

Engelmann

Again, if we bring into focus the under side, say, of the circle, we may notice a slight mistiness about its general outline, which may be removed by cutting off half the objective front lens, or of the eye lens. But on more careful examination, we shall perceive that we are bringing no one point into perfectly accurate focus, and at the same time concentrating our attention upon it. If these two things be attended to, all mistiness, thickening, and uncertainty, will disappear from such objectives as this gentleman employed. Such facts are no real obstacles to microscopic accuracy. They occur equally in unaided vision, whether of small or of large objects. If possible, we hold a solid body—a crystal for instance—in the hand, and turn it about, yet each change of position projects a different geometrical figure. The laws of vision are the same with a microscope as without, and no perfection of instruments can supersede the necessity of comparing different views and of arriving at a knowledge of the third dimension in space, through operations of the mind.

In some cases a restricted focal distance is both convenient and advantageous: one is when we look through a set of markings. The *Stauroneis pulchella* of Rev. Wm. Smith, is described by him: "striæ very distinct, 30 in '001", punctate; puncta hexagonal." In his introduction, Mr. Smith remarks: "The experiments and authority of Professor Bailey place the existence of an internal membrane (in the Diatomaceæ) beyond all doubt."—"In *Stauroneis pulchella* the membrane in question possesses an unusual degree of firmness, the siliceous valves, after a slight maceration in acid, may be seen to fall away from the internal membrane and to leave the latter unaltered in form."

Specimens in balsam from London, prepared by the author of these remarks, exhibit the following appearances: under a $\frac{1}{4}$ of between 60° and 70° , with a working distance sufficient for a Lieberkuhn, and having (to quote the term applied by the Jury of the Great Exhibition) the "exquisite" correction of Smith and Beck, they show by an achromatic condenser, the hexagonal puncta in three sets of lines, yet obscured in definition, and confused by the mingling of what seem like shadows.

Intense illumination of a suitable obliquity and direction, exhibits a set of fine striæ in a plane above these puncta, and running in directions which coincide with neither of the lines of puncta. So far, some would make the objection of "optical appearances." But when the focus is limited by the joint influence of the still more perfect correction, and the increased angles of the $\frac{1}{4}$ of 100° , the $\frac{1}{2}$ of still larger angle, and the $\frac{3}{4}$ of 120° to 128° , these two distinct sets of markings may be seen with either perpendicular or oblique light, simply by carrying the focal distance from the one to the other, and without changing the illumination. The upper striæ are at the distance quoted; the hex-

gons below are twice as distant; each set in turn may be seen in its own plane, and without confusion from the other. We do not refer to these hexagons as an instance of the interior membrane referred to in the passage just now extracted, which seems to indicate a different one. The appearances are the same on every specimen, and fragment, whether lying flat or edgewise. The striæ are similar, only more difficult to distinguish with accuracy, to the fine diagonal markings on the surfaces of *Triceratium*, *Actinocyclus*, *Coscinodiscus*, and other genera which have large hexagonal cells.

An able optician from Berlin says that the importance of spherical correction is but imperfectly understood in Germany: we thus find accounted for the mistakes of Ehrenberg, which have caused so much surprise, and Dr. Hannover's omitting all mention of a screw collar, in a work of such merit as to be selected for translation into English.

★ ART. XXIII.—Further Notes on *Cereus giganteus* of Southeastern California, with a short account of another allied species in Sonora; by Dr. GEORGE ENGELMANN, St. Louis, Missouri.

SPECIMENS of flowers and fruit, together with interesting notes and drawings communicated by Mr. George Thurber, and specimens of ribs of the plant with spines presented by Dr. Parry, enable me to perfect the history of this giant Cactus.* Mr. Thurber travelled through the Gila country and Sonora, as one of Mr. Commissioner Bartlett's party, in the summer of 1851, and is believed to be the only scientific gentleman who has seen the plant in question in flower. These materials enable me to furnish the following detailed character.

