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TOWNSHEND STITH BRANDEGEE

EDITOR

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Errata.

In "Plants of San Francisco" the names of the following plants introduced from the Old World should be italicised—102, 119, 206, 274, 375. Many others which are not so printed, are unquestionably introduced on this coast, at least in our region.

The note on Zauschneria at the foot of page 352, belongs at the bottom of the previous page.

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SOME BIOLOGICAL PECULIARITIES OF THE PHYLLOXERA AND A METHOD OF UTILIZING THEM FOR THE PROTECTION OF VINEYARDS.

BY H. H. BEHR.

Almost every investigator of the biological phenomena in Phylloxera, and its different forms of existence, has been struck by the comparatively and unexpected ease with which the winged generation of the insect pest may be developed.

This experience has left an impression that under ordinary circumstances, that is in our vineyards, the winged generation of the insect develops as regularly and frequently as in the glass jars, where, together with some grape roots, the wingless insects are kept prisoners by the entomologist. The scarcity of the winged insect—in fact I do not know any case of its being observed except in the glass jar—has always been imputed to its minuteness, nocturnal habits, shortness of existence, etc. Still if the insect would develop as regularly out of the glass jar as it does within it, it would not so successfully have escaped notice.

As to its nocturnal habits, I am not so certain that they are exclusively so. At least, in the glass jar, they seem lively enough during day time. But, even supposing that they are exclusively nocturnal, there is not much probability that they would escape our notice if they kept regular seasons. Water tanks that reflect the sun in day time and either the moon or artificial lights at night, and which especially to the minute insect world prove such an attractive trap, would have yielded at least some Phylloxera amongst the many winged Aphidians, Coccides, Tipulides, Microptera, Noctuides, and even Sphinges, which become victims to the deceptive reflection, or if wise enough to escape that illusion are wafted into the water by some untimely breeze, whose power their weak wings cannot counteract. There is just a trace of volition in the flight of Aphid-

ians and Coccides; they are wafted on the breeze in a style but little superior to that of the Medusa palpitating in the currents of the ocean. Why should then the Phylloxera not share the fate of analogous organisms?

I do not refer here to the crowd of minute insects found in abandoned spider webs, because the minuteness of the Phylloxera would prevent to a considerable degree its detection in the dust and variety of debris collected at such a locality, but the smooth, clear surface of the water cannot conceal any object minute as it may be, provided it be not transparent.

I do not deny the possibility of these minute things being carried in the plumage of birds, the clothing of vintners, or by the evening breeze from spot to spot, from vineyard to vineyard. On the contrary, I am certain that all the isolated centers from which irradiates destruction are originated by winged individuals carried thither.

The only point in which experiments have taught me to differ, is the idea of a regular development of the winged generation according to a law analogous to the one that rules the development of the winged generation in the rest of the known Aphidians and Coccides. In these insects the development to the winged and to the sexual generations runs through a well defined cycle, corresponding more or less, but always in some way with the cycle of the seasons of the year.

Now my own experience has convinced me that the development of the winged generation is entirely independent of the seasons, or any regular cycle. The law that rules its dimorphism is analogous to the law that rules the dimorphism of the Lepidopterous genera Œceticus, Solenobia, Talæporia, and perhaps other sack-bearers. Here a parthenogenesis of wingless individuals is going on *ad infinitum*, and the collector who expects specimens of the winged male is constantly disappointed till suddenly winged males are produced, which, mating with the wingless females, reproduce another series of parthenogenetic generations.

The circumstance that in Phylloxera the winged generation serves only as an introduction to the sexual generation, and is not the sexual itself, forms a difference immaterial to the present discussion, although it is highly interesting as an instance of the power of adaptation in itself.

In regard to Œceticus, the exceptional circumstances which cause

a generation of winged males are not known. In Solenobia I found in one locality the same species regularly producing the winged male, in another locality the larvæ without exception developed into parthenogenetic females. In the first locality the fences on which the larvæ fed had a covering of Palmella, variegated with isolated patches of Parmelia, and similar lichens. In the second locality, fences and trunks of trees were covered by a luxuriant vegetation of Evernia, Usnea, Cladonia, etc. The sack-bearing larvæ collected in the locality produced only females, never yielded any male.

We know but few instances of this form of dimorphism amongst animals, but in the vegetable kingdom the thallophytes abound in analogous cases. Penicillium develops its sexual generation only when deprived of the regular supply of oxygen of the atmosphere. A majority of Confervæ form the product of sexual combination, the teleutospore only when by the evaporation of water their existence become questionable. Nature does most for the preservation of the species when the existence of the individual becomes questionable.

We do not know the exact circumstances which in one locality produces in Solenobia and analogous cases an endless series of wingless females propagating like Aphidians by parthenogenis, when in another locality the regular development of the winged male takes place. But it is very probable that the abundant food in one case is not favorable to sexual reproduction, the scarcity of food and perhaps its inferior quality in the other locality are, it may be, the cause of the more energetic form of propagation.

In the case of Phylloxera the inferior kind of food, the dying grape roots in the glass jar, or in the infested vineyard, evidently have a great deal to do with the development of the winged generation. There is a second factor in the case of the Phylloxera that favors the development of wings, *i. e.*, the necessity of preserving the species by the formation of a new colony on sound grape roots.

This is perhaps the cause of the winged generation having been developed by the Phylloxera, not sexual itself, but carrying eggs of two different sizes, analagous to the macrospores and miscrospores of the Selaginella. The small eggs analogous to the microspore produce males, the larger eggs analogous to the macrospore produce the one-ovuled female.

Thus the problem of preserving the species is divided between locomotion and propagation. The first generation removes the ovules containing the parents of the colony from the exhausted locality, the second plants that colony.

Now it is highly probable, in fact it is almost certain, that surrounded by an abundance of food the Phylloxera develops no winged generation. This peculiarity of the insect explains a great many otherwise inexplicable phenomena in its distribution, and by pointing out where in the fight against the enemy our tactics have been wrong, offers to us a method by which we may establish our lines of defense.

This problem resolves itself into two indications:

First, preventing the spread of the subterranean pest.

Second, preventing the spread of the winged aërial pest.

The first indication we reach in surrounding the infested spot by an area that contains no food. This result may be obtained by destroying the sound vines without displacing them. The exceedingly imperfect organs of locomotion prevent the insect from traveling a distance of, let us say, a foot. As on this way the Phylloxera has to follow the more or less serpentine direction of a root, the distance to be traveled to a new pasture increases. Now it is true the fasting ability of this animal is considerable, but with its defective facilities of locomotion it would take a year to cross a girdle of two feet wide, even if the insect could live so long in another than an asphyctic state and would move in one direction during all that time.

The second indication, viz: to prevent the escape of the winged form, we reach by covering the infested spot by some substance impenetrable by the insect. As individuals of the winged generation do not possess the faculty of prolonging existence through an asphyctic state analogous to hibernation it is much easier to be dealt with than with the ordinary wingless generations, which possess under certain circumstances not yet perfectly understood a considerable power of preserving vitality.

Of course a vineyard of which the Phylloxera once has taken a perfect hold cannot be saved by all the chemicals of the world. The sooner the vines are destroyed the better it is for the neighboring cultivations. On the other hand, it is easy enough to stop by proper methods an invasion of the pest, but this is exactly the

point where an imperfect knowledge of the biology of the insect has injured the farmer and helped the pest.

There was a time when it was considered sound policy to pull out the infested roots and drag them through the vineyard to a spot where, when a sufficient number had been accumulated, and when they all appeared sufficiently dry to take and hold fire, the torch was applied to what was supposed to be the funeral pyre of the Phylloxera. But this supposed funeral pyre was in fact the breeding place of new colonies of the insect pest. The starving Phylloxera had produced the winged generation before the pile of roots was dry enough to take fire, and had been wafted away by currents of air to infest the region with new colonies. Even the rootlets, shaken off in carrying the infested vines to the pile, formed new centers for the production of winged generations, and thus it can easily be explained that this sanitary measure proved quite the reverse of what it was intended for. Experience has fully demonstrated that the pulling out of the infested vines aggravated the calamity. This danger may be avoided to a great extent by destroying the vines on the spot, or making them unfit to serve as food for the pest.

It may be permitted here to suggest a method of fighting the pest. I would advise the owners of vineyards in which the infested spots are not yet confluent to surround them and cover them with a layer of the substance called gas lime, which recommends itself by its cheapness as well as by its efficacy. It is, so far as I know, of no commercial value and can easily be obtained at gasworks, perhaps for the mere expense of removal. At the same time it does not, like petroleum and similar substances, entail permanent sterility on the localities where it is used; but on the contrary, being washed into the soil by the rains will serve as a fertilizer.

My experiments have convinced me, that a layer of an inch thickness is more than sufficient to prevent the escape of the winged generation. A thicker layer, of course, is necessary to destroy speedily and effectually the vines of the healthy area.

The method recommended here, will require perhaps an additional quantity of gas lime, or some modification of it, to destroy the gall-forming variety of the Phylloxera. This variation must be very local in California or is generally rare, because during all my experiments and investigations from the year 1869 to 1880, I have not

met with it, and I only once received a quantity of leaves affected in that way from a vineyard in Fresno, otherwise injured by too profuse irrigation. This happened in the year 1883. My efforts to obtain another supply of infested leaves were not successful, and it is a queer circumstance, that neither before that time nor after, have I heard that the vineyards of Fresno were infested by Phylloxera of the form feeding on roots. I, therefore, consider the occurrence of the gall-forming Phylloxera in California as an isolated fact.

The object of this communication is only to lay down a principle derived from biological facts. The successful adaptation of this principle to season and locality must be left to the viticulturist.

COLEOPTERA AND MOLLUSCA OF THE OCEAN BEACH AT SAN FRANCISCO.

BY GEORGE W. DUNN.

Probably most of those who visit the Cliff House and vicinity, look upon the expanse of sand as a waste, with no sign of animal life, and only here and there a few low plants, Abronia, Franseria, etc., with some stunted willows in depressions; but notwithstanding its very desolate and unpromising appearance it is rich in insect life, many species hidden in the sand being exposed by pulling away brush or debris from the top of a hillock and starting the rolling sand.

The following is a list of the Coleopterous insects found along the ocean beach and adjacent dunes. The species inhabiting the sand at a greater distance from the sea will be given in a future list:

CICINDELA HIRTICOLLIS. On damp sand feeding on any small animals.

CICINDELA 12-GUTATA. On damp sand feeding on any small animals.

CICINDELA HÆMORRHAGICA. On damp sand feeding on any small animals.

THINOPINUS PICTUS. Under kelp and sticks, feeding on small crustaceans below high water mark.

CAFIUS CANESCENS. Under decomposing kelp and animal substance.

DYSCHIRIUS OBESUS. On damp sand below high water mark.

EULABIS OBSCURUS. Under decomposing kelp.
PHALERIA ROTUNDATA. Under decomposing kelp.
PHALERIA LIMBALIS. Under decomposing kelp.
PHYCONOMUS MARINUS. In decomposing kelp.
CERCYON FIMBRIATUM. In decomposing kelp.
CERCYON POSTICATUM. In wet sand.
TACHYCELLUS NITIDUS. Under sticks in damp sand.
SAPRINUS LUGENS. In decomposing animal substance.
SAPRINUS SULCIFRONS. Under decomposing animal substance in sand.
SAPRINUS SCISSUS. Under decomposing animal substance in sand.
SAPRINUS FIMBRIATUS. Under decomposing animal substance in sand.
SAPRINUS ÆNEIPUNCTATUS. Under decomposing animals.
OMOPHRON DENTATUM. In holes in wet sand.
HISTER SELLATUS. In dry sand.
CREMASTOCHILUS PILOSICOLLIS. On dry sand.
COPIDITA QUADRIMACULATA. Under sticks and cocoanut husks.
PHILONTHUS CALIFORNICUS. Under kelp and sticks in wet sand.
AMARA INSIGNIS. Under sticks.
ELEODES CLAVICORNIS. In sand dunes.
CŒLUS CILIATUS. In dry sand.
TRIGONOSCUTA PILOSA. In dry sand.
CREOPHILUS VILLOSUS. On dead animals.
SILPHA RAMOSA. On dead animals
SILPHA LAPPONICA. On dead animals.
NECROBIA RUFIPES. On dead animals.
NECROPHORUS NIGRITUS. On dead animals.
ALEOCHARA BRACHYPTERUS. Under decaying kelp.
ALEOCHARA SULCICOLLIS. Under decaying kelp.
OMOSITA DISCOIDEA. On decaying animals.
ANTHICUS MARITIMUS. On decaying animals.
ELLASOPTES MARINUS. Under sticks in damp sand.
CALATHUS RUFICOLLIS. In sand dunes.
COCCINELLA CALIFORNICA. On kelp.
HIPPODAMIA CONVERGENS. On kelp.
AGONODERUS LINEOLA. In wet sand.

BEMBIDIUM BIFOSSULATUM. In wet sand.
BEMBIDIUM CRURALE. In wet sand.
BEMBIDIUM APPROXIMATUM. In wet sand.
BEMBIDIUM EPHIPPIGER. In wet sand.
BEMBIDIUM ERASUM. In holes in wet sand.

The ocean beach at this place is poor in Mollusca, but we find occasionally *Siliqua patula*, *Cardium corbis*, *Mytilus Californicus*, *Schizothærus Nuttalli*, usually old and broken valves.

STUDIES AMONG MOLLUSKS—INSTINCT AND GENERA.

BY HENRY HEMPHILL.

HELIX (GLYPTOSTOMA) NEWBERRYANA W. G. Binney.

The study of this mollusk, its shell and habits, supplies us with some puzzling and interesting facts that are worthy of close and careful investigation.

We are told by Mr. W. G. Binney, the highest authority on our American land shells, that the animal inhabiting this shell is a "true Helix," while I might add the shell it moulds and forms is the shell of a true Zonites. Mr. Binney at first, 1859, described the shell as a Helix, subsequently, 1869, he removed it to the genus Zonites, but later, after the study of the soft part from specimens I sent him from San Diego, California, he removed it again, putting it back into the Helicidæ, making for its reception the genus Glyptostoma. The late G. W. Tryon placed this shell in the genus Macrocyclis.

Now we have been taught and led to believe that animals perform all their functions of life by instinct, and instinct is supposed to be unerring in its action, being directed and governed by laws over which the animal has no control. If our division of these animals into genera is based on true and natural principles, and if genera really exist in nature, then good logic would lead to the conclusion that, as each genus is separate and distinct from the others, then equally as distinct must be the generic instinctive impulses, for they partially serve to define genera, as well as modifications in the structure of the animals. If this is true, it would be reasonable to suppose that all the members of a genus would be equally stimulated or animated by this generic impulse, and hence

we would expect to find great uniformity among the shells of each genus, so that we could very readily assign them to the genus at least to which they belonged in a natural system of classification. But when we find two different genera moulding and forming shells so nearly alike that we cannot separate them, or determine the genus to which they belong without referring to some peculiarity of the soft parts, we begin to wonder if we have not made some mistake in our interpretation of nature and her laws in this respect.

We have a class of not very wise philosophers, who tell us about free will in man, perhaps in our studies we have found a class of animals which act independently of this generic impulse. Free instinct in animals is about as consistent as free will in man, but I must confess that I cannot conceive of any impulse, faculty or function, in either man or animal, that exists or acts in any particular independently of law. Now if a strawberry plant should bear blackberries, or a currant bush produce cherries, we would look on with astonishment. If we are correct in our divisions of these animals into genera, then, in principle, this is just what *Helix Newberryana* is doing by constructing its shell identical in every particular with the shells of the genus Zonites, instead of forming them like the shells of the genus Helix, to which the animal is said to belong.

Besides these puzzling facts, *Helix Newberryana* shows some other peculiarities worth noting. So far as we know at present its geographical range extends from Los Angeles south about two hundred miles, and from the coast inland about forty miles, thus it ranges over an area of about eight hundred square miles.

Within this area at certain localities favorable to its existence and development it is found quite abundant, and it is not considered a rare shell. Notwithstanding its wide geographical range and its abundance, it adheres with rigid tenacity to one unvarying form, and its sculpturing or smooth surface is unbroken by a single innovation of any kind.

In our philosophy of climatic effects upon land shells, we had always supposed that in a warm, dry and treeless region, where almost perpetual sunshine prevailed, such as prevails over the entire area in which this shell is found, that we must look for white, bleached and colorless land shells, and so nearly have the land shells of other regions been supposed to conform to this

theory that some of our more philosophical writers upon conchology have suggested that shells might be arranged geographically to represent the peculiar climatic conditions of the areas which they inhabit. But our Helix, true to its paradoxical instincts, persists in covering its shell with an epidermis as dark almost as the cuticle of a Congo negro, and in shells of the same size and age, so far as I have observed, scarcely a shade of difference in coloring can be detected. In its dark coloring, as well as by the form of the shell. *Helix Newberryana* agrees fairly well with the larger forms of our American Zonites found south of the Ohio River. (Compare it with *Z. capnodes*, *Z. fuliginosus* and *Z. subplanus).* Those Zonites, however, inhabit a densely wooded region, with a moist, hot and variable summer, and a moderately cold and wet winter climate.

On the coast of California its nearest allies, by the color of their shells *Helix fidelis*, and its varieties *infumata*, *subcarinata* and *mormonum*, occupy the region north of San Francisco Bay. This region in the localities where these shells are found, is also densely wooded and has a cool, foggy and moist climate the greater part part of the year, the opposite conditions in almost every respect to those prevailing in the region over which our southern snail ranges. It will be seen by this that the color of *Helix Newberryana* cannot be taken as an index of the climatic conditions of the area which it inhabits.

When we consider the variable nature of all our other west coast land shells in form, size, color and sculpturing, the persistency with which *Helix Newberryana* adheres to one unchanging form, and its constancy in color and sculpturing, it is remarkable and a puzzle indeed.

ZONITES (MESOMPHIX) ELLIOTTI Redfield.

This small shell is found quite plentifully in the mountains of North Carolina and adjacent States. It is constant in color, but very variable in size. The late G. W. Tryon placed it at one time in the genus Macrocyclis, which at that time included the forms we now know as Selenites.

In this mollusk and its shell we have another example in which two genera are represented, one by the structure of the animal that agrees with the genus Zonites, in having a caudal mucus pore and a smooth or ribless jaw, and the other by the form and character of the shell, which agrees in every particular with the shells of

the genus Selenites, as we understand those genera at the present time.

