but no organic matter. The manganese was present as fluoride.

From these results it is difficult to say to what the color is really due. It certainly is not due to organic matter, and the manganous fluoride detected in it, though of a violet color, is not dark enough to give the purple color to the fluor spar. This must be left for further experiment.

Green Fluor Spar also gave a violet fluorescence on heating, and the color was found to be due to a small quantity of ferrous silicate.

Yellow Fluor Spar is colored by the presence of ferric hydrate. On heating, this mineral becomes red.

GYPNUM.—Composition, $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$. When pure is colorless or white.

Red varieties of this salt are colored by ferric oxide.

WEBSTERITE.—When pure, is white.

Yellowish-brown.—The color of a yellowish-brown specimen was found to be due to ferric hydrate.

CALCITE.—Composition, CaCO_3 . When pure, is colorless or white.

Yellowish-red.—A yellowish-red variety was found to owe its color to ferric hydrate. On heating it cracks to pieces and becomes brown.

Peachblossom Colored.—The color of this specimen was found to be due to cobalt carbonate.

Pink Calcite.—A pink variety of marble on examination showed that the color was due to manganous carbonate, of which it contained 0.37 per cent. Specimens of this variety of marble have before been examined by Rone, who found 1.13 per cent. of manganous carbonate, and a specimen from Nantlle Valley, Carnarvonshire, contained as much as 8 per cent. of the same.

Black.—Bischof found in a black limestone 1.15 per cent. of ferrous carbonate.

Upon ignition this marble becomes quite white, and the color is due to disseminated carbon, which burns off on heating.

The presence of ferrous carbonate in the limestone examined by Bischof is not sufficient to explain the black color.

ARAGONITE.—Composition, CaCO_3 . When pure, is colorless or white.

Yellowish-red.—A yellowish-red variety of this mineral was colored by ferric oxide.

Red.—The red specimens are also colored by ferric oxide, sometimes manganese is also present.

SPATHIC IRON ORE.—Composition, FeCO_3 . When pure, is white.

Pink.—The color of a pink variety of this mineral was found to be due to the presence of a small quantity of manganous carbonate.

Black.—This mineral was found to be colored by the presence of carbon.

WAVELLITE.—Composition, $3\text{Al}_2\text{O}_3 \cdot 2\text{P}_2\text{O}_5 \cdot 12\text{H}_2\text{O}$. This body, when pure, is white.

Blue.—Erdmann found in a specimen of this mineral 1 per cent. of ferric oxide. Turquoise is a blue variety of wavellite, and has been examined by Church, who found 2.21 per cent. of ferrous oxide, and 5.27 of cupric oxide, also by Hermann, who found 1.10 of ferric oxide and 2.02 of cupric oxide. The color of the blue wavellite was found to be due to the presence of phosphate of copper. Thus it approaches to turquoise in composition.

SCHORL.—The formula of this mineral is very complicated. The name is generally applied to the black varieties of tourmaline.

The color is due to ferrous and ferric silicates; the combination of the two silicates forming the black color.

MUSCOVITE.—(Common mica.) Composition $\text{K}_2\text{H}_4\text{Al}_6\text{Si}_6\text{O}_{22} + \text{H}_2\text{SiO}_4$. This mineral, when pure, is colorless.

Brown.—The color of this variety was found to be due to both ferrous and ferric silicates.

Black.—The color of this mineral was also due to the two silicates of iron.

LEPIDOLITE.—A variety of mica containing lithium, often found colorless.

Peachblossom Colored.—This color is due to the presence of a smaller quantity of manganous silicate.

TALC.—Composition, $\text{Mg}_3\text{Si}_4\text{O}_{10} \cdot \text{H}_2\text{O}$. When pure, is white.

Yellow.—The color of this mineral was found to be due to a small quantity of ferric silicate.

Red.—This variety is colored by the presence of ferric oxide. Treatment with hydrochloric acid dissolves the ferric oxide, leaving the talc colorless.

Black.—Black talc owes its color to both ferrous and ferric silicates.