CEREUS GIGANTEUS, Engelm.: erectus, elatus, simplex, s. ramis paucis erectis caule cylindrico versus apicem sensim attenuato brevioribus candelabriformis; vertice applanato tomentoso; costis ad basin caulis sub-12 versus apicem 18-20 rectis obtusis (vetustioribus ad caulis basin obtusissimis) subrepandis; sinubus ad basin caulis latissimis versus apicem profundis angustioribus angustissimisque; areolis prominentibus ovato-orbiculatis junioribus albido-tomentosis; aculeis rectis basi valde bulbosis tenuiter sulcatis angulatisque albidis demum cinereis, radialibus 12-16 imo summisque brevioribus, lateralibus (præcipue inferioribus) longioribus robustioribus subinde cum aculeis adventitiis paucis setaceis summo areolæ margini adjectis; aculeis centralibus 6 robustis albidis basi nigris apice rubellis demum totis cinereis, 4 inferiori-

* See this Journal, New Series, vol. xiv, page 335, Nov., 1852.

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bus decussatis quorum infimus longissimus robustissimus deflexus, 2 superioribus lateralibus brevioribus; floribus versus apicem caulibus ramorumque sparsis, tubo ampliato breviusculo petalisque patulis; ovario ovato sepalis 25-30 squamiformibus triangulatis acutis in axilla fulvo-villosis stipato; sepalis tubi sub-30 orbiculato-subtriangularibus mucronatis, inferioribus in axilla lanigeris, superioribus nudis, sepalis intimis 10-15 spathulatis obtusis carnosissimis (pallide viridibus albescentibus); petalis sub-25 obovato-spathulatis obtusis integris crispatis coriaceo-carnosis crassis (flavescenti-albidis); staminibus numerosissimis, filamentis superiori tubi parti adnatis (inferiore nudo); stylo stamina paulo superante; stigmate multifido; bacca obovata squamis sepaloideis triangularibus carnosissimis minutis ad axillam fulvo-lanatis stipata, pericarpio duriusculo carnoso, demum valvis 3-4 patentibus reflexisve dehiscente; seminibus numerosissimis in pulpa saccharina nidulantibus oblique obovatis laevibus lucidis exalbuminosis; embryo cotyledonibus foliaceis incumbens hamato.

This species ranges from north of the Gila river southwardly into Sonora, to within 20 miles of Guaymas on the Californian Gulf. It doubtless also occurs on the Peninsula of California; where, according to Vanegas in his history, published about 100 years ago, the fruit of a great Cactus forms an important article of food to the natives of the eastern coast, the harvest time of which was a season of great festivity. The flowers are produced in May and June, and the fruit ripens in July and August. Mr. Thurber collected the last flowers and the first ripe fruit in the beginning of July. He has collected abundance of seed, and will be pleased to communicate it to those who take an interest in the cultivation of Cacti. The youngest plants Mr. Thurber noticed were three or four feet high, with narrow furrows and long spines; the smallest flowering plants were about 12 feet high, and the tallest specimens observed appeared to reach the elevation of 45 or 50 feet.

The ligneous fascicles correspond with the intervals between the ribs, and not with the ribs themselves; of which Dr. Parry has fully satisfied himself, and which indeed is the case in all ribbed Cacti. From between these bundles ligneous fibres radiate horizontally towards the ribs, and especially to the areolæ.

At the base of the stem the ribs are broad and obtuse, with wide and shallow intervals; upwards the ribs are somewhat triangular, rounded or obtuse, with deep and acutish grooves between them; towards the top of the plant the ribs are equally obtuse, but quite compressed, and the grooves are deep and narrow.

The elevated areolæ are 7 lines long, nearly 6 lines in diameter, about an inch distant from one another, sometimes more closely approximated.