In the Manual of American Land Shells, Mr. Binney describes the animal of the family Selenites "Without a caudal mucus pore, jaw of Limacidæ." In the family Limacidæ he includes Limax, Vitrina, Zonites and Vitrozonites. The animal of this family is described, "With or without a caudal mucus pore, jaw arched without ribs." In the family Helicidæ he includes twenty-seven genera. The animal of this family is described, "With or without a caudal mucus pore, jaw of many patterns."

Now it will be seen by this that the caudal mucus pore is not an invariable character, for it is both present and absent in the two families of Limacidæ and Helicidæ, therefore we cannot use it as a generic character.

The smooth or ribless jaw is found in the three families of Selenitidæ, Limacidæ and Pupidæ, while the jaw of the animal comprising the family Philomycidæ is described, "With or without anterior ribs." The ribbed jaw of the Helicidæ is known to be so variable, even in the same species, that it is hardly worth referring to for this purpose. The jaw then offers us no characters, lines or limits, that can be relied upon to distinguish or determine genera.

Some students attach great importance to the form of the lingual membrane, and the arrangement of the teeth, and think they have found the keystone to the systematic arrangement of mollusks in these useful organs, which are used in the economy of the animal simply to chop or grind up the food, for its reception in the stomach preparatory to the process of digestion. Now I do not underestimate the value of the knowledge of the structure, form and the uses, as well as of the varied and beautiful arrangement of those organs, but it seems to me a system based on the dentition alone would represent the carnivorous and herbivorous habits of the animal and nothing more.

For the purpose of determining genera the lingual membrane rather adds to the confusion than otherwise, as will be seen by the following list of families that have similar lingual membranes, which I have selected from Mr. Binney's Manual of American Land Shells:

Family Selenitidæ membrane of Testacellidæ.

Family Philomycidæ membrane of Helicidæ.

Family Bulimulidæ membrane of Helix.
Family Pupidæ membrane of Helix.

From all of these facts it will be seen that there are no invariable characters or arrangements of these organs on which genera can be based. They seem to be scattered throughout the class without reference to divisions of any kind, and from these and other facts I cannot resist the thought that genera, as we understand them at present, do not exist in nature, and the sooner we abandon them for some more natural divisions of these animals, the better it will be for science and for the student.

As the shell of a mollusk is extravascular, and moulded by the mechanical action of the animal's mantle, and not by the processes of secretion as bones and other parts of an animal's body are formed, it (shell) does not constitute any portion of the animal's body, but is simply an outside covering constructed by the animal for the protection of its body. No animal can form or mould part of its own natural body. Its form, size and growth are determined by a principle inherent in the germ of all organic bodies. Nor is any part of an animal's body extravascular, but on the contrary all parts are closely connected with the venous system, and whenever this connection is interrupted, severed or broken, the body withers, decays and disappears. The shell bears the same relation (mechanically) to the animal that moulds and forms it that the web does to the spider, that spins and sets it to catch insects for food. In both instances the material is secreted by these creatures, and afterwards constructed into the shell and web by mechanical action directed by the instinct of these curious and skillful little mechanics.

The shell of a mollusk then represents the instinctive impulses of the animal, and nothing more.

Besides the instinct common to all animals, viz: the reproduction of their own kind, mollusks display in their shells instincts that are regarded by man as evidence of a higher intelligence, and to the philosophical student adds an importance and a charm to their study not found, perhaps, in the study of some other branches of natural history.

For the purpose of study I separate these higher instinctive impulses, as follows:

1. The mechanical impulse to construct a shell as an outer covering for the protection of the animal's body.

2. The artistic impulse to decorate the external surface of the shell.

This second or artistic impulse I divide as follows:

a. The impulse to ornament the external surface of the shell by varied designs of sculpturing.

b. The impulse to ornament the external surface of the shell by regular artistic colored designs.

On account of their brilliant colors and the dazzling external polish of many shells they have been truly called the "Butterflies of the Sea," and have always occupied a conspicuous place in the homes of the rich and poor alike, in the cabinets of the mere curio collector, and in the great collections of natural history in all the civilized countries.

The animals of the oyster, mussel, and many kinds of clams, as well as the animals of many univalves, have supplied both civilized and savage people with an abundance of wholesome and nutritious food for ages, while their shells have been utilized in various ways for ornamental and useful purposes. From a geological point of view the work of mollusks in past ages is recognized as having effected great changes in the earth's strata, and they might be called the great lime gatherers of the world, for their shells form the basis of the vast limestone, marble and chalk formations that constitute so large a proportion of many mountain ranges that "rib" the surface of the globe.

Notwithstanding these facts and the conspicuous manner in which mollusks have displayed their instincts, no collection, nor a part of any collection, so far as I know, except my own, has been especially arranged to display the mechanical instincts of the mollusk, or the progressive development of the shell, from the rude beginning, an aggregation of the few particles of limy matter such as we find under the mantle of some of the slugs and ending with the most complicated and perfect shells. Neither have especial efforts been made to exhibit the progressive development of what I have called the artistic impulse by arranging a series, first, to represent the development of the sculpturing by commencing with the plain smooth forms and ending with those ornamented externally with elaborate spines and fringes; and second, by arranging a series to represent

the development of the impulse to ornament the external surface of the shell with colored patterns and designs, by commencing with those stained with a few irregular blotches or daubs and ending with those shells painted with regular artistic designs and patterns.

An arrangement of this kind would represent the mollusk and his work, and would form one of the most interesting, instructive and important features of a collection for the scientific investigation of these curious and wonderful little animals that could be devised.

DESCRIPTION OF THE NEST OF THE CALIFORNIAN TURRET BUILDING SPIDER, WITH SOME REFERENCE TO ALLIED SPECIES.

BY J. J. RIVERS.

The Californian turret builder mines into the ground more or less perpendicularly to the depth of from 8–10 inches, and from a ¼ to ½ inch in diameter, according to sex and maturity. The burrow is lined with silk throughout, and the nest of a full-grown female will have a turret 3 inches high covering the surface opening to her burrow or tube. The material of which the turret is formed depends largely upon what may be found in the neighborhood; it is constructed of vegetable debris, such as crisp pieces of leaves, or of small leaves, pine leaves or needles and grasses, the whole being woven together with silk, and at times it is closed horizontally at top with similar materials, of which the other part of the turret is made.

The spider has a wide range in California, occurring in wooded districts from Monterey County to Mendocino County, and turrets gathered from the various habitats show a pleasing variation on account of the different foliage, of which the structure is necessarily built. A turret erected in a pine groove is an interesting object as well as a pretty one, and reminds one of the leading shoot of a spruce that has been sun scorched. In these situations it is surrounded by a protecting carpet of pine needles of the same tone of color, its presence being known only by its rising perpendicularly from the ground. The turrets made of a mixture of leaves form a regular figure under the manipulation of this industrious spider, and a remarkable turret is made occasionally by half-grown males,

which during the rainy season dig out and enlarge their tubes. At this age and time the young do not carry off or scatter the earth brought out of the tube, but utilize it by building an earthen turret, and in wet weather the earth becomes a regularly formed and compact figure with the rim thickened, reminding one of a miniature vase in terra cotta without lid or cover of any kind.

The sexes when mature occupy different nests, but the newly hatched young are found with the mother at the bottom of her burrow, which is more roomy at the base than at the opening. There is a period of æstivation, but the cause is not yet investigated.

The Californian turret building spider is closely allied to the trap-door spider, the former however being smaller, more elongate and possessing at the base of the mandibules of the male a club-like projection covered with black bristles at the upper part of the tip, while the female has but a shallow tubercle in the same region. The other Californian species of notable spiders belonging to the Theraphosidæ are: The great tarantula of Southern California, Arizona, and Texas, and the lesser tarantula belonging to the middle of California. The use of the word "tarantula" is rather wide and dubious in application. While the tarantula of the Southern States is of the same family as the true tarantula of Spain—Lycosidæ—the Californian tarantula is of the Theraphosidæ *(*Mygalidæ*)*. In fact the name carries with it no meaning of value because in each locality the name is bestowed upon the largest hairy spider of the region, irrespective of its classification or habits. The Californian trap-door spider and the Californian tarantula are also confounded, and visitors to our coast who take home with them a spider souvenir, purchased at one of our so-called Natural History Stores, are unaware they are cherishing a mis-matched memento of some one's cupidity, and, in some instances, of their own as well. The large spider called "Californian tarantula" does not fabricate a nest with a trap-door, but commercial enterprise supplies the demand by annexing a specimen of *Mygale Hentzii* to the trap-door nest of *Cteniza Californica*. Some years ago I made an ineffectual effort to persuade one of the dealers to sell the real spider, but the man of business replied that he knew all about the matter, but the public would not be satisfied with the smaller spider, and that he could not trade without the larger animal.

Species mentioned in this paper:

THERAPHOSIDÆ.

Californian turret builder = Atypoides Riversii.*
Californian tarantula = Eurypelma (Mygale) Hentzii.
Californian trap-door spider = Cteniza Californica.

LYCOSIDÆ.

Southern tarantula = Lycosa Carolinensis.
Spanish tarantula = Lycosa tarantella.

NOTES ON CALIFORNIAN PLANTS.

BY S. B. PARISH.

II. AN ABNORMAL PHACELIA.

Phacelia Whitlavia Gray is a well-known species common in the hills and lower mountains of southern California. It is an annual, with ovate or cordate leaves coarsly serrate, and the flower has an ample blue corolla of typically campanulate form, somewhat spreading at the mouth, and with a narrow 5-parted limb.

To it I must refer a plant quite different in many respects, and of sufficient interest to deserve brief record. The basal leaves of the specimen are wanting, but all the cauline are narrowly oblong and entire. The corollas are somewhat reduced, and are divided to the base into six very narrow lobes, the tips dilated. So deep is the division that the flower appears polypetalous. The calyx-lobes are normally linear but are six in number, and the stamens are also six. On the other hand the gynœcium is regular, the pistil being 2-cleft and the ovary 2-celled and many-ovuled.

A consideration of the position of this plant illustrates the artificiality of systematic distinctions, and even of some morphological definitions. Supposing it to be an abnormal Phacelia, the pubescence and the characters of the ovary bring it into the section Whitlavia. Here are two species with which it agrees in habit of growth and in the possession of a campanulate corolla, but from which it differs entirely in the very important characters of the shape and

*Proc. Zool. Soc. Lon., June 5, 1883.

serration of the leaves and the size and form of the corolla lobes. To one of these species, *P. Whitlavia*, our plant must be referred, not from any characters of its own, but purely for the geographical reason that it was found in the territory of that species, for it might with equal propriety be placed with the other, *P. campanularia*, had it come from the desert region to which the latter species is confined.

But even this disposition would be unsatisfactory if, instead of dealing with a stray plant or two, the variation had become fixed and was abundantly propagated, and diffused, so that they might be collected by the thousand. There could be no hesitation in considering it a valid species, and a new section would be required for its reception, and the generic character must be modified; or with a less conservative view, it might be made the type of a new genus. Should the increased number of some of the floral organs remain constant, even the ordinal definition would need changing. And thus fitted into a regular place in systematic classification, it would cease to be an example of the antholysis of a corolla normally entire and must be described as a plant with a corolla normally deeply lobed. And all these apparent changes would be due not to any characters inherent in the plant itself, but solely to a difference in numerical abundance.

My specimen is from the mountains near San Bernardino, where it was found by Mr. E. D. Palmer. Similar flowers, without leaves or other parts of the plant, are in the Gray herbarium, collected by Rev. J. C. Nevin, near Lang Station, on the Southern Pacific Railway. In this plant, Mr. Nevin informs me, the floral branches were fasciated, showing that the force of variation, which in Mr. Palmer's plant was manifest only in the leaves and flowers, had here modified other parts of the structure.

III. PSEUDO-CAUDEX OF *Carex Barbaræ* DEWEY.

This sedge is found along stream banks in the lower foothills of the San Bernardino Mountains, and also in open swampy ground in the adjoining valley. In the former situations it forms robust tussocks, but in the latter the bases of these are often elongated in such a way as to present the appearance of trunks. These are from four to six feet high, so that in collecting specimens one frequently has to reach up to gather the flower stems. They are

erect, cylindrical in shape, about eighteen inches in diameter, and quite bare, either from the natural decadence of the leaves, or possibly from their removal by fires. They consist of an interlaced mass of coarse fibers, similar to the roots, of which they are properly a part. There is, of course, no exterior covering. Seen from a little distance one of these short stout shafts, topped with its crown of long leaves, might be easily mistaken for some aborescent yucca.

As the places in which these tree-like sedges grow are not subject to overflows which might induce such a growth by changes of water-level, their upward prolongation must be a natural growth, added to as each successive crop of foliage surmounts the previous one.

ANATOMICAL NOTES ON SUTROA ALPESTRIS, A NEW LUMBRICULIDE OLIGOCHÆTE FROM SIERRA NEVADA, CALIFORNIA.

BY GUSTAV EISEN.

During a visit to Donner Lake, in the Sierra Nevada, I found a new Lumbriculide worm greatly resembling Rhynchelmis and Sutroa, as regards external characteristics. An anatomical study of the worm proved it to belong to the genus Sutroa, but in many important points differing from the only species, *Sutroa rostrata*, hitherto described.*

This new species is in many respects interesting, proving, as it does, the genus Sutroa to be well defined from Rhynchelmis. It further gives us a new insight into the generic and specific characteristics, which necessarily must remain more or less obscure, as long as only one single species is known.

A study of this new species has enabled me to decide several obscure anatomical points, such as the position of the testes and the ovaries, and the nature of those organic masses which have been formerly mistaken for these reproductive organs.

The genus Sutroa appears to take the place on this coast of the old world genus Rhynchelmis, which it resembles in general ap-

*On the anatomy of *Sutroa rostrata*, a new annelid of the family Lumbriculina, by Gustav Eisen. Memoirs California Academy of Sciences, Vol. ii, No. 1, San Francisco, Jan. 1888.

pearance. The discovery of a new one is the more interesting, as only one well defined species of Rhynchelmis* has been described, although it is probable that a closer examination of this annelid will increase the number.

SUTROA Eisen.

Prostomium filiform. The spermathecæ consist of several pairs or lobes all opening into a central receptacle or atrium situated in somite VII. One or more pairs of albumen glands.

RHYNCHELMIS Hoffm.

Prostomium filiform. One pair of spermathecæ, each receptacle opening separately in somite VIII. One central albumen gland.

From the above description of the two genera it will be seen that the principal characteristic of Sutroa is the absence of a central albumen gland, and the centralization of the seminal receptacles or spermathecæ which open into a common and central atrium or receptacle.

Of the genus there are now known two species.

SUTROA ROSTRATA Eisen. The ventral vessel is forked in somite VIII. The two forks being connected by a secondary vessel in each somite. The ventral vessel is only connected with the dorsal vessel in the cephalic lobe. The spermathecal atrium opens in somite VIII; albumen glands in somites IX and X; spermiducal pores between somites X and XI; oviduct between XI and XII. Sperm-sacs begin in XV and extend towards XXIV or further. Testes in X, ovary probably in somite XXXII or in its vicinity. Egg capsule oblong, not pointed. Habitat: Mountain Lake, at Marine Hospital, San Francisco; elevation 40 or 50 feet above the ocean.

SUTROA ALPESTRIS n. sp. Ventral vessel forked in somite V, each fork being connected with the dorsal vessel by one perigastric secondary vessel in each somite. The ventral vessel is connected with the dorsal vessel in the majority of the somites by two pairs of feathered secondary vessels. The spermathecal atrium opens in somite VII; albumen glands in VIII and IX; spermiducal pores open in somite IX; oviduct between somites X and XI;

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* *Vejdovsky:* Anatomische Studien, Rhynchelmis, Zeitschrift f. w. Zool. Bd. xxvii, Taf. xxi–xxiv.

sperm-sacs begin in XIII and extend to somite XX or further. Ovary in somite XXXII. Egg capsule globular and pointed. Testes in somite IX.

Habitat: In springs on the north and east side of Donner Lake in the Sierra Nevada, California, at an altitude of about 6,000 feet. Adult in the end of July.

This species lives in the mud close to the surface of the water, and is often found crawling on the underside of pieces of wood among the roots of moss or smaller plants, or even attached to stones partly submerged in the water. The color of this species is much less vivid and iridescent than that of *Sutroa rostrata*, which latter must be considered as one of the most beautiful of all fresh water Oligochætæ.

As to size, *Sutroa rostrata* is by far the larger, being thicker, but not as long as *Sutroa alpestris*. In shape the body of *Sutroa rostrata* is more quadrilateral than that of our new species, in this respect very much resembling Rhynchelmis.

I will now enter more fully into a description of the anatomical characteristics of the new species.

VASCULAR SYSTEM—consists of two main vessels: the ventral vessel and the dorsal vessel. (Figures 24 to 29.) The ventral vessel is not pulsating; the dorsal vessel is strongly pulsating; the blood is reddish as in the other species of this family. The ventral vessel is forked in somite V, and differs in this respect from the ventral vessel in *S. rostrata*, which is forked in somite VIII.

The two forks of the ventral vessel are connected with the dorsal vessel in every somite by one pair of secondary vessels (as seen in Figs. 24 and 25). In this respect the species resembles *Rhynchelmis limosella*, but differs from *S. rostrata*, in which there are no such secondary vessels connecting the ventral and dorsal vessels, but only secondary vessels connecting the two forks of the ventral vessel. In *Sutroa alpestris* the two forks of the ventral vessel are not connected.

The dorsal pulsating vessel connects in every somite except in the extreme caudal somite with the ventral vessel through secondary perigastric vessels. In the six anterior somites there are but one pair, or two perigastric vessels in each somite—one vessel on each side of the dorsal vessel. In the posterior somites, beginning with somite VII, are two pairs of perigastric vessels, one post-

septal or anterior pair, and one preseptal or posterior pair, each secondary vessel connecting with the ventral vessel. The perigastric vessel in somite VI connects directly the ventral and dorsal vessels (Fig. 26), while in the anterior somites the perigastric vessel connects the forks of the ventral vessel. Thus somite VI differs from all other somites, which contain the two primary vessels, in that there is only one pair of perigastric vessels, all posterior somites having two pairs. A similar arrangement is seen in *Rhynchelmis limosella*,* where the six and seven somites have only one pair of perigastric vessels, but in *Sutroa rostrata* only the 6 anterior somites are characterized by the existence of a single pair of perigastric vessels.† The perigastric vessels in the posterior somites in *Sutroa alpestris* connect with the ventral vessel. The dorsal parts of these perigastric vessels are feathered or ramified, and the ventral part of the postseptal or anterior pair is similarly but somewhat less extensively ramified (Figs. 24, 27, 28). Of the posterior pair the ventral part is simple, not ramified (Figs. 27 and 28.) The perigastric vessel in somite VI is not ramified.