ACTINOLITE.—Composition $(\text{Ca}, \text{Mg}, \text{Fe})_2\text{Si}_2\text{O}_6$.

Green.—It will be seen from the composition of the mineral that it owes its color to ferrous silicate, which is a component of the green mineral.

ASBESTOS.—Composition, $\text{CaSiO}_3 \cdot 3\text{MgSiO}_3$. When pure, is white.

Green.—This mineral is colored by the presence of ferrous silicate, which replaces the other silicates to a certain extent.

Grayish-green.—Is also colored by the presence of ferrous silicate.

EPIDOTE.—Formula very complicated.

Green.—This mineral contains ferrous silicate as an essential ingredient; therefore the color is due to that body.

AXINITE.—Formula very complicated.

Grayish.—This mineral was colored by the presence of both ferrous and ferric silicates.

SERPENTINE.—Composition, MgSiO_3 , $\text{Mg}_2\text{SiO}_4 \cdot 2\text{H}_2\text{O}$. When pure, is white.

Green.—The color of this variety of the mineral is due to ferrous silicate, which varies in amount from 1 to 14 per cent.

Red.—The color of the red variety of serpentine is due to ferric oxide.

GARNET.—Formula variable. Pure garnet is white.

Dark-red.—The color of dark-red garnet is due to both manganous and ferric silicates; ferrous silicate is present in some, and perhaps slightly modifies the color.

HYPERSTHENE.—Composition, $(\text{MgFe})\text{SiO}_3$.

Green.—It will be seen from the formula that the color of this mineral is due to ferrous silicate, which is a constituent of the mineral.

STILBITE.—Composition, $\text{CaAl}_2\text{Si}_6\text{O}_{18} \cdot 5\text{H}_2\text{O}$. When pure, is white.

Red.—Red varieties of stilbite are colored, owing to

the presence of both manganous and ferric silicates, which replace to a certain extent the silicates which are the real components of the mineral.

STEAHITE.—Composition, $3\text{MgSiO}_3 \cdot \text{H}_2\text{SiO}_3$. When pure, is white.

Bluish-green.—The color was found to be due to ferrous silicate.

AUGITE.—Composition, $(\text{CaMgEe})\text{SiO}_3$.

Black.—The black varieties owe their color to both ferrous and ferric silicates.

FELDSPAR.—Composition, $\text{K}_2\text{O}, \text{Al}_2\text{O}_3, 6\text{SiO}_2$. When pure, is white.

Red.—The coloring, varying from flesh-red to very dark-red, is due to varying amounts of ferric oxide.

On looking at the results of these analyses, we find that the coloring agents are very few in number, viz., carbon, cobalt salts, manganous salts, ferric oxide, hydrate, and silicate, and ferrous salts. The presence of organic matter other than carbon is very doubtful. The above may be arranged as follows:

Pink colors are produced by manganous and cobalt salts.

Red colors are produced by ferric oxide, manganous and ferric silicates.

Yellow colors are produced by ferric hydrate and silicate.

Brown colors are produced by ferric oxide and silicate.

Green colors are produced by ferrous silicate.

Blue colors are produced by copper salts.

Black colors are produced by carbon, and ferrous and ferric silicates.—*Hardwicke's Science-Gossip*.

FRIENDSHIP OF BIRDS.

WE all know how widespread in the ornithological world is the instinct of sociability, which prompts the individuals of a same species among a certain number of birds not only to emigrate in flocks, but to live in company for the entire year, and to nest thus.

On the contrary, it sometimes happens, especially in a wild state, that two birds (male and female) of different orders seek each other's company and lavish caresses on one another without endeavoring to couple

THE TWO FRIENDS, PARROT AND STARLING.

(physiologically speaking), and, in a word, love one another platonically.

I have had an opportunity of observing such a thing a great number of times between two birds that my mother had kept for several years in one of her aviaries at Rouen. One of them is a female of the genus *Conurus* (*C. jendaya*, Gm.), and the other a male of the genus *Gracupica* (*G. nigricollis*, Payk.) The former is a parrot that inhabits Brazil, and the other, which belongs to the family Sturnidae, is a native of China and the Indies.

