possibly winged forms might have been forced in time if in each instance the overcrowding had not been checked by a fungous growth, which set in and destroyed a majority of the insects.

Many volumes have been written upon the habits and life histories of plant-lice; enough has been written upon the grape Phylloxera alone to fill a small library. And yet we have much to learn about plant-lice. I believe they present as varied, peculiar, interesting, and wonderful phases in their habits and life histories as do any other insects.

THE EXTREME HEAT AND COLD ENDURED BY MAN.

BY THE MARQUIS DE NADAILLAC, PARIS, FRANCE.

THE exceptional faculties of Man enable him, alone of all the mammals, to battle with extreme cold as with extreme heat, and it is with real astonishment that we ascertain what men of our race can endure. In the earliest times of which we have any knowledge, we have strong evidence that our species lived, both in America and in Europe, when large extents of both continents were covered with ice and when his companions were the elephant and the woolly rhinoceros. Later, the Aryan race, whatever may have been its birthplace, reached step by step in the south the Gangetic Peninsula, 8° only removed from the equator, and, in the north, Iceland and Greenland, which seem the extreme points attained by our most prolific race in those days so distant from ours.

A few years ago the English and Russian officials assembled at Maruchak for the delimitation of Afghanistan suffered a mean temperature of — 20° C., which was considered moderate in those regions. In his eventful journey across the mountains of Central Asia, utterly unknown to us, Prince Henry of Orleans had to

support a cold of — 40° C. (mercury is congealed at — 29° C.; alcohol alone, highly rectified, can mark the low temperatures we give here), with piercing northern winds. The horses and camels died; man resisted.

The northern parts of America have known still more severe colds. Captain Back reported at Fort Reliance — 56.74° C., and Captain Dawson, at Fort Rae, in 62° 30′ north latitude, — 67° C., in April, 1882. Other explorers have never observed such low temperature. The Abbe Petitot gives us — 40° C., as the mean temperature of January at Fort Good Hope, and — 35° C. for January, and — 42° C. for February, at Yukon, Alaska.

In Siberia we find the coldest points inhabited by comparatively civilized men. In the government of Yenissei, the winter time is double the summer time. Autumn sets in in August, and the Yenissei River is completely frozen by the month of October. Yakoutsk was long considered the coldest town of the world. During the winter months the thermometer is as low as — 45° C. But Yakoutsk must yield to Verkhoyansk, a small Siberian town at the mouth of the Lena, where we find — 55° C. in January. And yet this cold is far from being the most severe suffered in those dreary regions. A Frenchman, Mr. Martin, recently dead, travelling in Eastern Siberia, wrote to the Society of Geography, of Paris, that he experienced in 59° north latitude and 132° east longitude a cold of — 63° C.

Physical phenomena, the differences in the relation of the continents and the oceans, have a greater importance than was suspected some years ago. Yakoutsk, which I have just mentioned, is only 6° nearer the pole than Edinburgh, and numerous arctic islands are on the same latitude. Yet Edinburgh and these islands enjoy a much warmer climate, thanks to the Gulf Stream, so well studied by Lieutenant Maury, one of the glorious scientists of our day.

This is probably the cause that some of the polar lands do not always experience the extreme cold we find in some parts of Siberia. Captain Nare's careful observations in Grinnell Land, in 1875–6, only give for January — 36° C., for February — 38° C., for March — 39.90° C., for November — 27.12° C., for December — 36.6° C. Nordenskjöld, in one of his latest voyages, speaks of — 47.7° C. We have still higher records. Lieutenant Greely, in his illfated expedition, tells us that during his long stay at Discovery Bay the temperature maxima never exceeded + 50° (Fahrenheit) and was at one time as low as — 66° F. This difference of temperature, supported in a few months time by the same men, is most remarkable. Hunger, dearth of provisions, incredible hardships broke down those who had so bravely suffered extreme cold.

Nothing daunted by the cruel fate of Lieutenant Greely's companions, Lieutenant Peary tried, in his turn, to attain the solution of the northern problem, and, with a courage which does infinite honor to her sex, Mrs. Peary elected to accompany her husband. They wintered, in 1891, in MacCormick Bay, about a hundred miles distant from the great Humboldt Iceberg, and lived for three months under a temperature varying from — 30° C. to — 50° C. without experiencing any very great inconvenience. It is Lieutenant Peary, if I make no mistake, who approached the nearest to the Pole. He got farther than Frederick William's Land and Cape Bismarck, the extreme northern points reached before him.