Thus, as regards the perigastric vessels, Sutroa differs from Rhynchelmis in having both the postseptal and preseptal pairs ramified, Rhynchelmis having only the preseptal pair ramified. In *Rhynchelmis limosella* only the anterior perigastric pair connects with the ventral vessel. In *Sutroa rostrata* neither pair connects with the ventral vessel, while in *Sutroa alpestris* both pairs connect with it. It will thus be seen that generic characteristics cannot always be derived from the branching or from the connections of the vessels. As specific characteristics, however, they are of the greatest importance.

The branches of the posterior pair of perigastric vessels are less numerous but rather more prominent than those of the anterior pair, the latter being by far the strongest vessels. There are in every somite, beginning with XII, two or three pairs of gastric vessels attached to the intestine. There are also tertiary perigastric vessels along the reproductive and conductive organs, but none surrounding the nephridia or segmental organs.

Recapitulating, it may be said that in *Sutroa alpestris* the vascu-

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*Vejdovsky, Anatom. Stud. loc. cit. page 344.

†Eisen On Sutroa, loc. cit. fig. 4.

lar system consists of primary and secondary vessels, the former being the ventral and dorsal vessels. The ventral vessel branches in somite V, the branches being connected with the dorsal vessel through one pair of secondary vessels in each somite. Of the posterior perigastric vessels, both pairs in each somite connect the dorsal and ventral primary vessels. The anterior pair is ramified, of the posterior pair only the dorsal part is ramified.

In *Sutroa rostrata* the ventral vessel branches in somite VIII, the branches connecting with each other through one secondary vessel in each somite, but do not connect with the dorsal vessel. The perigastric branches of the dorsal vessel are ramified, but do not connect with the ventral vessel.

In *Rhynchelmis limosella* (according to Vejdovsky) the ventral vessel branches in somite V, each branch connecting with the dorsal vessel through one pair of simple secondary vessels. In the eight anterior somites the perigastric vessels consist of only one pair, while in the posterior somites there are two pairs in each, the anterior pair which is not ramified connecting with the ventral vessel, the posterior ramified pair being entirely free. The dorsal vessel is covered with opaque cells. The ventral vessel is transparent and entirely devoid of cells.

The alimentary canal is very simple. In the anterior somites it consists of a simple tubular duct or intestine. In somite XII this duct changes to a sacculated intestine covered with gastric vessels (Fig. 27). In *Sutroa rostrata* this sacculated intestine commences in somite XIII.

NERVOUS SYSTEM—resembles that of *Sutroa rostrata*, but the cephalic ganglion is more compact and exhibits two large anterior lobes, which emit a number of nerve threads towards the cephalic lobe (Fig. 9), or filiform part of the prostomium.

REPRODUCTIVE SYSTEM. The sexual organs are, as elsewhere in this family, generative and conductive. The generative organs are sperm-sacs and testes, ovaries, albumen glands, and prostata.

The conductive organs are oviducts, efferent ducts and spermathecæ. As some confusion yet exists as regards the true interpretation of these various organs a more detailed description is necessary.

The sperm-sacs consist of one pair of large elongated bodies situated in somites 13–20. They are the largest and most conspic-

uous organs in the body, filling the largest part of the somite (Fig. 1). There can be no doubt as to the true nature of these bodies, as they are full of spermatophores and spermatozoa in all stages of development. These bodies were described by Vejdovsky as testes.*

But at a later date this learned investigator supposed that he had made an error in ascribing to these bodies the nature of testes, and suggested that their nature is only that of a seminal vesicle, and that the true testes, as well as the ovaries, are to be found in some of the somites anterior to the efferent ducts and the spermaducal pores.†

I shared this opinion when I described *Eclipidrilus frigidus*. A larger material of this worm as well as of Sutroa enables me to take a different view of these organs. Thus in *Sutroa rostrata* the spermathecal porus is found in VIII. In somite IX we find two large bodies similar to the albumen glands in *Sutroa rostrata*, while in somite X are found the two testes proper. Undoubtedly the ovaries must be looked for in the somites posterior to the sperm-sacs, possibly in XXXII. In both species of Sutroa the sperm-sacs cover the atrium and prostate to such an extent that it is difficult to separate them and clearly define one from the other. But the sperm-sacs are not really connected with the prostate, as can be seen in the anterior segments of this organ where the prostate lies free and is not covered by the sperm-sacs. The real testes in *Sutroa rostrata* are smaller and not lobed, whereas in *Sutroa alpestris* the testes are large and deeply and repeatedly lobed. (Figs. 1 and 15.)

The sperm-sacs or testes in Rhynchelmis, as well as in Sutroa, extend thus through several (6) somites, occupying more or less segments, as the worm is older or younger.

These sperm-sacs contain spermatophores in all stages of development. In the posterior part of the sperm-sac, which also is the largest (Fig. 1), the spermatophores are the most advanced in development. Thus it is important to notice that the spermatophores develop directly in the sperm-sacs, and that they are not formed afterwards by an aggregation of spermatozoa. I cannot agree with Vejdovsky, that the formation of the spermatophore is quite as simple

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*Vejdovsky on Rhynchelmis, loc. cit. Taf. xxii, fig. 6.

†Vejdovsky, System and Morphologie der Oligochæten, Prague, 1884, pag. 57.

as he supposes.* As the spermatophore is already formed in the sperm-sacs, it is evident that neither the prostata or the spermathecæ contribute to its formation. It is far more likely that the glandular part of the spermatheca produces a secretion which dissolves the spermatophore and separates the spermatozoa. The cell-wall in the spermatophore is the primary part, the spermatozoa forming in the interior of the cell. At a later stage of development the tails of the spermatozoa protrude through this cell-sac, their free ends forming a ciliated appendix on one side of the spermatophore (Fig. 18). These protruding parts of the spermatozoa are at this stage beautifully wavy or screw-like and very stiff. At a later stage these screw-like ciliæ elongate themselves, or rather their extreme free ends grow out, forming the tails of the spermatozoa. This later developed part of the tail is not screw-like, and the division between the two parts is so very distinct that at a superficial examination it appears as if it constituted two distinct and separate bodies (Figs. 19 and 20). In the full grown spermatozoon this screw-like part is about one-eighth or one-tenth part of the whole (Fig. 23).

The ovaries or ovisacs are situated far behind the sperm-sacs in somite XXXII, one on each side of the ventral nerve ganglion. As regards their structure, they do not materially differ from the ovaries in Rhynchelmis as described by Vejdovsky (l. c., page 353). In one specimen I found the ovary in segment XXXII, but I am inclined to think that their position sometimes varies with the size of the worm. Ripe ova surrounded by numerous fatty agglomerations are frequently seen moving freely in the anterior somites in the vicinity of the oviduct, which is situated in somite X.

SPERMIDUCAL ORGANS. These consist of one pair opening into a common atrium (Fig. 1). The atrium is furnished with a large prostate gland extending through at least seven somites, commencing in somite XII and ending in XVIII, thus leaving three segments of the atrium free (IX, X and XI). The atrium opens into a copulatory papilla, which latter opens externally in the center of segment IX behind the ventral setæ. The atrium extends through ten somites, from IX to XVIII. The exact place where the efferent ducts enter the atrium I have not been able to ascertain, but most probably this takes place in the extreme pos-

*Vejdovsky, Syst. des Oligochæten, l. c., page 153.

terior part, possibly in somite XVIII. The prostata is attached to the posterior part of the atrium, extending through seven somites. It must be considered as one continuous gland, although it is contracted at every dissepiment and similarly enlarged in the center of each somite (Fig. I, pros.; Figs. 12 and 13); thus forming a number of sacculated pockets. These contain glandular agglomerations of pear-shaped cells (Figs. 12 and 13). The posterior part of the prostata is completely covered by the sperm-sacs, to such an extent that it is extremely difficult to observe and dissect them. In the XII somite the prostrata is generally free, and it is here easy to observe the difference in structure between this organ and the sperm-sac.

The funnel-shaped openings of the efferent ducts (Fig. 1, eff.), are seen immediately behind the copulatory papilla and are generally found full of protruding spermatophores. The copulatory papilla opens in the center of segment IX (Fig. 1). It is here surrounded by from two to four or more glands (Fig. 2), which open through the body wall at the base of the papilla (also Fig. 3). These glands vary in size and number, but are often equal to the diameter of the papilla. In the interior of this papilla is seen the extreme end of the atrium, which projects from the wall of the papilla and forms a distinct copulatory organ (Fig. 2, p.). At copulation the whole papilla becomes inverted and projected outside of the body (Fig. 3, p.), thus forming a distinct exterior copulatory organ.

SPERMATHECA. The receptacula seminis or spermatheca* are somewhat similar to those of *Sutroa rostrata*. While in Rhynchelmis there exist one pair of spermatheca in somite IX, opening behind the vertral setæ, Sutroa possesses only one solitary spermathecal atrium opening in the center of somite VII.

The spermathecal-porus opens immediately under the ventral ganglion which is, in order to give room, slightly pushed towards the left (Figs. 1 and 7). In my description of *Sutroa rostrata* I ascribed to this spermathecal atrium the properties of an albumen gland, but a further consideration of this organ in our present

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*In this paper I have to a great extent adopted for the organs the nomenclature proposed by Benham. See "An Attempt to Classify Earthworms" by W. B. Benham, Quatr. Journal of Microscop. Science, xxxi, p. ii, page 201.

species satisfies me that it must be considered only as a centralized spermatheca analogous to the spermathecæ in *Rhynchelmis limosella.* It is true that the walls of the spermothecal atrium are glandular, but the secretions of the cells must serve a different purpose than the albumen glands in Rhynchelmis and Lumbriculus. On each side of the spermathecal atrium are seen the true receptacula seminis or spermathecæ, slender, branched ducts (Fig. 7), opening interiorly close together, but not separately (Fig. 8). The branched spermathecæ generally contained spermatozoa, but I have never observed in them any spermatophores.

In the undeveloped spermathecal atrium no branched spermatheca are seen; these develop later, only at the full maturity of the worm. In one instance I found an interior porus in the free end of the spermatheca similar to the one described by Vejdovsky in the receptacula seminis of *Rhynchelmis limosella.* The object of such an opening is not at present understood.

Considering this central spermatheca in Sutroa in connection with the two spermathecæ in Rhynchelmis, two theories are admissible. One is that in Sutroa one of the spermatheca has failed to develop, and that the remaining one has become central by being moved towards the central ganglion, which latter it considerably displaces. The other theory is, that in Sutroa the two spermathecæ are represented by or homologous with the pairs of branched spermathecal sacs opening into the spermathecal atrium. The latter, then, is only an infolding of the body-wall, deep enough to cause the spermathecæ to become merely appendices to the central spermathecal sac or atrium. I believe this latter theory to be the correct one.

Somewhat similar spermathecal branches or pockets are found in Anachæta as well as in Tygmæodrilos, but here the formation is a different one, the appendix being simply a pocket and not a separate organ. As regards the morphological structure of the spermathecal branches, it is quite similar to that of the same organs in *Sutroa rostrata*, and described by me elsewhere.

ALBUMEN GLANDS. In *Rhynchelmis limosella* as well as in Lumbriculus, we meet with a central albumen gland in one of the somites between the spermatheca and the spermiducal pores. In *Sutroa rostrata* I ascribed glandulous properties to the spermathecal atrium, considering it homologous with the albumen gland in Rhynchelmis.

I now discard this view, as I have found one or more pairs of albumen glands in *Sutroa alpestris*, situated in somite VIII. In this somite we find two comparatively large glands engaged in the dissepiment between somites VII and VIII, with distinct ducts opening between the somites (Figs. 6, 1, 16).

Glands of somewhat similar construction are found in somite IX in the same relative position as the former, but I have not been able to clearly define their ducts, and cannot judge as to whether they open outwardly or not. In *Sutroa rostrata* we find exactly similar glands, one pair in somite IX. There can be no doubt but that their nature is identical with that of the glands now described in *Sutroa alpestris*. That neither of these glands can be identified as testes or ovaries may be considered conclusive, as I have found both spermatozoa and egg-cells in various stages of development in different organs, as I have previously stated.

OVIDUCTS. The two goblet-shaped oviducts are found in somite X, opening outwardly through a duct and porus in the line between somites X and XI. The oviducts are covered with glandulous epithelium and the interior funnel-shaped opening is furnished with vibrating ciliæ (Fig. 10). These organs are situated in the ventral side of the somite quite close to the spermiducal atrium, almost touching the efferent ducts.

NEPHRIDIA. The excretory system (formerly so-called segmental organs) or nephridia, are found in somities V, VI, VII, and in XII and following. The interior head is large, brown and glandular, furnished with a small projection, protruding through the dissepiment of the anterior somite, and forming the interior opening of the organ.

SETÆ. The setæ are quite similar to those of *Sutroa rostrata* as well as to those of *Rhynchelmis limosella*. There are four couples in every somite. In each couple are found two fully developed setæ and two smaller, partly developed (Fig. 5). The central swelling is situated at the anterior third of the spine.

The egg capsules of *Sutroa alpestris* resemble those of Rhynchelmis more than they do those of *Sutroa rostrata*. Their shape is almost globular with the free end pointed and bent (Fig. 14). The central figure shows the egg capsule in natural size.

NOTE.—I have been asked to describe the manner of collecting and temporarily preserving the fresh-water Oligochætæ. Use a small sieve for separating the worms from the mud. For preserving most of the species alive for any longer time, use small tin boxes, say two inches broad by three-quarter inch deep. In each box place two or three pieces of sponge, which first must have been thoroughly washed out with strong alkali. The sponge is saturated with fresh water and the worms, freed from all mud, placed in the box. To begin with, change the water in the sponge every day. Later, when the excrements of the worms have been all ejected, one change a month is enough in hardier species. There must be no free water in the box, and not more than six worms in each. In this way I have preserved worms alive for four months, and carried them with me in my valise across the continent to be studied at leisure at home. For instance: I have to-day before me alive a Criodrilus, or a related genus, which I caught in Mississippi River the latter part of September, 1891, to-day being January 12, 1892. The worm is yet as active as at first, but greatly emaciated from want of food. The "sponge box" is indispensable to the helminthologist.

EXPLANATION OF THE FIGURES.

Plate 1.

Fig. 1.—Ventral part of the body wall, showing the arrangement of the various organs.

R. s.—Receptacula seminis or spermatheca, opening into a central.

Sp. at.—Spermathecal atrium.

Ex. por.—Exterior pore of the spermathecal atrium.

Alb. gl.—Albumen gland.

Sep. gl.—Testes.

C. p.—Copulatory glands surrounding the copulatory papilla. c. p.

Eff—Efferent funnels or ciliated rosette, the interior free opening of the efferent duct.

Atr—Atrium of the spermiducal ducts.

Ovd.—Oviducts.

Ovd. p.—Exterior pore or opening of the oviduct.

V. d.—Efferent ducts.

Pros.—Prostata.

Test—Sperm-sacs.

Ovary—Ovary or ovisac.

Observe that the somites between XIX and XXXII are not shown.

Fig. 2.—Copulatory papilla, showing the interior copulatory organ—p.; the muscular wall—c. p.; the copulatory gland—gl.; and the atrium—atr.

Fig. 3.—The projected or inverted copulatory papilla extending outside of the body.

p.—External copulatory organ.

gl.—Copulatory glands.

set.—Setæ.

Fig. 4.—Anterior part of the worm showing the filiform part of the cephalic lobe or prostomium.

Fig. 5.—A couple of setæ, showing two fully developed and two reserve setæ.

Fig. 6.—Albumen gland from somite VIII.

Fig. 7.—Spermathecal atrium with the branched spermathecæ or seminal receptacles.

Fig. 8.—Interior opening of the spermatheca into the spermathecal sac.

Plate 2.

Fig. 9.—Cephalic and ventral ganglions.

Fig. 10.—Oviduct from somite X.

Fig. 11.—Ovisac or ovary, with two fully developed ova.

Fig. 12.—A part of the prostata.

Fig. 13.—One of the cell agglomerations from the above.

Fig. 14.—Egg capsule. The interior figure shows its natural size.

Fig. 15.—One of the testes from somite IX.

Fig. 16.—A part of the albumen gland from somite VIII.

Fig. 17.—One of the nephridia.

E. p.—Exterior pore.

gl. h.—Interior glandular head attached to the dissepiment of the anterior somite.

i. p.—Interior opening of the nephridium.

Figs. 18 to 21.—Spermatophores in various stages of development. In 18 the tails are only partly grown, their lower screw-like parts alone projecting from the sac. Fig. 21 shows a full grown spermatophore.

Fig. 22.—A bundle of spermatozoa, being part of a spermatophore.

Fig. 23.—A full grown and separated spermatozoön.

Fig. 23 b.—A partly grown spermatozoön.

Plate 3.

Fig. 24.—Vascular system in the anterior part of the worm.

In this and the following figures, the letters indicate as follows:

v. v.—Ventral primary vessel, which is not pulsating;

d. v.—Dorsal primary pulsating vessel, covered with glandulous cells and pigment spots;

p. g. v. a.—Anterior perigastric vessel;

p. g. v. p.—Posterior perigastric vessel;

g. a.—Gastric vessel.

Fig. 25.—Vascular system in somite IV, showing the branches of the ventral vessel and their connection with the dorsal vessel.

Fig. 26.—Vascular system in somite VI, showing the ventral and dorsal vessels and their connection by only one perigastric vessel.

Fig. 27.—Vascular system in one of the central somites, showing the connection of the ventral and dorsal vessels through two pair of perigastric vessels in each somite; also the gastric vessels, two pairs in each somite and one pair between two somites.

Fig. 28.—Vascular system in somite VII, showing the connecting perigastric vessels, two pairs in each somite.

Fig. 29.—Posterior part of the vascular system, showing the undeveloped perigastric vessels.

Fig. 30.—*Sutroa alpestris*—natural size of the worm.

CATALOGUE OF THE FLOWERING PLANTS AND FERNS GROWING SPONTANEOUSLY IN THE CITY OF SAN FRANCISCO.

BY KATHARINE BRANDEGEE.

The collections on which this list is founded were made by the members of the California Botanical Club† during the year 1891, and although probably not complete must be very nearly so. As a record of the rapidly changing flora of the principal seaport of the west coast of America its interest will be greater in the future than at the present time.

The city of San Francisco is co-extensive with the county, and

†A few plants collected by others are duly credited where mentioned.

excluding the islands* embraces the terminal end of a narrow peninsula. Its average length and breadth is a little more than six, and its total area a little more than forty-two square miles. That the number of plants is not greater is due not only to the destruction of native species, caused by the cutting down of hills, filling swamps and burying streams incident to the growth of a large city, but even more to the lack of variety in climate and conditions, the city being surrounded on three sides by water, and swept by the ocean winds, and the flora of the dry interior of the state being in consequence very sparingly represented.