It is curious to see these two beings that ornithological classification widely separates from each other united by ties of friendship. . . . It is well to say that this sentiment exists to a much higher degree in the parrot, who earnestly seeks her companion, follows him to where he goes to perch, presses herself against him, picks his feathers, and, in a word, exhibits a constant friendship for him. As for the starling, although he does not follow up the parrot, he has at least a little friendship for her, for he not only cheerfully allows her to nestle close to him, but he also picks her feathers.

I may add that the starling, by his curious and varied song, and by the queer attitudes that he assumes in executing certain passages of his musical repertoire, justly excites the laughter of those who observe him. This excellent pair of friends is worth the trouble of speaking of in a special publication, and I think that these few lines will not be without interest to those who occupy themselves with ornithological psychology, either from a purely scientific point of view, or solely from a recreative standpoint.

The accompanying figure represents, at about a quarter of their natural size, and in a position that is usual for them, the two birds in question, which I put into a cage so that I could easily photograph them.—*H. G. De Kerville, in Le Naturaliste*.

EARLY LAMBS FOR MARKET.

By GEO. L. GILLINGHAM.

SELECTING THE EWES.

THIS is the first and a very important part. They should be secured early, about the middle of June or not later than the middle of July, and if good pasture is obtainable, they may be purchased even sooner.

Select those with medium tight wool, and under no consideration those with long open wool. We find for this section a grade merino gives the best results, not too much into the merino, as they will be too small and will have difficulty in lambing. But some of the above blood is a decided advantage, as they will drop their lambs earlier, make better mothers, and grow their lambs faster than the coarser breeds. We have always found our first ewes to drop their lambs were of this cross. About one half or one quarter merino is about right. Such ewes can always be found in the drove yard in West Philadelphia at the season of the year above alluded to, and can be bought from \$3.50 to \$5.00 each, according to the size, supply and demand.

SELECTION AND CARE OF THE BUCK.

He should be of some of the Down breeds. We have always used the Southdown with very good results. Some are now introducing into this section the Hamshiredown and Shropshiredown, but if the ewes are not very large they have difficulty in lambing, as the lambs are larger boned than the Southdown, and it frequently happens that a lamb is lost at birth, and sometimes a ewe. All of which very materially reduces the profits. The Southdown cross, although not as large at birth, fatten as rapidly and are ready for the market as soon as the cross of the larger breeds, without such a strain on the ewe. He should be turned with the ewes at night and kept in a cool, well ventilated pen or stall during the day, not in hearing distance of the flock, where he can remain quiet and be fed on oats and good sweet clover hay, with free access to pure water, being careful not to overfeed on grain, beginning on a half pint and increasing gradually, until he will consume a quart twice daily. He should be allowed the companionship of the ewes until September 1, after which he should be kept from them one month. Thus the last ewe will drop her lamb about February 1, which is late enough for *strictly early* lambs. Some, however, prefer leaving him with them until October 1, thus having the last lamb come about March 1, but this is rather late. After keeping him from them one month, he is again put with them, and a light application of lamp black mixed with oil applied to his brisket, and he will mark all ewes not with lamb.

They by that time having had good pasture, or it being supplemented with a small amount of grain, will be fat enough for the market and can be sold at once, obviating the necessity of keeping them till spring at a probable loss, besides the risk of having them injure the others by crowding, etc. It is a good plan, and one sometimes practiced, to purchase more ewes than you care to winter, as there will be those that will not breed early, and by thus culling you may still have your desired number.

CARING FOR THE EWES.

They should be driven from the pasture and confined in the pen at nights, that they may be safe from dogs.