Lowest and upper radial spines 6 to 12 lines long, sometimes the upper ones with a few additional, shorter, flexuous, setaceous spines: lateral ones 12-18 lines long, the lower ones longest; the four lower central spines straight or very slightly curved downwards, 20-30 lines long; the two upper central spines 15 to 18 lines long. The stoutest spines are one line in diameter, their bulbous base being fully twice as thick. The old spines together with the whole areola readily come off in one bunch, but generally the 6 central spines fall off first, leaving the radiating ones appressed to the stem, till finally they also fall away.

The flowers are produced near the summit of the plant, but not on it, and the fruit is usually 6-12 inches from it.

The dried flower communicated by Mr. Thurber is 3 inches long; but the drawing represents the flowers as fully 4 inches in length and diameter. The ovary in the dried specimen is $\frac{3}{4}$ ths of an inch long; the lower naked part of the tube 1 inch, the upper staminiferous much widened part $\frac{3}{4}$ ths of an inch long. Upper sepals fleshy, greenish white, $\frac{3}{4}$ ths of an inch long, below 2, above 4 lines wide. Petals of a light cream color, an inch long, 6-7 lines wide above, very thick and fleshy, and very much curled. Filaments light yellow, adnate to the upper half of the tube: anthers 0.8 to 0.9 of a line long, linear, emarginate at the base and apex. Style not seen; the drawing represents the numerous (15-20?) stigmata as half an inch long, suberect, of a green color. The flowers appear to be open night and day, and probably for several days in succession.

The fruit sent by Mr. Thurber (in alcohol) is obovate $2\frac{1}{2}$ inches long, by $1\frac{1}{2}$ in diameter, beset with about thirty scales, having short brownish wool in their axils, but entirely destitute of spines. Mr. Thurber informs me that this specimen is unusually long: the fruit, he says, is usually 2 or 3 inches long by $1\frac{1}{2}$ to 2 in diameter; the color is green, reddish towards the summit; the remains of the flower fall off, leaving a broad and convex scar. The pericarp has the hardness of a green cucumber, somewhat softer towards the apex, and is about 2 lines thick: it bursts open on the plant with 3 or mostly 4 irregular, interiorly red valves, which spread horizontally, and appear like a red flower when seen at a distance, which accounts for the report of this species having red flowers. The crimson-colored and rather insipid pulp has the consistency of a fresh fig; it completely separates from the rind, and drying up from the heat of the sun, falls to the ground, or is beaten down, when it is collected by the natives and rolled into balls, which keep several months, or is pressed for the thick molasses-like saccharine juice which it contains. The innumerable seeds are 0.7 to 0.8 lines long.

Another, apparently nearly allied species, was collected in Northern Sonora. From the half of a flower before me, together

with Mr. Thurber's meagre notes, (other specimens unfortunately having been lost,) I have ventured to make out the following description :

CEREUS THURBERI (n. sp.): erectus, elatior, e basi ramosus sub-14-costatus, sulcis parum profundis, aculeis brevibus nigricantibus; floribus tubuloso-campanulatis virescenti-albidis; ovario globoso sepalis 80-100 carnosiss squamiformibus triangularibus acutis imbricatis ad axillam villosis stipato; sepalis tubi inferioribus 24 lanceolatis acutiusculis axilla nudis, superioribus 20-25 orbiculato-obovatis obtusis; petalis 16-20 obovato-spathulatis obtusis crassis.

Collected in June 1851, in a rocky cañon near the mountain pass of Bacuachi, a small town on the road to Arispe, in Sonora; afterwards found with *Cereus giganteus*, near Santa Cruz: it abounds also near Magdalena and Ures. Santa Cruz appears to be the northern limit of this species, which does not extend to the Gila river. Stems 4 to 12 feet high, many from the same base, 6 to 10 inches in diameter, sometimes articulated, occasionally branching above, with about 14 ribs and shallow grooves. Flowers greenish white, borne about a foot below the summit of the stem. Dried flower $2\frac{3}{4}$ inches long; the tube narrower, and more elongated than in *C. giganteus*; the globose ovary and the naked and stamiferous part of the tube each about $\frac{3}{4}$ inch long; free part of petals of the same length, and 4 lines wide. Anthers much larger than in the foregoing species, 1.3 to 1.4 lines long. Style not seen.