The climate of San Francisco is not subject to great variations of temperature. In most seasons there is very little frost, but the summers are cool and often foggy. The plants in consequence have a much longer season of flowering† than in localities farther removed from the sea, and many perennials, especially herbaceous

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*Yerba Buena (Goat Island), Alcatraz, Farallones, Red Rock.

† The following plants have been brought to me in bloom from our limits during the first fortnight of this month (January):

Ranunculus Californicus, Berberis aquifolium, Eschscholtzia Californica, Alyssum maritimum, Cardamine paucisecta, C. oligosperma, Arabis blepharophylla, Cheiranthus asper, Nasturtium officinale, Capsella Bursa-pastoris, Lepidium nitidum, Raphanus sativus, Viola adunca, Cerastium nutans, C. arvense, Stellaria media, Lepigonum macrothecum, L. rubrum, Spergularia arvensis, Claytonia perfoliata, Lavatera assurgentiflora, Malva parviflora, Sidalcea malvæflora, Erodium cicutarium, E. moschatum, Oxalis corniculata, Rhamnus Californica, Trifolium repens, Medicago marginata, Vicia Americana, Rubus vitifolius, Fragaria Chilensis, Ribes sanguineum, R. Menziesii, Echinocystis fabacea, Mesembryanthemum æquilaterale, Sanicula arctopoides, Œnanthe sarmentosa, Peucedanum dasycarpum, P. fœniculaceum, Heracleum lanatum, Garrya elliptica, Galium Nuttallii, Aplopappus ericoides, Corethrogyne Californica, Solidago Californica, Aster Chamissonis, Erigeron glaucus, E. Canadensis, Anaphalis Margaritacea, Gnaphalium purpureum, G. decurrens, G. Sprengelii, Layia gaillardioides, Eriophyllum stæchadifolium, E. confertiflorum, Helenium puberulum, Achillea millefolium, Anthemis cotula, Matricaria discoidea, Tanacetum Huronense, Artemisia pycnocephala, Cotula australis, C. coronopifolia, Senecio vulgaris, Cnicus occidentalis, Silybum Marianum, Troximon humile, Taraxacum dens-leonis, Sonchus oleraceus, Gaultheria Shallon, Armeria vulgaris, Anagallis arvensis, Gilia achillæfolia, Phacelia circinata, Solanum nigrum, S. umbelliforum, Scrophularia Californica, Mimulus luteus, M. glutinosus, Castilleia latifolia, C. foliolosa, Monardella villosa, Stachys bullata, Plantago major, P. lanceolata, P. hirtella, P. maritima, Abronia umbellata, Rumex acetosella, R. crispus, Polygonum paronychia, Eriogonum fasciculatum, E. latifolium, Chenopodium album, C. ambrosioides, C. Californicum, Euphorbia leptoceras, Salix lasiolepis, Corylus rostrata, Iris longipetala, Muilla maritima.

ones, are more or less in bloom during the whole year, the more hardy annuals becoming perennial as is the case with *Sonchus oleraceus, Graphalium purpureum, Chenopodium ambrosioides*, etc.

Dr. Behr records* that there were some small conifers on Lone Mountain as late as 1854. None are now to be found, and very few trees of any kind worthy to be so called now exist. In shaded places in the cemeteries and parks, *Quercus agrifolia* reaches a diameter of two feet. *Salix lasiolepis* makes trees of considerable size near the old Russ Gardens. *Heteromeles arbutifolia*, *Myrica Californica* and *Sambucus glauca* may possibly be included, for they occasionally reach moderate dimensions.

The Mediterranean and Chilian plants form in our flora a well marked and often disputed element. Many of them are considered indigenous plants, upon what seem to the writer very slender grounds. San Francisco was a Spanish town for fifty years before California was acquired by the United States. Its cattle, horses, sheep, goats, came from Spain directly, or by the way of Mexico and Chili. So did the seeds they planted in the ground. The ships that brought supplies lay long in the harbor, which was then at North Beach, and we find accordingly that if there is one spot on the peninsula more blessed with Mediterranean weeds than any other it is the vicinity of Black Point and the Presidio. There are so many cases known where plants and insects brought by accident or intent into a new region have overrun it with great rapidity, that there is no special reason for astonishment at finding these plants already well established. In their spread they were greatly aided by the pastoral habits of the people, with their numerous flocks of sheep and herds of cattle, which covered the plains, and in seasons of scarcity penetrated the mountains during the Spanish occupancy. The direct comparison of our species with their nearest congeness in other regions is but just begun and promises in its progress to make important changes in our lists.

The agency of sheep in disseminating plants is well known to every one. A case of the introduction of plants resulting directly from the importation of wool may be seen just outside the gate of the Reservation at Black Point. Immediately adjoining this enclosure is the now disused Pioneer Woollen Mill. There grow in

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* Zoe, ii, 3.

this place, near to each other, *Artemisia dracunculoides*, *Bigelovia veneta Hemizonia fasciculata*, *Eriogonum fasciculatum* and *Atriplex Nuttallii?* The first belongs farther inland, and the remainder to places more or less considerably removed.

Plants which are distributed along the maritime borders of widely separated countries, such as *Pentacæna ramosissima*, *Mesembryanthemum æquilaterale*, *Dichondra repens*, etc., may perhaps always have their birthplace disputed. In such cases it seems more in accordance with philosophical methods, to look for their origin in the places where their congeners or nearest relatives abound than in regions in which they are systematically aliens, even though the date and means of introduction remain always unknown.

In the list of introduced plants, only such are included as are spontaneous in considerable numbers or at various points. It would be absurd to consider the apple, peach or plum which sometimes springs from an accidentally buried seed, or potatoes and corn which grow on waste heaps, as naturalized plants. Eucalyptus, though widely planted in the state, very rarely springs from self-sown seed, but the common Acacia does so in great numbers. On the nearly vertical cliffs of Telegraph Hill small fig-trees find a precarious lodgment, but cannot reproduce themselves for the varieties of fig in California do not produce perfect seeds. Many other plants, such as *Brugmansia*, Scarlet Sage, Roses, etc., persist for a considerable time, marking the places where houses formerly stood on the outskirts of the city, and if not interfered with would perhaps extend themselves.

The nomenclature and systematic arrangement of this list is for obvious reasons essentially that of the "Botany of California" of the Geological Survey, but the species are usually credited to the original describer whenever rectification would not involve a new combination.

RANUNCULACEÆ.

1. THALICTRUM FENDLERI Engelm. var. PLATYCARPUM Torr. Pac. R. Rep. iv. 6, in part; Trel. Proc. Bost. Soc. Nat. Hist. xxiii. 394, fig. 13. Mission Hills, and according to Dr. Behr,* formerly on Telegraph Hill. April—June. "Meadow Rue."

2. MYOSURUS MINIMUS L. spec. 407. A very small form collected in Laurel Hill Cemetery by Dr. Kellogg. March. "Mouse-tail."

3. RANUNCULUS AQUATILIS L. var. TRICHOPHYLLUS Chaix. in Vill. Dauph. I, 335. Mountain Lake, Lake Merced. April—September.

4. RANUNCULUS CALIFORNICUS Benth. Pl. Hartw. 295. Common. February—May. "Buttercup."

5. RANUNCULUS HEBECARPUS Hook. & Arn. Bot. Beech. 316. Hills south of Golden Gate Park. April—May.

6. *Ranunculus muricatus* L. spec. 780. A native of the Mediterranean region. Common in wet places in the western and southern parts of the city, particularly about Lake Merced, Mountain Lake and near the Presidio.

7. AQUILEGIA FORMOSA Fisch. in DC. Prodromus i, 50. *A truncata* of Bot. Cal. March—May. "Columbine." The length of the petals varies considerably, and all our forms are very close to *A. Canadensis.*

8. DELPHINIUM CALIFORNICUM Torr. & Gray. Fl. i, 31. Strawberry Hill in Golden Gate Park, Mission and Potrero Hills. April—June. "Tall Larkspur."

9. DELPHINIUM DECORUM Fisch. & Mey. Ind. Sem. Petr. iii, 33. Mission Hills. March—May. "Larkspur."

BERBERIDEÆ.

10. BERBERIS PINNATA Lag. Elench. Pl. Matr. 1803, 6. Summits of the Mission Hills, growing only a few inches high. February—April. "Barberry."

NYMPHÆACEÆ.

11. NUPHAR POLYSEPALUM Engelm. Trans. Acad. St. Louis, ii, 282. Mountain Lake. June. "Yellow Water Lily."

PAPAVERACEÆ.

12. PLATYSTEMON CALIFORNICUS Benth. Trans. Hort. Soc. 2, ser. 1, 405. Hills in the western and southern parts of the city. March—May. "Cream Cups."

13. PLATYSTIGMA LINEARE† Benth l. c. 407. Between Golden Gate Park and Lake Merced. March—May.

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*Zoe, ii, 3.

† The writer's views concerning this and the following species are set forth in Proc. Cal. Acad. ser. 2, i, 240.

14. PLATYSTIGMA CALIFORNICUM (Torr. in Frem. Rep. 312). Hills south of Golden Gate Park. March—April.

15. ESCHSCHOLTZIA CALIFORNICA Cham. Hor. Phys. Berol. 73, t. 15. Common in the western part of the city. Blooming the whole year. "California Poppy."

CRUCIFERÆ.

16. *Alyssum maritimum* L. Escaped from cultivation in many places, but not truly naturalized. All the year. "Sweet Alyssum."

17. CARDAMINE OLIGOSPERMA Nutt. in Torr. & Gray, Fl. i, 85. Everywhere in the western part of the city. March—May.

18. CARDAMINE PAUCISECTA Benth. Pl. Hartw. 297. Western and southern parts of the city. January—April. "Bitter Cress."

19. ARABIS PERFOLIATA Lam. Hills of South San Francisco; not common. March—May. "Tower Mustard."

20. ARABIS BLEPHAROPHYLLA Hook & Arn. On rocky hills at the Presidio, south of Golden Gate Park and at South San Francisco. February—May. "Rock Cress."

21. CHEIRANTHUS ASPER Cham. & Schl. in Linnæa i, 14. Low hills and sandy flats near the sea. February—May. "Rough Wallflower."

22. *Brassica nigra* (L. spec. 933). About fields and waste places, not common. March—May. "Black Mustard."

23. *Brassica campestris* L. spec. 931. About fields in the southern part. March—May. "Turnip."

24. *Barbarea vulgaris* Brown. About the Almshouse and the Ocean House road. February—April. "Winter Cress."

25. SISYMBRIUM LASIOPHYLLUM* (H. & A. Bot. Beechey 321).

26. *Sisymbrium officinale*† Scop. Fl. Car. ed. 2, no. 824. An unsightly weed common about roadsides and neglected walks. March—May. "Hedge Mustard."

27. NASTURTIUM CURVISILIQUA Nutt. In sandy places about the shore of Lake Merced. April—July.

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*S. *reflexum* of Bot. Cal.

† *S. acutangulum* is mentioned in Bot. Cal. as occurring about San Francisco, but has not been brought to our notice.

28. *Nasturtium officinale* Brown. Common in streams and marshy places. All the year. "Water Cress."

In the marshy ground about the estuary of Visitacion Valley it grows supported by bushes and other plants to a height of five feet. Dr. Behr has recorded* the fact that he did not find it about San Francisco in the earlier years of his residence.

29. *Capsella Bursa-pastoris* (L. spec. 903). Common everywhere. January—April. "Shepherd's Purse."

30. LEPIDIUM NITIDUM Nutt. T. & G. Fl. i, 116. There seems to be two vernal generations of this plant. The first (in January and February) is strict, nearly simple, not more and usually much less than four inches in height. The succeeding generation is of very much greater size and more spreading. Common everywhere. "Pepper Grass."

31. LEPIDIUM MENZIESII. DC. Syst. ii, 539. Low, often prostrate and forming round mats. South San Francisco, Mission Hills, Islais Creek. January—May.

32. *Senebiera didyma* (L. Mant. 92). About the base of Telegraph Hill, sidewalks in the western part of the city, and hanging over the cliffs near Sutro Heights. January—August. "Wart Cress."

33. *Senebiera coronopus* (L. spec. 904). About the base of Telegraph Hill, not so common as the last.

34. THYSANOCARPUS CURVIPES Hook. Fl. i, 69, t. 18. Mission and South San Francisco Hills. February—May. "Lace Pod."

35. THYSANOCARPUS PUSILLUS Hook. Ic. Pl. t. 43. Sunset Heights and hills of South San Francisco. March—April.

36. *Raphanus sativus* L. spec. 935. Very abundant in old fields, often completely filling them with various tints of white, pink and cream color. March—May. "Radish."

37. *Cakile Americana* Nutt. Gen. ii, 62. About the shore sparingly from Black Point to the outlet of Lake Merced, and very abundant a short distance south of it. June—September. "Sea Rocket."

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* Zoe, ii. 4.

VIOLARIEÆ.

38. VIOLA CANINA L. var. ADUNCA (Sm. in Rees Cyc. No. 63) Bluffs above Fort Point and southward, Sunset Heights, Potrero and South San Francisco Hills. February—April. "Dog Violet."

39. VIOLA PEDUNCULATA Torr. & Gray, Fl. i, 141. Potrero and Mission Hills. March—May. "Yellow Violet."

FRANKENIACEÆ.

40. FRANKENIA GRANDIFOLIA Cham. & Schl. Linnæa i, 35. Salt marshes, South San Francisco and Presidio. June—August.

CARYOPHYLLEÆ.

41. *Silene Gallica* L. spec. 594. Common everywhere. April—July. "French Campion."

42. SILENE VERECUNDA Watson Proc. Am. Acad. x, 344. Lone Mountain, cemeteries, Mission Hills. April—June. "Shy Campion."

43. *Saponaria vaccaria* L. spec. 585. Presidio grounds. June—July. "Soapwort."

44. ARENARIA CALIFORNICA Brewer. Bol. Cat. 6; Bot. Cal. 1, 69. Potrero Hills, meadows among the sand dunes south of the Park. March—May. "Sandwort."

45. ARENARIA PALUSTRIS (Kell. Proc. Cal. Acad. iii, 61). Dr. Behr records this plant from what is now the heart of the city. Mr. Bolander's specimen in the Harvard herbarium is labeled "Fort Point 6/5." Dr. Kellogg notes it as "blooming in July and August."

46. *Stellaria media* (L. spec. 389). Common. Jan.—May. "Chickweed."

47. STELLARIA NITENS Nutt. in Torrey & Gray, Fl. i, 185. Cemeteries, Mission Hills. April. "Shining Chickweed."

48. *Cerastium viscosum* L. spec. 627. Common everywhere. March—May. "Mouse-Ear Chickweed."

49. *Cerastium arvense* L. spec. 628. Rocky or bushy hills Potrero, Sunset Heights, Mission and South San Francisco. March—May. "Field Chickweed."

50. SAGINA OCCIDENTALIS Wats. Proc. Am. Acad. x, 345. Common about the saline marshes. March—May. "Pearlwort."

51. LEPIGONUM* MACROTHECUM F. & M. including var. SCARIOSA Britt. Bull. Torr. Club, and *T. pallida* Greene l. c. Common about the bluffs of the ocean shore. All the year.

52. *Lepigonum rubrum* Fries. About the summits and slopes of the Potrero and Presidio Hills. Although perennial, not to be distinguished from specimens in the herbarium from Paris, France, where, if not sometimes perennial, it evidently forms strong indurated roots. It is apparently *Tissa Clevelandi* Greene, Fl. Francis. 127, although the flowers are not usually "white." All the year.

53. *Lepigonum medium* Fries. Low lands about the shores of the bay. April—July.

54. *Spergula arvensis* L. spec. 630. Common by roadsides and in sandy places. January—July. "Corn-Spurrey."

ILLECEBRACEÆ.

55. PENTACÆNA RAMOSISSIMA (Weinm. Bot. Zeit. 608.) Common on the sea coast. April—September.

56. *Paronychia Chilensis* DC. Prod. iii. 370. Common near Point Lobos Creek and the Marine Hospital. April—September.

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* The generic name of these plants is in dispute, both Lepigonum and Spergularia being antedated by Buda and Tissa, concerning the merits of which a somewhat acrimonious discussion has recently appeared in botanical publications. Buda being adopted in the sixth edition of Gray's Manual and by English botanists generally, while Baillon, Pax, N. L. Britton and E. L. Greene have upheld the claim of Tissa. Recently, however, Mr. Britton announces in Jour. Bot. xxix, 303, a still older name, Corion (Mitchell, 1748). In view of these facts the names in commou use are retained until some agreement among botanists may be reached.

The species are of "difficult definition," a phrase which in botany is apt to mean that inconstant forms have been raised to specific rank. No two authors have been able to agree as to the limits of the species. Dr. N. L. Britton revised the North American forms in the Bulletin of the Torrey Club (vol. xvi, 125). Prof. Greene, in Flora Franciscana, agrees with him so little as to make a new species of the plant which Dr. Britton considered to belong to the South American *T. villosa* and to unite *T. macrotheca* var. *scariosa* Britt. with the type of his own *T. pallida*, which itself bears a suspiciously close resemblance to *Spergularia rupicola* Lebel.

Lepigonum tenue Greene Pitt. ii, 63, although occurring immediately opposite on the Alameda shore, has not been found in San Francisco. It is very near *L. gracile* Watson, and although described as apetalous and diandrous, often has 3, 4 or 5 stamens, and 1, 2, 3 perhaps more minute included petals.

PORTULACEÆ.

57. *Calandrinia caulescens* HBK. nov. gen. vi. 78, t. 526, var. *Menziesii* Gray. Common. March—June. Neither this nor *C. Breweri* have the habit of indigenous plants.

58. CLAYTONIA PERFOLIATA Donn. Ind. Hort. Cant. 25. Common in shaded places everywhere. February—May. "Miner's Lettuce."

59. CLAYTONIA SPATHULATA Dougl. var. TENUIFOLIA Gray. Proc. Am. Acad. xxii, 282. Rocky hills in Laurel Hill Cemetery. March.

60. MONTIA FONTANA L. spec. 129. Wet springy places in the western and southern parts of the city. April.

ELATINEÆ.

61. ELATINE BRACHYSPERMA Gray. Proc. Am. Acad. xiii, 361. In late dried pools along the Cliff House Road near First Avenue. July—September. "Waterwort."

HYPERICINEÆ.

62. HYPERICUM ANAGALLOIDES Cham. & Schl. Linnæa iii, 127. Wet places in the western and southern parts of the city. March—June.