The pen should be made facing the south, and so constructed as to keep out all cold winds from the north and northwest. Have a small yard connected with it, that they may get the sun in winter. Do not make the inner pen too tight, as it needs to be well ventilated. Their wool is a sufficient protection from the cold if they are kept dry. A good shed with tight roof to keep off rain, open on south side and tight on north and northwest is sufficient. The size of pen to be regulated by the size of flock. As soon as the pasture becomes short in fall, or the ground becomes frozen, they should be confined to the pen and yard and from all cold storms previous to this. The pen should be situated where the surface drainage is good, that the water may be carried away rapidly after a rain. The roof made to shed the water outside the pen, as sheep will not thrive in wet quarters. The troughs for grain should be V shaped, fastened around the sides of the inner pen or shed, sheltered from the storms, high enough from the ground to prevent the sheep from getting into them with their feet, and of sufficient length to give ample room that they may not have to crowd each other while feeding, as this often leads to bad results. These should be *separate* from the hay racks, which should be placed in the center of the pen to enable the sheep to get all around them, and so constructed that they cannot get their heads in them. A good rack is made of slats, nailed up and down about two inches apart, the rack being wider at the top, so the hay may continually drop in reach as it is consumed from below.

Feed liberally on good milk-producing food. What will make a cow milk will also do the same for a ewe. A very good food is composed of oats, corn and coarse wheat bran, about one third of each, beginning with about a half pint, till they will eat about three pints each per day, given in three feeds, with all the good clover hay they will consume. Keep pure water before them at all times. They should be grained some before the lambing season begins, as it will make the ewes stronger, they will have more milk, the lambs will be stronger, get on their feet sooner, and seek the fountain of maternal nourishment, thus enabling them to better withstand the cold we are so apt to have at this season of the year. By feeding grain before lambing, the ewes will require especial attention to keep their udders from becoming caked. They will be found to have an abundance of milk, much more than the lamb will take at first, and will have to be milked out morning and evening until the lamb is large enough to take it all. Under this treatment, the writer has had ewes that required milking for a full week after the lamb was dropped. But even with all this trouble it pays *well* to have them drop their lambs in this condition. The ewes are ready to lay on more fat, or at least hold their own, while suckling their lambs, and be ready to go to market with the lamb, which is another big item on the right side of the ledger, rather than to having to keep her for weeks, and feed her nearly all the profit derived from the lamb to fit her for the market.

THE LAMBING SEASON.

This is the *most important time* and when the most care should be devoted to the flock. The shortest period of gestation for the ewe is 146 days, the longest 161 days, and the average 154 days. Therefore the lambing season may be expected to begin in 22 or 23

weeks from the time the buck was first turned with the flock, although it does not always begin so soon, this being one of the uncertainties of the business.

During this period the flock should be carefully watched, particularly if the weather is very cold. On dropping her lamb the ewe should be caught and the milk started, first removing the small scab on the end of the teat, enabling the lamb to readily supply itself with nourishment, which it will seek to do in a quarter or half an hour from birth, if the ewe has had proper feed and care. In most cases it will be able to start the milk without any help of this kind, but it frequently happens a ewe will milk very hard or have the end of the teat closed so firmly the lamb is not able to start the milk. To be on the safe side it is better to examine all. After the lamb has satisfied its hunger the balance should be all milked out to prevent any trouble resulting from a feverish condition of the ewe, and kept from becoming too full for several days, or until the lamb is able to take it all, as has already been referred to. In case of twins it is safest (particularly if the flock is large) to remove the ewe with her lambs to a small pen or stall till she is sure to own them both. Sometimes while she is devoting her attention to the youngest, the oldest will be able to get on its feet and wander off to another part of the pen and get lost from her; when again brought to her she may refuse to own it, having forgotten it by the other taking her attention. By removing her and giving her less room, the lamb cannot stray off.

Do not be afraid to visit the pen too often. We have found it a good plan to pay several visits during the day, *always* the last thing before retiring and sometimes getting up in the middle of the night, when we thought there would be some new arrivals before morning. We have saved lambs by this means that would otherwise have been lost during a very cold night. When it so happens a lamb is lost, by exposure or any other cause, and another ewe has a pair of twins about the same time, it is a very good plan to put one of the twins to the ewe which lost her lamb. She can be made to own it with a little care. Both lambs will grow faster. Remove her to a small pen with the lamb, hold her for it to feed several times a day, and if she shows no signs of owning it take a dog with you to her pen once in a while. The fear of the dog will arouse the motherly instinct, and she will *naturally* have a desire to protect her young, which will cause her to take more notice of the lamb and own it in a short time.

