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

into spherical balls, and when felted they sometimes alternate with layers of phosphates, so that when divided the transverse sections of these are found to be marked by concentric lines.

III. The true Oriental Bezoar is found in the wild goat of Persia (*Capra ægagrus*), and is brought to India from the Persian Gulf. In appearance it is black and hard, oval in shape, with a smooth surface, which has a peculiar shiny lustre.

This stone consists entirely of ellagic acid, which is an insoluble organic acid derived from certain constituents of the diet of the Persian goat. This acid can also be extracted from an infusion of gall-nuts when exposed to the air.

Bezoars were frequently set in hoops of gold or silver, having a chain of some metal by which they were suspended in the liquid to which it was desired they should impart their curative virtues.

Koemfer says: "In Persia all people of consequence possess one or more of these stones preserved with great care as valued treasures." A proof of their value is found in the fact that amongst the treasures sent to the Emperor Napoleon the First, by the Shah of Persia, were three Bezoars valued at nearly two hundred pounds.

Five hundred crowns (£125) have been given for one such stone, and Tavernier mentions one, weighing four ounces, which was sold for one hundred and fifty pounds.

The diseases supposed to be cured by Bezoars were of varied character, such as epilepsy, palpitation, vertigo, contagious fevers, etc. It is said to have been a custom in Persia to take a dose of powdered Bezoar at the beginning of the year to protect the body from poison for the succeeding year.

They may have been useful perhaps in some cases, owing to the amount of bile contained in them, and also because they were sometimes steeped in infusions of active medicinal plants.

IV. The Occidental Bezoar.

This is found in the goat of Peru and India, and, as a rule, it is larger, lighter in color, and for the most part without the peculiar black metallic lustre of the true Oriental stone, and is of much less value. The chamois yields what is known as German Bezoar, and another similar stone is found in the llamas of Peru.

The high price of the Oriental Bezoar led to numerous imitations, for the most part made of chalk and pipe clay, frequently gilded to give the high polish of the Eastern stone.

By putting butter of antimony under the action of nitric acid an artificial Bezoar can be made, and other imitations were made of vegetable resin identical with the litho-fellic acid of M. Goebel, which he found in a calculus examined by him. These stones are sometimes called resino-bezoardic concretions.

The snake stones of the Portuguese were probably made by the Brahmins, who pretended that they were taken from behind the head of the Cobra da Capello. They were called Pedra di Cobra, and were made of calcined bone-earth finely powdered and mixed with musk and aromatic gums. They were probably of use when applied to wounds, although not quite in the way imagined, for, being highly porous and absorbent, when applied in quick succession to a recent snake-bite, these stones would naturally draw out the poison by capillary action; when one stone fell off another would be supplied until the wound was sucked dry. Koemfer says 28 stones were needed to be applied to effect a cure.

Fossil Bezoars are found in Sicily in sand and clay-pits. They are concretions of a purple color, around some usually organic body, and are of the size of a walnut.

V. Concretions of phosphates of magnesia and ammonia. The consideration of these calculi would hardly come within the limits of this paper.

VI. Ambergris.

Concretions found in the Spermaceti whale. This substance is found also floating on the sea upon the coasts of Japan, Coromandel, and Madagascar. It is of very light specific gravity, ash-colored, with black veins and spots. It is supposed to be a product of disease, as it is only found in dead or sickly whales.

One more so-called Bezoar may be mentioned, and then, as far as is known, all the various kinds will have been touched upon.

In the Malay Peninsular there is sometimes found in the cocoanut a stony concretion, properly called *Callapitte*, which is worn by the Malays as an amulet of great value. This is so like Bezoar that it is sometimes mistaken for it, although a purely vegetable product.

THE STUDY OF MOULTING IN BIRDS.

BY WITMER STONE, M.A., CONSERVATOR, ORNITHOLOGICAL SECTION, ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA.

THE question of change of plumage in birds, even in our commonest species, has never received the attention that it deserves, and, considering the number of ornithologists which we now have in the United States it seems strange that we know so little of the matter.

Perhaps now that the field for the discovery of new species or races of North American birds is narrowing so rapidly, attention will be turned to the study of moulting and other none the less interesting phases of bird life. Comparatively little material seems to have been gathered as yet for the proper discussion of plumage changes, for in almost all the private collections of bird-skins that I have examined I have been struck with the lack of specimens illustrating seasonal changes of plumage, the bulk of the material being either adult spring birds or fall birds which have completed the moult.

The reason for this is easily seen, as in August, the season when most birds experience their complete moult, collecting is by no means easy work. The birds themselves are quiet and inactive, which renders them inconspicuous and hard to find; then, also, the specimens secured during the moulting season are difficult to prepare satisfactorily, while the heat of mid-summer renders immediate preparation necessary. Such obstacles should not, however, stand in the way of the collector and those making local collections of birds should aim to have a sufficient series of each species to show all its seasonal changes of plumage.

Having been recently engaged in examining some interesting series of moulting birds, a few words on these and the question of moults in our passerine birds in general may not be out of place.

Change of plumage in birds, as is well known, takes place in two ways (1) by the acquisition of an entirely new set of feathers and (2) by an abrasion or wearing away of portions of the old feathers.

As a matter of fact both of these methods are employed by all our birds though the amount of change and the number of changes during the year vary in different species.

In all our birds there is a moult of all the feathers late in the summer or early in September, when the breeding season is over, and the feathers are in the poorest condition. The moult at this season is an obvious necessity, as without it the birds would be unable to accomplish their autumnal migration and would be but ill prepared to withstand the cold of winter. Specimens secured just before this moult takes place are in a wretched condition, many of the tail feathers are reduced to mere spines and the wing feathers are often more or less broken while the body plumage is very much worn and some patches are often entirely lacking.

In effecting the complete moult the feathers are renewed a few at a time in a regular sequence, and the utility of this can easily be seen for if the old plumage was all lost at once the bird would be unable to fly for some days and would in all probability perish. On the wings the moult begins with the middle feathers and extends outward and inward, corresponding feathers being lost from each wing simultaneously. At the same time the feathers on the sides of the breast, centre of the back, and the wing coverts are renewed. Male bobolinks taken in this state show the process very clearly, and the bright bands of buff forming an inverted V on the breast stand out in relief against the dull black of the old summer plumage. The change of plumage on the other parts of the body follows rapidly, and the new dress is donned in a remarkably short time, with the exception of the last wing and tail quills.

The second method of changing plumage — by abrasion — is best seen in birds having parti-colored plumage where the centre of the feather is of one hue and the margin of another. Of course, abrasion occurs in all birds, but when the feathers are