MALVACEÆ.

63. LAVATERA ASSURGENTIFLORA* Kell. Proc. Cal. Acad. i, 14. Planted about the city for ornament and as a wind-break for gardens; persisting and spreading wherever protected from browsing. It is the universal belief of the Spanish population of California that the seeds of the plant were brought from Spain, but direct comparison with Mediterranean species has not yet been made.

64. *Malva Nicæensis* All. ped. n. 1416. Lowlands about the Potrero. Flowers larger than in the other species about the city; bractlets broad and nutlets less reticulated. It agrees perfectly with all the specimens so named in the herbarium of the California Academy of Sciences. These are from France and from Chili.

65. *Malva parviflora* L. Am. iii, 416. Common but much more robust and larger-fruited than our examples from France and from Teneriffe.

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* Zoe, ii, 4.

66. *Malva borealis* Wallm. in Liljebl. Sw. Fl. ed. 2, 218. Common.

Possibly this species, but bractlets ovate instead of linear-lanceolate, petals much more than "lightly emarginate." The carpels are reticulate on the face and readily separate from the prominent stellate axis.

67. SIDALCEA MALVÆFLORA (Moc. & Sesse). DC. Prod. i, 474. Ic. Mex. ined. pl. 70. The figure leaves no doubt that the common species of the Californian Coast is the one intended. It represents a weak-stemmed plant with all the leaves 6–8-parted, large flowers and a copious hirsute pubescence. It is incompletely diœcious, the larger-flowered form frequently developing seeds in the later flowers. The sterile flowers are sometimes deeply fringed.

LINEÆ.

68. *Linum usitatissimum* L. spec. 397. Found occasionally about low fields and waysides. April—July. "Flax."

69. LINUM CALIFORNICUM Benth. Pl. Hartw. 299. On a bare and stony hill in Laurel Hill Cemetery a few hundred yards from Lone Mountain. It is probably the plant mentioned under *L. Breweri* Bot. Cal. ii, 448, as having been collected by Dr. Palmer on Lone Mountain, the species, when the color of the flowers has faded, being hard to distinguish. May. "California Flax."

GERANIACEÆ.

70. GERANIUM CAROLINIANUM L. spec. 956. Common. March —May.

71. *Geranium dissectum* L. spec. 956. Shady places about Sunset Heights. March—May.

72. *Geranium molle* L. spec. 955. According to Prof. E. L. Greene, this plant occurs about the Marine Hospital.

73. *Erodium cicutarium* (L. spec. 951). Common everywhere. All the year. "Pin Clover," "Alfilerilla."

74. *Erodium moschatum* Willd. sp. iii, 631. Common. Nearly all the year. "Musky Alfilerilla."

75. OXALIS CORNICULATA L. spec. 624. Western part of the city. All the year. "Sorrel."

Our species of the Corniculata section has a strong perennial root,

but also roots at the joints of the spreading slender stems and thus forms mats. It may be the same as the Arizonian *O. Wrightii*, but appears too near specimens of *O. corunta* from the West Indies.

RHAMNEÆ.

76. RHAMNUS CALIFORNICA Esch. in Mem. Acad. Petr. x, 281. Common. Flowering and fruiting nearly all the year in sheltered localities. "Coffee Bush," "Cascara sagrada."

77. CEANOTHUS THYRSIFLORUS Esch. in Mem. Acad. Petr. x, 285. Formerly abundant on the Presidio Hills, but now not frequent. On the hill at Point Lobos, above the signal station, it forms perfectly flat mats many feet in diameter. January—June." "California Lilac."

SAPINDACEÆ.

78. ACER NEGUNDO L. var. CALIFORNICUM* (Nutt. T. & G. Fl. i, 250) "Box Elder."

79. ÆSCULUS CALIFORNICA Nutt. T. & G. Fl. i, 251. Bluffs of the bay shore near South San Francisco. May. "Buckeye."

ANACARDIACEÆ.

80. RHUS TOXICODENDRON L. spec. 381; var. DIVERSILOBA (T. & G. Fl. i, 218). Common in Golden Gate Park and all bushy hills about the city. April. "Poison Oak," "Poison Ivy."

LEGUMINOSÆ.

81. LUPINUS ARBOREUS Sims. Bot. Mag. t. 682. Common in the sands of the western part of the city. March—June. "Tall Yellow Lupine."

82. LUPINUS CHAMISSONIS Esch. Mem. Acad. Petr. x, 288. Usually growing nearer the sea than the last. March—June. "Shrubby Blue Lupine."

83. LUPINUS POLYPHYLLUS Lindl. Bot. Reg. xiii, t. 1096. Southwestern border of Lake Merced. May—July. "Swamp Lupine."

84. LUPINUS DOUGLASII Agardh. Syn. 34. Near Lake Merced. April—June.

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*Zoe, ii, 4.

85. LUPINUS LITTORALIS Dougl. Lindl. Bot. Reg. xiv, t. 1198. About the Presidio Hills, especially near the shores of Mountain Lake. March—May. "Chinook Liquorice."

86. LUPINUS AFFINIS Agardh. Syn. Lup. 20 in part. Bluffs of the Bay Shore between South San Francisco and Visitacion Valley. April—May. "Succulent Lupine."

87. LUPINUS BICOLOR Lindl. Bot. Reg. xiii, t. 1109. Hills in the western and southern parts of the city. March—May.

88. LUPINUS MICRANTHUS Dougl. Lindl. Bot. reg. xv, t. 1251. Ocean View. March—May.

89. LUPINUS TRIFIDUS* (Wats. Proc. Am. Acad. viii, 535.) Laurel Hill Cemetery and sandy grounds westward. March—April.

90. LUPINUS POLYCARPUS Greene Pitt. i, 171. Near Ocean View. April—May.

91. TRIFOLIUM INVOLUCRATUM Willd. Common in wet grounds. March—May. "Clover."

92. TRIFOLIUM TRIDENTATUM Lindl. Mission Hills, South San Francisco. April—May.

93. TRIFOLIUM PAUCIFLORUM Nutt. Common in moist grounds about Lake Merced and Ocean View. March—May.

94. TRIFOLIUM BARBIGERUM Torr. Pac. R. R. Rep. iv, 79. Presidio, Potrero, South San Francisco. March—May.

——— var. ANDREWSII Gray. Proc. Am. Acad. vii, 335. Near Mountain Lake. May.

95. TRIFOLIUM MICRODON H. & A. Bot. Beech. 330, t. 79. Presidio, South San Francisco, Laguna, Honda, Mountain View.

96. TRIFOLIUM MICROCEPHALUM Pursh. Fl. ii, 478. Visitacion Valley. April.

97. TRIFOLIUM FUCATUM. Lindl. Bot. Reg. t. 1883. Potrero, Mountain Lake, South San Francisco.

98. TRIFOLIUM DEPAUPERATUM Desv. Journ. Bot. iv, 69, t. 32. Common. March—May.

99. TRIFOLIUM BIFIDUM Gray. Proc. Am. Acad. vi, 522. Common about roads in the western and southern parts. April.

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*The current names of the forms are given here without consideration of their specific value.

100. TRIFOLIUM GRACILENTUM T. & G. Fl. i, 316. Along the road to the Cliff House and the Presidio roads.

101. TRIFOLIUM MACRÆI H. & A. Bot. Misc. iii, 179. Specimens from Chili differ in no respect excepting a more spreading pubescence from the form found about South San Francisco (also on Tamalpais, at Point Reyes and Santa Catalina Island*).

102. TRIFOLIUM REPENS L. spec. 1080. Laurel Hill Cemetery and becoming frequent in lawns. March—June. "White Clover."

103. *Trifolium pratense* L. spec. 1082. About the borders of the Presidio marshes. April—July. "Red Clover."

104. *Melilotus parviflora* Desf. Roadsides and waste places. April—June. "Melilot," "Sweet Clover."

105. *Medicago sativa* L. spec. 1096. Cliffs of South San Francisco and Telegraph Hill and in waste places. All the year. "Lucerne," "Alfalfa."

106. *Medicago denticulata* Willd. Spec. iii, 1414. Common everywhere. April—July. "Bur-Clover."

107. *Medicago marginata* Willd. Enum. 802. Already very common. South San Francisco, Visitacion Valley, Mountain Lake, Presidio. All the year.

108. HOSACKIA GLABRA (Vog. Linnæa x, 591). Laurel Hill Cemetery, Mission Hills, Golden Gate Park. Low and spreading. March—June.

109. HOSACKIA TOMENTOSA H. & A. Bot. Beech. 137. Mountain Lake, Lake Merced, Point Lobos and southward. *H. Heermanni* of Bot. Cal. in so far as it relates to this locality is undoubtedly *H. tomentosa*. April—July.

110. HOSACKIA GRACILIS Benth. Trans. Linn. Soc. xvii, 365. A beautiful species, which should be cultivated. Ocean View. May—June.

111. HOSACKIA PURSHIANA Benth. Bot. Reg. under t. 1257. South San Francisco. May—June.

112. HOSACKIA SUBPINNATA (Lag. Gen. & sp. 23). Sandy stretches in the western part. May.

113. HOSACKIA BRACHYCARPA Benth. Pl. Hartw. 306. Common in the western part. April—June.

T. Catalinæ Wats. Am. Acad. xxv, 128.

114. HOSACKIA PARVIFLORA Benth. Bot. Reg. xv, under t. 1257. Mission Hills, South San Francisco Hills. April—May.

115. ASTRAGALUS NIGRESCENS Nutt. Pl. Gamb. 152. Potrero Hills, Ocean View. May.

116. ASTRAGALUS CROTALARIÆ Gray. Proc. Am. Acad. vi, 216. Mission Hills, Ocean View, Visitacion Valley, Point Lobos. April—June. "Rattleweed," "Loco."

117. VICIA GIGANTEA Hook. Fl. i, 157. Ocean bluffs from Point Lobos to Fort Point. April—June. "Great Vetch."

118. VICIA AMERICANA Muhl. var. LINEARIS (Nutt. in T. & G. Fl. i, 276). Mission Hills, Buena Vista Park, Visitacion Valley. April—May.

——— var. TRUNCATA (Nutt. T. & G. Fl. i, 270). Specimens in the herbarium of the California Academy of Sciences are labeled "Mission Hills, June 7, 1871, Kellogg."

119. VICIA SATIVA L. spec. 1037. Not uncommon about roadsides and old fields. May—June. "Vetch" or "Tare."

120. VICIA EXIGUA Nutt. in T. & G. Fl. i, 272. Mission Hills, Cemeteries. March—April.

121. LATHYRUS BOLANDERI Wats. Proc. Am. Acad. xx, 363. Shrub-covered slopes near Lake Merced, not common. May.

122. LATHYRUS LITTORALIS (Nutt. T. & G. Fl. i, 278). Near the seashore south of the outlet of Lake Merced. June—August.

ROSACEÆ.

123. PRUNUS DEMISSA (Nutt. T. & G. Fl. i, 411). Collected by Mr. C. A. Michener on Twin Peaks. "Choke Cherry."

There seems to be no sufficient reason for keeping this separate from the eastern *P. Virginiana.*

124. PRUNUS ILICIFOLIA Nutt. in Bot. Beech. 340, t. 83. Mission Hills, Strawberry Hill, Hunter's Point and bluffs near Visitacion Bay. March—May. "Holly-leaved Cherry."

125. NUTTALIA CERASIFORMIS T. & G. in Bot. Beech. 236, t. 82. Sunset Heights, Mission Hills, Fort Point. February—May. "Oso Berry."

126. SPIRÆA DISCOLOR Pursh. Fl. i, 342. Sunset Heights, Mission Hills. May.

127. RUBUS NUTKANUS Moç. in DC. Prod. ii, 566. Fl. Mex. ined t. 291. Ravine on the N. E. side of Sunset Heights. May. "Thimbleberry."

128. RUBUS SPECTABILIS Pursh. Fl. i, 348, t. 16. Same locality. March—June. "Salmon Berry."

129. RUBUS VITIFOLIUS Ch. & Schl. Linnæa ii, 10. (*R. ursinus* of Bot. Cal.) Common in the western part of the city. February —June. "Blackberry."

130. FRAGARIA CALIFORNICA Ch. & Schl. Linnæa ii, 20. Sunset Heights, Mission Hills. March—May. "California Strawberry."

131. FRAGARIA CHILENSIS Ehr. Beitrag vii, 26. Common near the sea, flowering the greater part of the year. "Coast Strawberry."

132. POTENTILLA ANSERINA L. spec. 710. Common in marshy places and about the borders of lakes. April—July. "Silver-Weed."

133. POTENTILLA GLANDULOSA Lindl. Bot. Reg. t. 1583. Sunset Heights, Hills about Lake Merced. April—May.

134. POTENTILLA CALIFORNICA (Ch. & Schl. Linnæa ii, 26). Mission Hills, Sunset Heights, South San Francisco.

——— var. SERICEA Gray. Proc. Am. Acad. vi, 529. Bluffs above Lake Merced, Sunset Heights, Point Lobos.

135. ALCHEMILLA ARVENSIS Scop. Carn. i, 115. Common on bare stony places. March—May. "Lady's Mantle."

136. *Acæna trifida* Ruiz & Pavon, Fl. Peruv. i, 67, t. 104. Common on hills about the city. March—May.

137. ROSA CALIFORNICA Ch. & Schl. Linnæa, ii, 35. Mission Hills, Lobos Creek. "California Wild Rose."

138. HETEROMELES ARBUTIFOLIA (Ait. J. Hort. Kew. iii, 202). Common on bushy hills. Flowering June—August, fruiting December and much used in decorating at Christmas. "Tollon or Toyon," "California Holly," "Christmas Berry."

139. AMELANCHIER ALNIFOLIA (Nutt. Gen. i, 306). "Sunset Heights,* dwarf. April. "Service Berry," "June Berry."

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*"Mission Dolores," Bolander, Proc. Cal. Acad. iii, (1863).

SAXIFRAGEÆ.

140. SAXIFRAGA VIRGINIENSIS Michx. Since the publication of Bot. Cal. Dr. Gray has referred this Californian plant to *S. reflexa* Hook. This determination is probably erroneous, but until the matter is fully investigated it is thought best to retain the name in common use. Mission Hills, Laguna Honda. March—May.

141. TELLIMA GRANDIFLORA (Pursh, Fl. i, 314). Ravine on northeastern side of Sunset Heights, Mission Hills. April—June.

142. TELLIMA HETEROPHYLLA H. & A. Bot. Beech. 346. Mission Hills, Bluffs of Lake Merced and of Visitacion Bay. April—May.

143. HEUCHERA PILOSISSIMA F. & M. Ind. Sem. Hort. Petr. v, 36. "Alum Root." Mission Hills and about Laguna Honda, often growing upright with a strong stem 6–12 inches long, clothed with vestiges of former leaves. The less pubescent and more spreading forms of this species can hardly, if at all, be distinguished from *H. micrantha.*

144. RIBES SANGUINEUM Pursh, Fl. i, 164. Point Lobos, Sunset Heights. January—March. "Black Currant."

145. RIBES MENZIESII Pursh, Fl. ii, 732. Sunset Heights, Laguna Honda, Hills of South San Francisco. February—March. "Prickly Gooseberry."

146. RIBES DIVARICATUM Dougl. Trans. Hort. Soc. vii, 575. Near Laguna Honda. March. "Gooseberry."

CRASSULACEÆ.

147. TILLÆA MINIMA Miers Trav. Chili, ii, 530. Very common on hills. March—April.

148. TILLÆA DRUMMONDII T. & G. Fl. i, 558. Borders of pools along the road near Mountain Lake. June—September.

The pedicels of this species vary extremely in length, even in the same specimen.

149. COTYLEDON CÆSPITOSA Haw. Misc. Nat. 180. Rocky cliffs about the shores. May—June.

150. SEDUM SPATHULIFOLIUM Hook. Fl. i, 227. Rocks on the summits of Mission Hills. April—June. "Stonecrop."

HALORAGEÆ.

151. HIPPURIS VULGARIS* L. spec. 3.

152. MYRIOPHYLLUM SPICATUM L. spec. 1409. Mountain Lake. "Water Milfoil."

153. CALLITRICHE VERNA L. Sides of pools and ditches near Ocean View.

CERATOPHYLLEÆ.

154. CERATOPHYLLUM DEMERSUM L. spec. 1409. Mountain Lake. "Hornwort."

LYTHRARIEÆ.

155. *Lythrum Hyssopifolia* L. spec. 642. *L. adsurgens*, Greene, Pitt. ii, 12. Common in the sides of shallow rivulets and roadside gutters. Away from the coast and subjected to greater vicissitudes it may be annual. In the herbarium of the California Academy of Sciences there are examples from Hyeres, France, which are stoloniferous from a strong crown. *L. Sanfordi* from Stockton appears to be identical with the Chilian *L. albicaule* Bert.

ONOGRARIEÆ.*

156. EPILOBIUM FRANCISCANUM Barbey, Bot. Cal. i, 220. Mountain Lake, Lake Merced, Lobos Creek. April—August. "Willow Herb."

157. EPILOBIUM MINUTUM Lindl. Hook Fl. i, 207. Cemeteries, Mission Hills. April—May.

158. EPILOBIUM ADENOCAULON Hausskn. Œsterr. Bot. Zeitschr. xxix, 119. Presidio Reservation. August—September.

159. ŒNOTHERA BIENNIS L. Along the outlet of Lake Merced. May—June. "Evening Primrose."

160. ŒNOTHERA OVATA Nutt. T. & G. Fl. i, 507. Hills in the western and southern parts of the city. March—April.
The leaves are sometimes used for salads.

161. ŒNOTHERA CHEIRANTHIFOLIA Hornemann. Lindl. Bot. Reg. t. 1040. Common all the year.

162. ŒNOTHERA MICRANTHA Hornemann, Hort. Hafn. Suppl.

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*Dr. Behr says this plant was formerly found near Lobos Creek.

Common in the sands of the western part of the city, and about the cliffs at Point Lobos. April—July.

163. ŒNOTHERA STRIGULOSA (Fisch. & Mey. Ind. Sem. Petr. ii, 25). Sands in the western part of the city. April—June.

164. GODETIA LEPIDA Lindl. Bot. Reg. t. 1849. Hillsides near Lake Merced. April—June.

165. GODETIA AMŒNA (Lehm. Nov. Act. Leop. xiv, 811, t. 45). Sunset Heights and Mission Hills. April—June.

166. BOISDUVALIA DENSIFLORA (Lindl. Bot. Reg. t. 1593). Mission Hills. May.

167. ECHINOCYSTIS FABACEA Naud. Ann. Sc. Nat. xii, 154. *Megarrhiza Californica* of Bot. Cal. Common. "Chilicothe," "Big Root." January—May.