I have dedicated this to the collector, Mr. George Thurber, of Rhode Island, an excellent botanist, who has kindly furnished me with the materials for this article.

Cereus Thurberi and *C. giganteus* appear to be closely allied species. They have high and erect stems, flowers with a short tube, half of which is naked, the filaments occupying only the upper half of the tube; both have short and fleshy sepals on the ovary, with short wool in their axils, unaccompanied by any bristles or spines; in both the petals are whitish, obtuse, and fleshy.

Both, and especially *C. giganteus*, stand very near the *Pilocerei* on account of the great height of the stem, the short ventricose tube of the flower, and the thick petals; but they have not the least indication of a *cephalum* (or woolly head) nor of any particular development of wool; their flowers spring from the axils of the ordinary and unaltered areolæ; and the seed is quite different, at least from that of *Pilocereus senilis*, the only species of that genus, I believe, which has been well examined; these seeds are said to be obliquely thimble shaped, densely dotted, and to have an embryo with thick globose cotyledons. It is also said that the filaments cover the whole inside of the tube of the flower,

and even the free upper part of the ovary. In all the *Cerei* and *Echinocacti* examined by me, I find the lowest part of the tube free, the filaments being adnate to some distance above the ovary. It is not improbable that the Chilean velvety *Cerei* (*Velutini*, Pr. Salin.) are to be classed near our species. The flower of what appears to be *Cereus Chilensis*, Pfr., obtained near Valparaiso, and figured by the artist of the U. S. Exploring Expedition, greatly resembles that of *C. Thurberi*: it is a little larger, but has the same shape, and the same closely imbricated sepals on the ovary; the tube has about 100 sepals, and the white petals are acute; whether fleshy or not is uncertain.

ART. XXIV.—On the Chemical Composition of Recent and Fossil Lingulæ, and some other Shells; by W. E. LOGAN, F.R.S., and T. S. HUNT.

IN the Report of Progress of the Geological Survey of Canada for 1851-52, we have mentioned the existence of small masses containing phosphate of lime, and having the characters of coprolites, which occur in several parts of the Lower Silurian rocks. In a bed of silicious conglomerate towards the top of the calciferous sandstone, at the Lac des Allumettes, on the Ottawa, they are abundant in cylindrical and imitative shapes, sometimes an inch in diameter. The same material forms casts of the interior of a species of *Holopea* or *Pleuronomaria*, and often fills or completely incases the separated valves of a large species of *Lingula*, which Salter has referred to *L. parallela* of Phillips. The phosphatic matter is porous, friable, and of a chocolate brown color; it contains intermixed a large quantity of sand; and small pebbles of quartz are sometimes partly imbedded in it. The analysis of one specimen gave 36 per cent. of phosphate of lime, with 5 p. c. of carbonate and fluorid, besides some magnesia and oxyd of iron, and 50 p. c. of silicious sand.

Similar masses occur in the same formation at Grenville, and in the lower part of the Chazy limestone at Hawkesbury, in both cases containing fragments of *Lingula*. Those from the latter place, are rounded in shape, and from one-fourth to one-half of an inch in diameter, blackish without, but yellowish-brown within, and having an earthy fracture; the analysis of one of them gave:

Phosphate of lime, (PO ₅ , 3Ca O),	-	44.70
Carbonate of lime, - - - -	-	6.60
Carbonate of magnesia, - - -	-	4.76
Peroxyd of iron, and a trace of Alumina,	-	8.60
Insoluble silicious residue, - - -	-	27.90
Volatile matter, - - - -	-	5.00