In one of the last polar expeditions attempted by the English, in the month of November the thermometer marked — 60° C., and on the 25th of January it went down to — 63° C. on board the "Varna" and the "Dymphna," blockaded in the ice.

But probably the highest amount of cold ever suffered by white man is the one recorded by Mr. Gilder, a reporter of the New York *Herald* attached to the expedition which, under command of Lieutenant Schwatka, went in search of Franklin. In the letters sent home during the winter of 1879–80, so severe in all parts of the world,[1] he speaks of the thermometer lower than — 71° C. Here again we find men of our race supporting an almost incredible amount of cold from November, 1879, to March, 1880. Their power of endurance may be attributed to their stay at Camp Daly from August, 1878, to March, 1879. They experienced there a range of temperature from + 14° C. to — 51° C. The members of the expedition had adopted the way of living of the Innuits. Like them, they fed on the raw flesh of the seals and the walrus and absorbed large quantities of oily and fatty matters which prevented the spread of scorbutic diseases, so fatal to many of their predecessors. The tents were rapidly discarded and replaced by *iglous*, the native winter houses of hard frozen ice, which, curious enough, offer a considerable amount of heat. Their clothes were made of reindeer skin without any linen underclothing, so as not to put a stop to perspiration.

Another day I will compile the highest amount of heat supported by men of the white race. I will only mention here that in Algeria, by no means the hottest point of the globe, our soldiers have often seen the thermometer as high as + 51° C., and Mr. Buveyrier, in his travels amongst the Touaregs, noted + 67.7° C. If we compare this extreme heat (and we will certainly find higher points) the difference between — 71° C., recorded in the Schwatka expedition, and + 67.7° C. reach nearly 138° C., and testify, as I said in the beginning, to the remarkable power of endurance of the white race.

[1] As a comparison, I give the lowest temperature experienced in Paris during the last century. January 20, 1788, — 21.5° C.; January 25, 1795, — 23.5° C.; December 9, 1871, — 21.3° C.; December 10, 1879, — 23 9° C.

BEZOARS.

BY ELIZA BRIGHTWEN, GREAT STANMORE, ENGLAND.

THE almost fabulous value set upon Bezoars in olden days, and the medical virtues often attributed to them, invest these concretions, which are found in the alimentary canal of animals, both wild and domestic, with a certain amount of interest; and, although belief in their curative power has long since passed away, it may be deemed worth while to try and put together a few items about their history and uses.

The name of Bezoar appears to be derived from the Persian *pād* (expelling) and *zahr* (poison), in allusion to the supposed virtues of the stone as a remedy for snake-bites and other wounds. Others again derive it from the name of the goat in which one variety is found.

These stones were introduced as medicines in the East by the Arabian physicians in the tenth century, there seems to be no mention of them in Greek or Latin authors, but from the East their use gradually spread into Europe. They are referred to by Frampton as far back as 1580, and as late as 1746 these stones were in use in England, being found in the London Pharmacopœia of that date. A severe blow to their reputation was administered by Ambrose Paré, who gave a dose of Bezoar to a criminal condemned to death and to whom arsenic had been given, death, however, was the result.

In the Royal College of Surgeons' Museum in London cases may be seen filled with all the various kinds of concretions which have been found in the intestines of different animals, including some very fine bezoars.

They may be roughly divided into six classes: —

1. Balls composed of animal hairs.
2. Those composed of vegetable hairs.
3. The Oriental Bezoars, composed of ellagic acid.
4. The Occidental Bezoars, formed of resin or bezoardic acid.
5. Concretions of phosphate of magnesia, ammonia, and earthy calculi.
6. Ambergris, found in the intestines of the whale.

We will briefly notice facts relating to each of these classes.

I. Animals, especially horses and oxen, are much given to licking each other and themselves, and the loose hairs being swallowed become felted into spherical balls of various sizes, generally black in color, with a hard, shiny surface, which often consists of phosphate of magnesia.

In the College of Surgeons' Museum there is one such hair-ball, taken out of an ox at Buenos Ayres, which measures forty inches in circumference, and one of oval shape, found in a peccary, measures six inches by four in diameter.

II. Vegetable hair concretions are usually formed round some nucleus, such as a horse-nail, plumstone, or a piece of flint.

The setæ of the oat seem to have a constant tendency to form