168. ECHINOCYSTIS MARAH† Wats. Proc. Am. Acad. xi, 138. *Megarrhiza Marah* of Bot. Cal. "Large-flowered Big Root."

FICOIDEÆ.

169. *Mesembryanthemum æquilaterale* Haw. Misc. Nat. 77. Cliffs of the sea coast. Flowering all the year. "Sea Fig."

170. *Mesembryanthemum cordifolium* L. f. suppl. 260. Escaped into thickets about the cemeteries; perennial and widely spreading. "Dew Plant."

171. *Tetragonia expansa* Ait. Hort. Kew. ii, 178. Fort Point, South San Francisco. June—September. "Sea Spinach."

Widely spread on maritime shores, but still infrequent on ours, though cultivated here for many years.

UMBELLIFERÆ.

172. HYDROCOTYLE RANUNCULOIDES L. f. Supp. 177. Mountain Lake, Lake Merced, Presidio Swamp, etc., floating often in rather deep water. April—May. "Marsh-Pennywort."

173. HYDROCOTYLE VERTICILLATA Thunb. Diss. ii, 415, t. 3. Mountain Lake, Lake Merced, pools along the railway which runs to Sutro Heights.

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* *Zauschneria Californica* though abounding on Angel Island has not been found within our limits.

† This species was originally described by Dr. Kellogg (under the preoccupied name of *muricatus*) from "declivities of the hills back of the Mission Dolores on Mr. Hutchinson's Ranch." Proc. Cal. Acad. i, 39.

The common plant with peltate-orbicular leaves found about the margins of pools and lakes appears to be this species. It is found in damp ground rather than in water. Dr. Kellogg's *H. prolifera* judging from the painting and not very good specimen, is *H. umbellata*.

174. BOWLESIA LOBATA Ruiz. & Pavon, Fl. Peruv. iii, 28, t. 251. Lake Merced, Point Lobos, Mission Hills, hills of South San Francisco. March—May.

175. ERYNGIUM PETIOLATUM Hook. & Arn. Fl. Bor-Am. i, 259. In swales at the end of Eighteenth street. May—June. "Button Snakeroot."

176. SANICULA ARCTOPOIDES H. & A. Bot. Beech. 147 and 347. Hills about San Francisco. January—April. "Sanicle."

177. SANICULA MENZIESII H. & A. Bot. Beech. 142 and 347. Common. April—May.

This plant appears to be absolutely identical with the much older *S. Liberta* Cham. & Schl. Linnæa i, 353. As in *S. laciniata* the fruit varies from pedicellate to nearly or quite sessile.

178. SANICULA BIPINNATIFIDA Dougl. in Hook. Fl. Bor-Am. i, 258. Common. March—May. "Purple Sanicle."

179. SANICULA MARITIMA Kell. Watson, Bot. Cal. ii, 451. Recently found by Miss E. Cannon on the Potrero Hills at the end of Eighteenth street. March—May.

180. SANICULA TUBEROSA Torr. Pac. R. Rep. iv, 91. Hills near Visitacion Bay. Not common. April—May. Closely related to *S. macrorrhiza* Colla.

181. *Conium maculatum* L. spec. 349. Waste places about the city. May—July. "Poison Hemlock."

182. *Apium graveolens* L. spec. 379. Escaped into the marshes about Mountain Lake and the Presidio, as in most others of the seaboard. March—May. "Celery."

183. *Fœniculum vulgare* Gaertn. fruct. i, 103. Naturalized in waste places. "Fennel."

184. PIMPINELLA APIODORA Gray. Proc. Am. vii, 345. Rocky places about the summits of the Mission Hills. April—June.

185. CARUM KELLOGGII Gray. Proc. Am. Acad. vii, 344. Near Mt. Olympus, hills near Visitacion Valley. May—August.

186. CICUTA VIROSA var. CALIFORNICA (Gray. Proc. Am. Acad. vii, 344). Coulter & Rose, Rev. Umb. 130. "Water-Hemlock."

187. ŒNANTHE SARMENTOSA var. CALIFORNICA* (B. & H. Bot. Beech. 142). Common in swamps and rivulets, flowering nearly all the year. "Fool's Parsley."

188. ANGELICA HENDERSONI C. & R. Bot. Gaz. xiii, 80. From Point Lobos to Fort Point. May—July. "Angelica."

189. HERACLEUM LANATUM Michx. Fl. i, 166. Hillsides about Lake Merced, Sunset Heights, Mission Hills, Lobos Creek. January—May. "Cow Parsnip."

190. PEUCEDANUM DASYCARPUM T. & G. Fl. i, 628. Common on hills, Mission, Potrero, South San Francisco. March—May.

191. PEUCEDANUM CARUIFOLIUM T. & G. Fl. i, 628. More common in the same localities than the preceding. March—May.

192. PEUCEDANUM UTRICULATUM Nutt. T. & G. Fl. i, 628. Mission Hills, hills near Visitacion Valley. April. Not common.

193. DAUCUS PUSILLUS Michx. Fl i, 164. Sunset Heights, Mission Hills, hills of South San Francisco. March—May. "Little Carrot."

The Chilian *D. hispidifolius* Clos. is extremely like the low form found near Fort Point.

194. CAUCALIS MICROCARPA H. & A. Bot. Beech. 348. Mission Hills, Point Lobos, etc. March—May.

This is said in Bot. Cal. to be used by native Californians and others as a remedy for snakebites, but the plant which is usually sent for identification with such statement of its curative powers is *Daucus pusillus.*

195. *Caucalis nodosa* L. spec. 346. About Islais Creek. May.

CORNACEÆ.

196. CORNUS NUTTALLII† Aud. Nutt. Sylva, iii, 51, t. 97. "Flowering Dogwood."

197. CORNUS PUBESCENS Nutt. Sylva, iii, 34. Lobos Creek. May. "Dogwood," "Cornel."

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*No other plant answering so well to the brief description of *Helosciadium? Californicum* occurs in this vicinity.

†Zoe, ii, 4.

198. GARRYA ELLIPTICA Dougl. Lindl. Bot. Reg. t. 1886. Sunset Heights. Mission Hills. January.

CAPRIFOLIACEÆ.

199. SAMBUCUS GLAUCA Nutt. T. & G. Fl. ii, 13. Presidio, Black Point. May. "Elder."

200. SYMPHORICARPUS RACEMOSUS Michx. Fl. i, 107. Sunset Heights. May—July. "Snowberry."

201. LONICERA INVOLUCRATA (Rich. App. Frankl. Journ. 6). Bushy hills in Golden Gate Park, Mission Hills, Point Lobos. April—June. "Twin-Berry."

202. LONICERA HISPIDULA (Dougl. in Lindl. Bot. Reg. t. 1761). Sunset Heights. May—July. "Honeysuckle."

RUBIACEÆ.

203. GALIUM APARINE L. spec. 157. Moist and shaded places in the western part of the city. April—May. "Cleavers."

204. GALIUM NUTTALLII Gray. Pl. Wright, i, 80. Common, climbing in bushes. March—June.

205. GALIUM TRIFIDUM L. spec. 153. Swamp at the head of Mountain Lake. May—July.

VALERIANACEÆ.

206. VALERIANELLA OLITORIA Poll. Hist. Pl. Palat. i, 30. Escaped from cultivation in the western part of the city. "Doucette."

207. VALERIANELLA MACROCERA (T. & G. Fl. ii, 50). Mission Hills, hillsides near Lake Merced. March—May.

COMPOSITÆ.

208. GRINDELIA GLUTINOSA* (Cav. Ic. ii, 53, t. 168). Point Lobos, Fort Point. May—August.

209. GRINDELIA CUNEIFOLIA Nutt. Trans. Am. Phil. Soc. vii, 315. Marshes of the bay shore at South San Francisco. June—October. The statement that this plant does not flower till October is erroneous. Like most plants preferring wet grounds it is a little later coming into bloom and lasts much longer than those of drier places.

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*The still unknown *G. humilis* (if really Californian) may possibly be a dwarf and immature specimen of this.

210. GRINDELIA ROBUSTA Nutt. Trans. Am. Phil. Soc. vii, 314. Mission Hills, South San Francisco. May—July. "Gum Plant."

211. PENTACHÆTA ALSINOIDES Greene. Bull. Torr. Club, ix, 109. Mission Hills. April.

212. LESSINGIA GERMANORUM Cham. Linnæa, iv. 203. Sandy stretches near Lobos Creek and Lake Merced. April—July.

213. CHRYSOPSIS VILLOSA (Pursh.) var. SESSILIFLORA (Nutt. Trans. Am. Phil. Soc. vii, 317). Mission Hills, Buena Vista Park. June—August.

214. APLOPAPPUS ERICOIDES (Less. in Linnæa, vi, 117). Common in the western part of the city. Flowering the greater part of the year.

215. BIGELOVIA VENETA HBK. Nov. Gen. & Spec. iv, 68. A few plants near the entrance to the Military Reservation at Black Point. In this location they grow luxuriantly, the largest being four feet high with a stem five inches in circumference. August—November.

216. SOLIDAGO OCCIDENTALIS (Nutt. Trans. Am. Phil. Soc. vii, 326). Laurel Hill Cemetery. July—September.

217. SOLIDAGO CALIFORNICA Nutt. l. c. 328. Hills in the western part of the city. July—October. "Golden Rod."

218. SOLIDAGO SEMPERVIRENS L. Spec. 1232. Near Laguna Honda. August—November. "Leafy Golden Rod."

219. CORETHROGYNE CALIFORNICA DC. Prodr. v, 215. Potrero Hills. April—June.

220. ASTER CHAMISSONIS Gray. Common. July—October. "Aster."

221. ERIGERON GLAUCUS (Nees. Ast. 275). Summits of rocky hills and cliffs of the seashore, flowering nearly all the year.

222. ERIGERON PHILADELPHICUS L. Spec. 1211. Near Ocean View, Visitacion Valley. May—July.

223. ERIGERON CANADENSIS L. Spec. 1211. Waste grounds, common. Nearly all the year. "Horseweed."

224. BACCHARIS PILULARIS DC. Prodr. v, 407. Common everywhere in the western part of the city, growing tall and robust in sheltered spots and depressed-spreading in bare spots exposed to the wind. June—October.

225. *Baccharis Douglasii* DC. Prodr. v. 400. Laguna Honda and near Visitacion Valley. June—August.

226. MICROPUS CALIFORNICUS Fisch. & Mey. Ind. Sem. Petr. 1835, 42. Vicinity of Ocean View, hills near Visitacion Valley. April—May.

227. PSILOCARPHUS TENELLUS Nutt. Trans. Am. Phil. Soc. vii, 340. April—May.

228. EVAX CAULESCENS (Benth. Pl. Hartw. 319.) The slender diffused form. Common on the Potrero Hills, usually in adobe soil. March—May.

229. *Filago Gallica* L. spec. 1312. Mission Hills. May.

230. ANAPHALIS MARGARITACEA (L Spec. 1198). Sunset Heights. Point Lobos. May—October. "Pearly Everlasting."

231. GNAPHALIUM DECURRENS Ives. Am. Jour. Sci. i, 380, t. 1. Thickets in cemeteries, parks and the Mission hills. April—July. "Everlasting."

232. GNAPHALIUM SPRENGELII H. & A. Bot. Beech. 150. Phillippi in Cat. Pl. Vasc. Chil. reduces this to *G. viravira* Mol. and Dr. Gray in Bot. Cal. i, 341, says: "Very probably *G. Sandwicensium* Gaudichaud is an older name of this species." Some of the forms appear to match exactly a specimen from Chili labeled *G. Valdivianum*.

233. GNAPHALIUM RAMOSISSIMUM Nutt. Pl. Gamb. 172. Laurel Hill Cemetery, Golden Gate Park. May—July. "Everlasting."

234. GNAPHALIUM PALUSTRE Nutt. Trans. Am. Phil. Soc. vii, 403. Borders of pools and lakes. May—September.

235. GNAPHALIUM PURPUREUM L. spec. 1200. Mission Hills, Potrero, South San Francisco, etc. March—June.

236. IVA AXILLARIS Pursh. Fl. ii, 743. Bay shore between Visitacion Bay and Hunter's Point. June—August.

237. AMBROSIA PSILOSTACHYA* DC. Prodr. v, 526. About the bay shore near Telegraph Hill. July—September. "Ragweed."

238. FRANSERIA CHAMISSONIS Less. in Linnæa vi, 507. Common on the drifting sands of the shore. May—October. "Shore-Bur."

*The date of flowering given in this list is for San Fraucisco only, and differs considerably in other parts of the state.

239. FRANSERIA BIPINNATIFIDA Nutt. Trans. Am. Phil. Soc. vii, 344. With the preceding and apparently connected by various forms.

240. XANTHIUM CANADENSE Mill. Dict. Ed. 8. Waste places near the Presidio and South San Francisco. Not common. June—September. "Cockle-Bur."

241. *Xanthium spinosum* L. spec. 1400. A common weed especially about South San Francisco and Visitacion Valley. June—October. "Spiny Cockle-Bur."

242. WYETHIA ANGUSTIFOLIA (DC. Prodr. v, 537). Mission Hills. April—June.

243. HELIANTHELLA CALIFORNICA* Gray. Pac. R. Rep. iv, 103. Mission Hills towards Ocean View. April—May.

244. BIDENS CHRYSANTHEMOIDES† Michx.

245. MADIA SATIVA Mol. Chil. ed. Germ. 113. Common. April—July. The worst of our "Tarweeds."

246. MADIA DISSITIFLORA Nutt. Trans. Am. Phil. Soc. vii, 387. Mission Hills. April—June.

247. MADIA FILIPES Gray. Laurel Hill Cemetery. May.

248. HEMIZONIA LUZULÆFOLIA DC. Prodr. v, 692. Potrero, South San Francisco. June—September.

249. HEMIZONIA ANGUSTIFOLIA‡ DC. Prodr. v, 692. Mission Hills, Hills near Visitacion Valley. June—August.

250. HEMIZONIA PUNGENS (H. & A. Bot. Beechey, 357.) Northern part of the city about Telegraph Hill. July. "Prickly Tarweed."

251. HEMIZONIA PANICULATA Gray, Proc. Am. Acad. xix, 17. Near Telegraph Hill and Black Point. June—July.

252. HEMIZONIA FASCICULATA§ DC. Prodr. v, 693. About Black Point. June—August.

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*Zoe, ii, 75.

†This plant formerly grew in a deep swamp at Seventh and Mission Streets.

‡The obscure *H. congesta* is intermediate between this and the above and may be a hybrid.

§The three last species do not properly belong to the Coast flora having been introduced in wool, grain, etc.

253. LAYIA HIERACIOIDES (DC. Prodr. v, 694). Sunset Heights, Mission Hills, hills of the bay shore near Visitacion Valley. April —May.

254. LAYIA GAILLARDIOIDES H. & A. Bot. Beech. 148 and 357. Mission Hills, South San Francisco. March—May.

255. LAYIA PLATYGLOSSA (Fisch. & Mey. Ind. Sem. Hort. Petrop. ii, 31). Common. April—June. "Tidy-tips."

256. ACHYRACHÆNA MOLLIS Schauer. Del. Sem. Hort. Vratisl, 1837. Near Visitacion Valley and Ocean View. April—May.

257. JAUMEA CARNOSA (Less. in Linnæa vi, 520). Salt marshes Visitacion Valley, South San Francisco, Islais Creek, Presidio. June—August.

258. ERIOPHYLLUM STÆCHADIFOLIUM Lag. Elench. Hort. Madr. 28. *Bahia artemisiæfolia* of Bot. Cal. Common. Blooming most of the year.

259. ERIOPHYLLUM CONFERTIFLORUM (DC. v, 657). Cliffs of the bay shore at South San Francisco, flowering nearly the whole year.

260. ERIOPHYLLUM CÆSPITOSUM Dougl. Mission Hills, Point Lobos. June. Not common in our limits.

261. BLENNOSPERMA CALIFORNICA (DC. Prodr. v, 531). Potrero, hills between Visitacion Bay and South San Francisco. February—April.

Extremely like *B. Chilense* and hardly to be considered more than a variety of that species, though perhaps from poor material, they were described in the Prodromus as two different new genera belonging even to different sections of Senecionidæ.

262. LASTHENIA GLABRATA Lindl. Bot. Reg. t. 1780. Low grounds in the western part of the city, Islais Creek, South San Francisco.

263. BÆRIA CHRYSOSTOMA Fisch. & Mey. Ind. Sem. Hort. ii, 29. Low grounds near the Park and Ocean View. March—May.

264. BÆRIA GRACILIS (DC. Prodr. v, 664). Islais Creek, South San Francisco, Visitacion Valley. March—May.

265. BÆRIA ULIGINOSA Nutt. Trans. Am. Phil. Soc. vii, 383. About the borders of marshes, Islais Creek, Visitacion Valley, Presidio, South San Francisco. April—June.

B. maritima from the Farallones is a mere form of this species not even worthy of varietal rank. Specimens of *B. uliginosa* from San Francisco have 2–5 awns and variable paleæ; the involucral scales may be any number from 6—12. The island form has the same villous–tomentose pubescence and leaves not more entire.

266. HELENIUM PUBERULUM DC. Common in wet places about the cliffs, flowering nearly all the year. "Sneezeweed."

267. ACHILLEA MILLEFOLIUM L. Common, flowering nearly all the year. Flowers often rosy. "Yarrow."

268. ANTHEMIS COTULA L. spec. 1261. "Mayweed." This plant was as common in the interior of California in 1854 and of much ranker growth than it is now.

269. MATRICARIA DISCOIDEA DC. Common in waste places, and about little-trodden streets. March—July.

270. MATRICARIA OCCIDENTALIS Greene Bull. Cal. Acad. ii, 150. Waste places in the western part of the city. April—July. This species should be compared with *M. corymbifera* DC. Prodr. vii, 297.

271. *Chrysanthemum segetum* L. spec. 1254. About abandoned gardens in the northern part of the city near the Presidio. "Corn Marigold."

272. *Chrysanthemum Parthenium* (L. spec. 1250). About the cliffs of Telegraph Hill. June—August. "Feverfew."

273. TANACETUM CAMPHORATUM Less. Linnæa, vi, 521. Buena Vista Park, western part of Golden Gate Park and adjacent dunes. Flowering most of the year. "Tansy."

274. COTULA CORONOPIFOLIA L. spec. 1257. Common everywhere in shallow water and muddy margins, flowering all the year. "Brass-Buttons."