To make the lambs grow as rapidly as possible they should have a small pen adjacent to the main sheep pen, to which they can have free access through a small opening where the ewes cannot get. In this pen keep a trough covered over in such a way that they may get their heads in easily without being able to get in with their feet. In this trough keep at all times a liberal supply of very coarse cracked corn, with all the fine sifted out, as it is apt to get up their nostrils. Also in this pen should be kept a small rack filled with clover heads from the barn floor where the hay has been thrown down. Let this be free from dirt of any kind. They will begin to visit this pen when about a week or ten days old, and after the older ones have found it they will teach the younger ones. You will be surprised how often they will require you to fill up this trough.

By following these directions they should weigh 35 or 40 lb., and be ready for the market (if early in the season) when five or six weeks old. This is a very rapid growth, but the writer has done this well, and in special cases even better. The earlier in the season the lamb is ready, the higher the price and the lighter the weight, and *vice versa*. The butchers will take lambs

by the first of February at 35 to 40 lb., and pay sometimes from \$8 to \$10 each, while by the first of April they will require them to weigh 50 lb., and only pay \$5 to \$5.50, and occasionally even lower. There have been times in this section when they brought as high as \$12, but that day seems to be passed. The price declines so rapidly after the *very early* lambs are ready for the market, leaving such a small margin of profit, that many have gone out of the business.

in connection with this business that cannot be taught by writing them on paper, but will have to be learned by experience, and will suggest themselves to any careful, observing man, and are so plain the wayfaring man cannot err therein.—*Farm Journal*.

SOME NOTES ON ECHINOCACTUS.

THE genus *Echinocactus* is represented in Southern

ECHINOCACTUS CYLINDRACEUS.

In conclusion, Mr. Biggle, don't get your ideas up too high, as the greatest difficulty is getting the lambs early enough. But by making a careful selection of the ewes, securing those not too old or too thin in flesh, giving them good succulent pasture, with an addition of a small amount of grain, you may expect a reasonable amount of success. There are many other things

California by a great diversity of forms which nearly approach each other. The Cactaceæ are generally recognized as very difficult to study, not perhaps because they are characterless, but because of the difficulty of making specimens, and the usual lack of material for study. Only by very extended and close field observation can one arrive at correct conclusions relative to species and varieties, and this none of our botanists has yet enjoyed.

Near San Diego the genus is represented by *E. viridescens*, Nutt., usually a low, depressed plant of about thirteen ribs, with pale straw-colored flowers and a slightly acid and pleasant fruit. This is a maritime species or variety almost wholly restricted to the immediate neighborhood of San Diego.

Echinocactus Orcuttii, Engelm., is found a little further to the south and further inland from the coast. It differs in size, the number of ribs (usually twenty-two to thirty), and in the young plants, which are globose. It is inclined to grow in caespitose clumps of fifteen to twenty cylindrical heads, around which the

THE EAGLE'S CLAW CACTUS.

A HARDY ECHINOCACTUS, *E. SIMPSONI*.

ribs are often spirally inclined. It seems to form almost a connecting link between *E. viridescens* and *E. cylindraceus*, Engelm., which was originally collected by Dr. Parry on the eastern slopes of the mountains bordering the Colorado desert, in San Diego County. Dr. Engelmann was at one time inclined to doubt its right to specific rank, as other botanists are still inclined to doubt. In 1882, I found what I determined was this species in the desert canons of Lower California and also west of the mountains near the San Rafael Valley, and Dr. Engelmann wrote that he concurred with me in that opinion. This cactus was a fine cylindrical plant, encompassed by a fine network of its slender, recurving white spines, with lemon-yellow flowers. *Echinocactus Lecontei*, Engelm., is another species originally credited to the eastern slope of our moun-