275. COTULA AUSTRALIS (Sieb. Spreng Syst. iii, 497). In yards and borders of sidewalks. Common. March—May.

276. *Soliva sessilis* Ruiz & Pavon Prodr. 113, t. 24. Mission Hills, South San Francisco, Presidio. March—May.

277. ARTEMISIA CALIFORNICA Less. in Linnæa, vi, 523. Bushy hillsides. June—August.

278. ARTEMISIA VULGARIS L. var. CALIFORNICA Besser. Lin-

næa xv. 91. Near Lake Merced, Mission Hills, Presidio. "Wormwood."

279. ARTEMISIA PYCNOCEPHALA (Less. in Linnæa, vi, 524). Common in the western part of the city. March—July.

280. ARTEMISIA DRACUNCULOIDES Pursh. Fl. ii, 742. Near the entrance to Black Point. July—September.

281. *Senecio vulgaris* L. spec. 1216. Common. March—June. "Groundsel."

282. SENECIO ARONICOIDES DC. vi, 426. Strawberry Hill. Mission Hills, South San Francisco. March—May:

283. CNICUS QUERCETORUM Gray Proc. Am. Acad. x, 40. Mission Hills, Point Lobos, South San Francisco. March—May. "Ground Thistle."

284. CNICUS OCCIDENTALIS (Nutt. Trans. Am. Phil. Soc. vii, 418). Common, more or less in bloom for the greater part of the year. "Western Thistle."

285. CNICUS EDULIS (Nutt. Trans. Am. Phil. Soc. vii, 420.) Common in swampy places. April—July.

286. *Sylibum Marianum** (L. spec. 1153). Common, flowering most of the year. "Milk Thistle."

287. *Centaurea Melitensis* L. spec. 1297. Common. April—August. "Star-Thistle."

288. *Centaurea solstitialis* L. spec. 1297. Less common than the last.

289. *Centaurea Cyanus* L. spec. 1289. Occasionally escaped from cultivation. May—August. "Blue-Bottle," "Corn Flower."

290. MICROSERIS SYLVATICA (Benth. Pl. Hartw. 320). Depressions on the hillside north of Mountain Lake. May—June.

291. MICROSERIS LINEARIFOLIA† (DC. Prodr. vii, 85). Common. April—May.

292. MICROSERIS LINDLEYI (DC. Prodr. vii, 85). Less common than the preceding. Near Ocean View. April—May.

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*Dr. Behr remarks (Zoe, ii, 5) that he had not seen this thistle previous to 1854, but its date of introduction must have been much earlier, as it was at that time already extremely abundant in the Sacramento Valley.

†Zoe, i, 126. *M. macrochæta* described from immature specimens, and credited to the vicinity of San Francisco is undoubtedly this species.

293. MICROSERIS APHANTOCARPHA (Gray Proc. Am. Acad. vi, 552). Visitacion Valley. May.

294. MICROSERIS BIGELOVII (Gray. Pac. R. R. Rep. iv, 113, t. 17). Common in the southern and western parts of the city. March—May.

295. MICROSERIS DOUGLASII (DC. vii, 85). Potrero, South San Francisco, Presidio. April—June.

296. STEPHANOMERIA VIRGATA Benth. Bot. Sulph. 32. Golden Gate Park, South San Francisco, Presidio. June—August.

297. RAFINESQUIA CALIFORNICA Nutt. Trans. Am. Phil. Soc. vii, 429. Golden Gate Park, Mission Hills, South San Francisco. May—July.

298. *Hypochæris glabra* L. spec. 1141. Common. March—June.

299. *Hypochæris radicata* L. spec. 1140. Presidio by roadsides. March—August.

300. *Hypochæris* ——— apparently *Achyrophorus amvandteri* Ph. Hillsides near the bay shore between Visitacion Bay and South San Francisco.

301. TROXIMON APARGIOIDES* Less. Linnæa, vi, 594. Near the sea. May—July.

302. TROXIMON HUMILE (Benth. Pl. Hartw. 320). Common, flowering most of the year.

303. TROXIMON LACINIATUM (Nutt. Trans. Am. Phil. Soc. vii, 432). Mission Hills. April—July.

304. *Troximon Chilense* (Less. Syn. Comp. 131). Not so common in our limits as *T. humile*. Various forms have received specific names in Chili as *lævigatus* and *pterocarpus* F. & M.—forms represented equally in California. Vars. *cryptopleura* and *kymopleura* in their extremes appear to have been found only in California.

305. *Taraxacum officinale* Weber Prim. Pl. Holst. 56. Becoming abundant in city squares and lawns, flowering the greater part of the year. "Dandelion."

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*In separating these species the relative length of beak and pappus is apparently of no value whatever.

306. *Sonchus asper* Vill. Waste places, common nearly all the year. "Sow-Thistle."

307. *Sonchus oleraceus* L. Common. "Sow-Thistle."

ERICACEÆ.

308. VACCINIUM OVATUM Pursh. Fl. i, 290. Laurel Hill Cemetery, Mission Hills. March—June. "Huckleberry."

The berries of this species are common in our markets. The beautiful, glossy evergreen foliage makes it well worthy of cultivation.

309. ARCTOSTAPHYLOS PUMILA Nutt. Trans. Am. Phil. Soc. vii, 226. Laurel Hill Cemetery. February—May. "Creeping Manzanita." The improvements now going on will soon destroy this locality.

310. ARCTOSTAPHYLOS PUNGENS HBK. Nov. Gen. & Spec. iii, 278, t. 259. February—April. "Manzanita."

Dr. Behr says this species formerly grew about the Protestant Orphan Asylum. Mr. C. A. Michener collected it last year somewhere between Lobos Creek and Fort Point.

311. GAULTHERIA SHALLON Pursh Fl. i, 284, t. 12. About the rocky summits of the Mission Hills. February—May. "Salal."

PLUMBAGINEÆ.

312. *Armeria vulgaris* Willd. Laurel Hill, Ocean View, Point Lobos, flowering the greater part of the year. "Thrift," "Sea Pink."

313. *Statice Limonium* var. CALIFORNICA Boiss in DC. Prodr. xii, 463. Marshes in Visitacion Valley, South San Francisco, Presidio. May—September. "Sea-Lavender," "Marsh-Rosemary."

PRIMULACEÆ.

314. DODECATHEON MEADIA L. var. MACROCARPUM Gray. South San Francisco, Mission Hills, Point Lobos. March. "Shooting Star."

——— var. ELLIPTICA (Nutt. Pl. Pratt 94). Adobe soil in depressions of the Potrero Hills.

315. GLAUX MARITIMA L. spec. 301. Above the flume, about midway between Lobos Creek and Fort Point. June. "Sea-Milkwort."

316. *Anagallis arvensis* L. spec. 211. Common, flowering nearly all the year. "Pimpernel."

APOCYNACEÆ.

317. *Vinca major* L. spec. 304. Flowering all the year. "Periwinkle."

Escaping from cultivation in many places and difficult to eradicate.

GENTIANEÆ.

318. *Microcala quadrangularis* Willd. spec. i, 636. Mission Hills. April—May.

319. ERYTHRÆA MUHLENBERGII Griseb Gent. 146. Mission Hills and slopes north of Mountain Lake. May—June. "Canchalagua."

320. MENYANTHES TRIFOLIATA * L. sp. 207. "Buckbean."

POLEMONIACEÆ.

321. GILIA GRACILIS Hook. Bot. Mag. t. 2924. Sunset Heights, Mission Hills. March—May.

322. GILIA LINIFLORA Benth. Bot. Reg. no. 1622. Potrero Hills. April—June.

323. GILIA DENSIFLORA Benth. Northern side of Lake Merced. June—August.

324. GILIA ANDROSACEA (Benth.) var. ROSACEA Gray. Sands in the western part of the city. April—July.

325. GILIA SQUARROSA (Esch. Mem. Acad. Petr. x, 283). Common. May—August. "Skunkweed."

326. GILIA ACHILLEÆFOLIA Benth. Bot. Reg. no. 1622. Western part of the city. May—July.

327. GILIA MULTICAULIS Benth. Sunset Heights, Mission Hills, South San Francisco. May—June.

HYDROPHYLLACEÆ.

328. NEMOPHILA INSIGNIS Benth. Trans. Linn. Soc. xvii, 275. Point Lobos, Mission Hills. March—May. "Baby-Eyes."

329. NEMOPHILA MENZIESII H. & A. Bot. Beech. 152 and 372. Hills near Lake Merced, South San Francisco, Mission Hills. March—May.

* Zoe, i, 4.

——— var. PEDUNCULATA (Benth. in Linn. Trans. xvii, 275). Point Lobos, Mission Hills. February. This plant seems to be worthy of a varietal name.

330. PHACELIA CIRCINATA Jacq. f. Ecl. i, 135, t. 91. Common. March—July.

331. PHACELIA NEMORALIS Greene Pitt. i, 141. Sides of cañon northeast of Stanford Heights. May.

332. PHACELIA MALVÆFOLIA Cham. Linnæa, iv, 494. Mission Hills, South San Francisco, Golden Gate Park, Laurel Hill Cemetery. May—July. "Stinging Phacelia."

333. PHACELIA DISTANS Benth. Bot. Sulph. 37. Common. April—June.

334. PHACELIA CILIATA Benth. in Linn. Trans. xvii, 280. Ocean House Road and near Laguna Honda. April—June.

335. PHACELIA DIVARICATA Benth. Trans. Linn. Soc. xvii, 280. Near Lake Merced. March—May.

BORAGINEÆ.

336. HELIOTROPIUM CURASSAVICUM L. spec. 188. Fort Point, Visitacion and South San Francisco marshes. June—September.

337. AMSINCKIA LYCOPSOIDES (Lehm. Pug. ii, 28). Common. February—June.

338. KRYNITZKIA CALIFORNICA F. & M. Mission Hills, Lake Merced. May.

339. KRYNITZKIA CHORISIANA Ch. & Schl. Mission Hills, South San Francisco. April—May.

340. KRYNITZKIA SCOULERI H. & A. Near Lake Merced. April—May.

341. KRYNITZKIA OXYCARYA Gray. Western and southern parts of the city. April—May.

342. KRYNITZKIA LEIOCARPA F. & M. Western part of the city.

343. CYNOGLOSSUM GRANDE Dougl. Hook. Fl. ii, 85. Mission Hills, hills near Visitacion Bay. March. "Hound's Tongue." Formerly abundant but now becoming very rare in our limits.

CONVOLVULACEÆ.

344. DICHONDRA REPENS Forst. Char. Gen. 39, t. 20. Mission Hills not far from Ocean View, hills near Mountain Lake, also about Tamalpais and at Monterey. April—July. With us undoubtedly introduced.

345. CONVOLVULUS SOLDANELLA L. spec. 226. Sands near the shore of the Presidio. "Shore Morning-Glory."

346. CONVOLVULUS CALIFORNICUS Choisy. Low places and hillsides in the Mission Hills. April–June. "Stemless Morning-Glory."

347. CONVOLVULUS OCCIDENTALIS Gray. Proc. Am. Acad. xi, 89. Along the rocky shores, blooming the greater part of the year. "Western Morning-Glory."

348. *Convolvulus arvensis* L. spec. 218. About Islais Creek and South San Francisco. May—July. "Bindweed."

349. CUSCUTA SALINA Engelm. Bot. Cal. i, 536. Salt marshes at Visitacion Bay, South San Francisco, Presidio. May—August. "Dodder."

SOLANACEÆ.

350. *Solanum nigrum* L. spec. i, 266. Common, flowering nearly the whole year. "Night Shade."

——— var. DOUGLASII Dunal in DC. Prodr. xiii, 48. South San Francisco, flowering nearly the whole year.

351. SOLANUM UMBELLIFERUM Esch. Mem. Acad. Petr. x, 281. Common, flowering all the year.

352. NICOTIANA BIGELOVII Watson, Bot. King 276, t. 27, f. 3, 4. Shores of South San Francisco, probably introduced from the interior. July. "Wild Tobacco."

SCROPHULARINEÆ.

353. LINARIA CANADENSIS L. spec. 853. Common in the western and southern parts of the city. April. "Toad-Flax."

354. SCROPHULARIA CALIFORNICA Cham. Linnæa, ii, 585. Common, blooming nearly all the year.

This plant has many forms and some of them are with difficulty discriminated from *S. nodosa*.

355. COLLINSIA BICOLOR Benth. Trans. Hort. Soc. n. s. i, 480. Mission Hills, South San Francisco. April.

356. COLLINSIA BARTSIÆFOLIA Benth. DC. Prodr. x, 318. Sands near the shore. April—June.

A low spreading form which connects with *C. corymbosa.*

357. COLLINSIA SPARSIFLORA F. & M. Ind. Sem. Petr. ii, 33. Ocean View, Lake Merced. April.

358. COLLINSIA PARVIFLORA Dougl. in Lindl. Bot. Reg. t. 1802. Potrero, South San Francisco. April.

359. MIMULUS LUTEUS L. spec. 884. Common in wet places, especially from Point Lobos to Fort Point. Flowering all the year. "Monkey-Flower."

360. MIMULUS GLUTINOSUS Wendland. Obs. 51. Common, blooming nearly all the year. "Sticky Monkey-Flower."

361. VERONICA AMERICANA Schw. mss. Benth. in DC. Prodr. x, 468. Mountain Lake, Lake Merced, Lobos Creek, South San Francisco. April—September. "Brooklime."

362. VERONICA SERPYLLIFOLIA L. spec. 15. Laurel Hill Cemetery. June.

363. VERONICA PEREGRINA L. spec. 20. South San Francisco. June.

364. LIMOSELLA AQUATICA L. spec. 881. Pools between Mountain Lake and Point Lobos Railway. June—September.

These pools are being filled with sand in the process of grading the tract and the locality will be soon destroyed.

365. CASTILLEIA AFFINIS Hook. & Arn. Bot. Beech. 154, 380. Golden Gate Park, Mission Hills, South San Francisco. May—August. "Painted Cup."

366. CASTILLEIA PARVIFLORA Bong. Veg. Sitk. 157. Western and southern parts of the city, blooming the greater part of the year.

367. CASTILLEIA LATIFOLIA H. & A. Bot. Beech. 154. Bluffs of the shore, blooming the greater part of the year, and apparently connecting with the preceding.

368. CASTILLEIA FOLIOLOSA H. & A. Bot. Beech. 154. Hills between Visitacion Bay and South San Francisco, flowering nearly all the year. "Woolly Painted-Cup."

369. ORTHOCARPUS DENSIFLORUS Benth. Scroph. Ind. 13. Mission Hills, Lake Merced. April—May. "Owls'-Clover."

370. ORTHOCARPUS PURPURASCENS Benth. l. c. Hills near Visitacion Valley. April—June. "Owls'-Clover."

371. ORTHOCARPUS PUSILLUS. Benth. l. c. 12. Common. March—May.

372. ORTHOCARPUS FLORIBUNDUS Benth. l. c. Presidio Hills, Potrero. March—May.

373. ORTHOCARPUS ERIANTHUS Benth. l. c. Laguna Honda, March—May.

——— var. ROSEUS Gray. About Ocean View and Lake Merced. Very abundant and fragrant, flowers usually white. March—May.

374. ADENOSTEGIA MARITIMA (Nutt. in DC. Prodr. x, 598). Salt marshes, Visitacion Bay, South San Francisco. June—August.

This is *Cordylanthus maritimus* of Bot. Cal.; described also by Dr. Behr under the name *Chloropyron palustre* from "marshes near Russ Gardens" in San Francisco.

OROBANCHACEÆ.

375. APHYLLON UNIFLORUM (L. spec. 882). North side of Sunset Heights. April.

376. APHYLLON FASCICULATUM (Nutt. Gen. ii, 59). Hills near Lake Merced. March.

377. APHYLLON COMOSUM (Hook. Fl. ii, 93, t. 169). Point Lobos near the sea, on roots of *Eriophyllum stæchadifolium.* July.

LABIATÆ.

378. *Mentha Canadensis* L. spec. 806. Marshes about the city. June—September. "Mint."

379. *Mentha viridis* L. sp. 804. Cemeteries, and about marshes. June—September. "Spearmint."

380. LYCOPUS SINUATUS Ell. Bot. Car. i, 187. Marshy grounds at Mountain Lake. June—September. "Water-Horehound."

381. MONARDELLA VILLOSA Benth. Bot. sulph. 42, t. 21. Mission Hills, South San Francisco, Point Lobos. Blooming the greater part of the year.

382. MICROMERIA DOUGLASII Benth. Common under shrubs. April—July. "Yerba Buena."

This plant was described by Bentham in Linnæa, vi, 80, as *Thymus? Chamissonis.* The specific name, in placing it in another genus, he altered to *Douglasii.*

383. SPHACELE CALYCINA* Benth. Lab. 568. "Wood Balm."

384. SCUTELLARIA TUBEROSA Benth. Lab. 441. Hills near Visitacion Bay. March—May. "Skullcap."

385. BRUNELLA VULGARIS L. sp. 387. Mission Hills, Potrero. April—June. "Self-heal."

386. *Marrubium vulgare* L. spec. 816. Islais Creek, South San Francisco, Presidio. April—August. "Horehound."

A troublesome weed.

387. STACHYS CHAMISSONIS Benth. Linnæa, vi, 80. Visitacion Bay in a swamp just within the city limits. May—August. "Hedge-Nettle."

388. STACHYS AJUGOIDES Benth. Linnæa, vi, 80. Open grounds, common, flowering the greater part of the year.

389. STACHYS BULLATA Benth. Lab. 547. Common, flowering nearly all the year.

The last two species are represented about San Francisco by many forms which closely represent the Chilian *S. Macræi, S. Gilliesii, S. Bridgesii, S. Chonotica*, etc.

PLANTAGINEÆ.

390. PLANTAGO MAJOR L. spec. 163. South San Francisco, Visitacion Bay, Islais Creek. April—September. "Plantain."

391. PLANTAGO HIRTELLA HBK. Nov. Gen. & Spec. ii, 229, t. 127. Common and blooming the greater part of the year.

392. PLANTAGO MARITIMA L. spec. 165. About the Ocean and Bay shores, blooming nearly the whole year. "Sea Plantain."

393. *Plantago lanceolata* L. spec. 164. Cemeteries, parks, Mission Hills, Potrero, South San Francisco. April—July. "Rib Grass," "English Plantain."

394. PLANTAGO PATAGONICA Jacq. Coll. Sup. 35. Mission Hills, Potrero, South San Francisco, Presidio Heights. March—May.

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*Zoe, ii, 4.

NYCTAGINEÆ.

395. ABRONIA UMBELLATA Lam. Ill. 469, t. 105. Hunter's Point, Presidio Beach. March—September. "Sea-Verbena."

396. ABRONIA LATIFOLIA Eschscholtz, Mem. Acad. Petr. x, 281. Dunes of the sea shore. March—November.

POLYGONACEÆ.

397. *Rumex pulcher* L. spec. i, 477. Common. May—July.

398. *Rumex maritimus* L. spec. i, 478. Low places near Lake Merced, Mountain Lake and Presidio. June—September.

399. *Rumex Acetosella* L. spec. i, 481. Common everywhere. April—August. "Sheep-Sorrel."

400. *Rumex crispus* L. spec. i, 476. About old fields. May—July. "Curled Dock."

401. RUMEX SALICIFOLIUS Weinm. in Flora, 1821, p. 28. In sandy depressions in the western and southern parts of the city. May—July.

402. *Rumex conglomeratus* Murr. Prodr. Fl. Gött. 52. Marshes about Mountain Lake and the Presidio. May—August.

403. RUMEX BERLANDIERI* Meisner in DC. Prodr. xiv, 45.

404. RUMEX OCCIDENTALIS Watson, Proc. Am. Acad. xii, 253. Lake Merced. May—August. "Western Dock."

Prof. Trelease has recently undertaken the study of the American species of Rumex, and his investigations may perhaps somewhat alter our nomenclature.

405. POLYGONUM PARONYCHIA Ch. & Schl. Linnæa, iii, 54. Common in the western part of the city and about the dunes of northern shore, blooming the whole year.

406. *Polygonum aviculare* L. spec. i, 519. Common about way-sides and dwellings. May—September. "Knotweed."

407. POLYGONUM LAPATHIFOLIUM L. Pers. Ench. i, 440. Sides of ditches and moist places, near the Presidio. June—September.

408. POLYGONUM AMPHIBIUM L. spec. 1, 517. Lake Merced. June—September.

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*"Specimens of Kellogg & Harford's collection (n. 862) from Fort Point, seem to belong to this species." Bot. Cal. ii, 9.

409. POLYGONUM MUHLENBERGII Wats. Margin of Mountain Lake. May—October.

410. *Polygonum Persicaria* L. spec. ed. i, 364. Waste places and ditch sides, between Black Point and the Presidio. June—October. "Lady's Thumb."

411. POLYGONUM PENNSYLVANICUM* L. spec. i, 549. Low places in the northern part of the city. June—September.

412. *Polygonum acre* HBK. Nov. Gen. ii, 179. About the Presidio, Mountain Lake, Lake Merced. South San Francisco. June—September. "Water Smartweed."

413. *Polygonum Convolvulus* L. spec. i, 522. Becoming common about the Presidio roads, and in the western part of the city. June—September. "Black Bindweed."

414. ERIOGONUM LATIFOLIUM. Sm. in Rees Cyc. Common in the western part of the city, blooming the greater part of the year. A form on the Potrero and South San Francisco hills, connects with *E. nudum*.

415. ERIOGONUM FASCICULATUM Benth. Trans. Linn. Soc. xvii, 411. Near the entrance to Black Point. August—December. "Wild Buckwheat."

416. CHORIZANTHE PUNGENS Benth. Trans. Linn. Soc. xvii, 419, t. 19. Common in the sandy outskirts of the city. May—July.

417. PTEROSTEGIA DRYMARIOIDES F. & M. Ind. Sem. Hort. Petr. ii, 23. Common in rocky and bushy places. March—June.

AMARANTACEÆ.

418. AMARANTUS ALBUS L. spec. 1409. Near the Presidio and at Islais Creek. May—August. "Tumble Weed."

419. *Amarantus retroflexus* L. spec. 1407. Common in waste places. June—September. "Pigweed."

CHENOPODIACEÆ.

420. *Chenopodium album* L. spec. 119. Common, blooming the greater part of the year. "Lamb's-Quarters."

——— var. VIRIDE (L.) Common.

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*The greater number of the species of Polygonum here enumerated are, with us, unquestionably introduced.

421. *Chenopodium murale* L. Common all the year.

422. CHENOPODIUM CALIFORNICUM (Wats. Rev. Chenop. 101). Mission Hills, Point Lobos, South San Francisco. March—June. "Soap Plant."

423. *Chenopodium ambrosioides* L. spec. 320. Common, flowering all the year. "Wormseed."

424. *Roubieva multifida* (L. spec. 320). Abundant about waste plates, cemeteries and roadsides in the western part of the city. Especially so between Black Point and the Presidio, forming dense light green mats often 6–10 feet in diameter. In Bot. Cal. ii, 49, it is credited only to Plumas County from the collection of Mrs. Austin. It has a deep perennial, fleshy root much like that of *Chenopodium ambrosioides*, with which it has perhaps been confounded by collectors.

425. *Beta vulgaris* L. spec. 222. Escaped from cultivation near Mountain Lake, Black Point, etc. "Beet."

426. ATRIPLEX PATULA L. var. HASTATA (L. spec. 1494). Common in the salt marshes of Islais Creek and South San Francisco. July—October.

427. ATRIPLEX LEUCOPHYLLA (Moq. in DC. Prodr. xiii^2, 109). Sands about the Bay shore, South San Francisco, Visitacion Valley. June—August.

428. ATRIPLEX CALIFORNICA Moq. in DC. Prodr. xiii^2, 98. Point Lobos, Fort Point. June—October.

429. SALICORNIA AMBIGUA Michx. Fl. Bor-Am. i, 5. Salt marshes at South San Francisco, Visitacion Bay, Presidio. June—October. "Samphire."

430. SUÆDA CALIFORNICA Wats. Rev. Chenop. 89. Salt marshes at South San Francisco and Visitacion Bay. June—October. "Sea Blite."

LAURINEÆ.

431. UMBELLULARIA CALIFORNICA* (Nees, Syst. Laur. 463). "California Laurel," "Mountain Laurel."

URTICACEÆ.

432. URTICA HOLOSERICEA Nutt. Pl. Gamb. 183. Mountain

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†Zoe, ii, 3.

Lake, Golden Gate Park, Lobos Creek, Presidio; flowering nearly all the year. "Silky Nettle."

433. *Urtica urens* L. spec. 1396. Common. Nearly all the year. "Nettle."

EUPHORBIACEÆ.

434. CROTON CALIFORNICUS Müll. Arg. DC. Prodr. xv², 691. South San Francisco and sandy grounds in the western part of the city. March—July.

435. EUPHORBIA LEPTOCERA Engelm. Pac. R. Rep. iv, 135. Common, flowering all the year.

436. *Euphorbia lathyris* L. spec. 655. Rarely met with about waste places. Islais Creek. June—August.

MYRICACEÆ.

437. MYRICA CALIFORNICA Cham. Linnæa, vi, 535. Buena Vista Park, Point Lobos, Golden Gate Park, Swamp at Visitacion Bay. March—July. "Wax Myrtle."

SALICINEÆ.

438. SALIX LASIOLEPIS Benth. Pl. Hartw. 335. The common willow of the coast. February.

439. SALIX LASIANDRA Benth. Pl. Hartw. 336. Lake Merced, Presidio, Point Lobos. February.

CUPULIFERÆ.

440. QUERCUS AGRIFOLIA Née, Ann. Cienc. Nat. iii, 271. The common oak of the outskirts of the city, usually low and shrubby, but occasionally becoming a tree. March—April. "Encina." "Coast Live-Oak."

441. QUERCUS CHRYSOLEPIS Liebm., in Pl. Hartw. 336. Hills near Lake Merced; a very low form, only two or three feet in height. "Golden Oak." "Maul Oak."

CORYLACEÆ.

442. CORYLUS ROSTRATA Ait, Hort. Kew. iii, 364, var. CALIFORNICA DC. Prodr. xvi², 133. Strawberry Hill in Golden Gate Park, Mission Hills and hills near Lake Merced. February—March. "Hazel."

ARISTOLOCHIACEÆ.

443 ARISTOLOCHIA CALIFORNICA Torr. Pac. R. Rep. iv, 128. Hills near Lake Merced, southern shore of Laguna de la Puerca, and Strawberry Hill in Golden Gate Park. March. "Dutchman's Pipe," "Pipe-Vine."

This plant, though common, is usually overlooked by collectors; the brownish flowers appearing before the leaves, not being readily distinguished from the twigs of Corylus, etc., about which it climbs. Its presence may be detected by the hovering of the common blue-black butterfly, *Papilio Philenor*, whose conspicuous caterpillar feeds exclusively on it, and is so fond of its fruits as rarely to permit one to ripen.

ORCHIDEÆ,*

444. CORALLORHIZA BIGELOVII Watson, Proc. Am. Acad. xii, 275. Dr. Behr says this plant grew in the western part of the city, near Woodward's Gardens. "Coral Root."

445. HABENARIA ELEGANS (Lindl. Orch. 285). Mission Hills, South San Francisco, Golden Gate Park. "Rein Orchis."

446. HABENARIA LEUCOSTACHYS (Lindl. Orch. 288). Swamps of Visitacion Bay. June—August. "Rein Orchis."

447. HABENARIA sp. Point Lobos to Fort Point, and also at the "Little Sur" in Monterey County. June—September.

This is a low stout plant with a dense short spike of whitish fragrant flowers, sepals incompletely 3-nerved, column short and almost beakless, glands of the pollen masses oblong.

448. SPIRANTHES ROMANZOFFIANA Cham. Linnæa, iii, 32. About the hills of the Presidio and Lake Merced. June—August. "Ladies'-tresses."

449. EPIPACTIS GIGANTEA* Dougl. Hook. Fl. Bor.-Am. ii, 202, t. 202.

IRIDEÆ.

450. IRIS LONGIPETALA Torr. Pac. R. Rep. iv, 144. Common on grassy slopes about San Francisco. February—July. "Iris," "Flag," "Flower-de-Luce."

451. IRIS DOUGLASIANA Herbert in Bot. Beech. 395. Presidio hills, Mission Hills, Point Lobos. March—June.

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*Zoe, ii, 4.

452. SISYRINCHIUM BELLUM Wats. Proc. Am. Acad. xii, 277. Common. March—June. "Blue-Eyed Grass."

453. SISYRINCHIUM CALIFORNICUM Ait, f. Hort. Kew. iv, 135. Wet places at Mountain Lake, Mission Hills, Lake Merced. April—June. "Golden-Eyed Grass."

LILIACEÆ.

454. ALLIUM SERRATUM Wats. Bot. King. 487, t. 37, fig. 4. Summits of the Mission and South San Francisco hills, Laurel Hill Cemetery, Point Lobos, Fort Point. March—May. "Wild Onion."

455. MUILLA MARITIMA (Benth. Pl. Hartw. 339). Mission Hills, South San Francisco, meadows near Lake Merced. February—April.

456. BRODIÆA TERRESTRIS Kell. Proc. Cal. Acad. ii, 6. Potrero and Mission Hills. April—June.

457. BRODIÆA LAXA Benth. Trans. Hort. Soc. i, 413, t. 15. Mission and South San Francisco hills. A very stout low form is found near the sea between Point Lobos and Lobos Creek, and south of the Ocean Side House. April—June.

458. BRODIÆA LACTEA Wats. Near Lake Merced and at Visitacion Valley; rare in our limits. April.

459. BRODIÆA CAPITATA Benth. Pl. Hartw. 339. Common. March—May.

460. CHLOROGALUM POMERIDIANUM (DC. Cat. Monsp. 143; Red. Lil. t. 421). Common. May—July. "Soaproot," "Amole."

461. SMILACINA SESSILIFOLIA Nutt. Sides of ravines near Lake Merced, Strawberry Hill in Golden Gate Park, and the southern shore of Laguna de la Puerca. March—May. "False Solomon's Seal."

462. LILIUM PARDALINUM* Kell. Proc. Cal. Acad. ii, 12. "Leopard Lily."

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*Dr. Kellogg in Proc. Cal. Acad. vi, 140, describing *L. maritimum* says: "A small maritime lily found in the black, peaty, low meadows, exposed to the bleak foggy climate of the coast of California, in the vicinity of San Francisco," but gives no localities, and as no specimens appear to have been preserved it is doubtful whether this or the above species was found in our limits.

"Wet uncultivated spot in a strawberry field beyond St. Mary's College, in company with a remarkably abundant Platanthera [*Habenaria leucostachys*]. Summer of 1868. Mrs. Kingston, Dr. Kellogg, Georgie and myself.—H. G. Bloomer."

463. FRITILLARIA LILIACEA Lindl. Bot. Reg. xx, t, 1663. Potrero, Twin Peaks. February—March. "White Fritillaria."

464. FRITILLARIA LANCEOLATA Pursh, Fl. N. Am. i, 230. Bluffs of the seashore. Mission and South San Francisco hills. March—April. "Rice-Root."

465. CALOCHORTUS LUTEUS Dougl. Bot. Reg. t. 1567. Potrero, South San Francisco. June—July. "Mariposa." "Butterfly Tulip."

466. PROSARTES HOOKERI Torr. Pac. R. Rep. iv, 144. Sunset Heights. April—May. "Drops-of-Gold."

467. TRILLIUM SESSILE L. var. GIGANTEUM H. & A. Bot. Beech. 402. Sunset Heights, sides of a deep cañon near Stanford Heights, southern shore of Laguna de la Puerca, and ravine terminating in it. February—April. "Wake-Robin."

The San Francisco form seems to have always pure white flowers.

468. ZYGADENUS FREMONTI (Torr. Pac. R. Rep. iv, 144). Presidio and South San Francisco Hills—a low, few-flowered form. February—April. "Zygadene."

TYPHACEÆ.

469. TYPHA LATIFOLIA L. spec. 1377. Mountain Lake, Presidio, Lake Merced, and low wet places in Golden Gate Park. "Cat-tail Flag."

LEMNACEÆ.

470. LEMNA TRISULCA L. spec. 1376. "Duckweed."

471. LEMNA VALDIVIANA Phil. Linnæa, xxxiii, 239. "Duckweed."

472. LEMNA MINOR L. spec. 1376. "Duckweed."

473. LEMNA GIBBA L. spec. 1377. "Duckweed."

The species of Lemna are given on the authority of Bot. Cal. Dr. Behr* records the absence of Lemna at the date of his earliest

*Zoe, ii, 4,

residence. If it had been nearly as plentiful as at the present time, it could not possibly have escaped his observation.

NAIADACEÆ.*

474. NAIAS FLEXILIS Rostk. & Schm. Flor. Sed. 382. "In ponds near San Francisco." Cham. Linnæa, iv, 502.

475. ZOSTERA MARINA L. spec. 1374. Shoal waters of the bay. "Eel Grass," "Grass Wrack."

476. LILÆA SUBULATA HBK. Nov. Gen. i, 222, t. 63. Wet places between the arms of Lake Merced, and about Stanford Heights. March—June.

477. ZANNICHELLIA PALUSTRIS L. spec. 1377. Mountain Lake. "Horned Pondweed."

478. POTAMOGETON LUCENS L. spec. 183. Mountain Lake, Lake Merced. "Pondweed."

479. POTAMOGETON PAUCIFLORUS Pursh, Fl. Am. i, 121. San Francisco.

480. POTAMOGETON PUSILLUS L. spec. 184. Mountain Lake. "Slender Pondweed."

481. TRIGLOCHIN MARITIMUM L. spec. 483. Saline marshes, Visitacion Bay and South San Francisco. June—August. "Arrow-Grass."

JUNCACEÆ.

482. LUZULA COMOSA Mey. var. CONGESTA Wats. Common. February—April. "Wood-Rush."

483. JUNCUS LESEURII Boland., Proc. Cal. Acad. ii, 179. Salt marshes at Visitation Bay. South San Francisco.

484. JUNCUS BALTICUS Deth.†

485. JUNCUS EFFUSUS L. spec. 464,‡ and var. BRUNNEUS Engelm. Salt marshes about the bay shore.

486. JUNCUS PATENS Mey. Luzul. 28. Lobos Creek.

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*_Phyllospadix Torreyi_, though found above and below San Francisco, has not been collected in our limits, except as washed up on the beach after storms.

†Many of the specimens of Juncus, Cyperaceæ and Gramineæ, were brought in without record of exact locality.

‡Nearly all the species of Juncus are called "Bog-Rush."

487. JUNCUS BUFONIUS L. spec. 466. Common.

488. JUNCUS KELLOGGII Engelm. Trans. St. Louis Acad. ii, 494. Not since collected. Perhaps only a form of *J. triformis*.

489. JUNCUS TENUIS Willd. var. CONGESTUS Engelm. Trans. St. Louis Soc. ii, 450. Common about the western part of the city.

490. JUNCUS FALCATUS Mey. Syn. Luzul. 34. Rel. Haenk. ii, 144. On Lone Mountain and among the bluffs of the sea shore.

491. JUNCUS XIPHOIDES Mey. Syn. Junc. 50; Rel. Haenk ii, 413. Common in the western part of the city.

492. JUNCUS PHÆOCEPHALUS Engelm. Trans. St. Louis Acad. ii, 484. Lone Mountain, and various places in the western and southern parts of the city.

CYPERACEÆ.

493. CYPERUS DIANDRUS Torr. var. CASTANEUS Torr. Swamp near Mission Creek, Lake Merced. "Galingale."

494. SCIRPUS RIPARIUS Spreng. Wet margins of pools and lakes about the city, and along the cliffs of the sea shore.

495. SCIRPUS CARINATUS Gray. With the last, common.

496. SCIRPUS TATORA* Nees, ab. Esenb. in Linnæa, ix, 292. Mountain Lake, Presidio Marsh. "Tule." "Bulrush."

497. SCIRPUS OLNEYI Gray, Pl. Lindh. 30.

498. SCIRPUS MARITIMUS L. Fl. Suec. 39; spec. 74. Marshes at Visitacion Bay and South San Francisco. "Sea Club-Rush."

499. SCIRPUS SYLVATICUS L. var. DIGYNUS Boeck. Deep cañon north of Stanford Heights.

500. ERIOPHORUM GRACILE† Koch, in Roth. 2, app. "Cotton Grass."

501. ELEOCHARIS PALUSTRIS (L. spec. i, 70). Mountain Lake, Presidio Swamp. "Spike Rush."

502. *Fimbristylis miliacea* (L. spec. i, 75). "Collected near San Francisco"—Bot. Cal.

503. CAREX MURICATA L. var. GRACILIS Boot. Ill. 193.

**Scirpus lacustris*, the second species of "Tule," may be within our limits, but does not occur in the collections.

†Zoe, ii, 4.

504. CAREX BRONGNIARTIA* Kunth, Enum. Pl. ii, 380.

——— var. DENSA Bailey, Proc. Am. Acad. xxii, 137. *C. paniculata* of Bot. Cal. Salt marshes.

505. CAREX NUDATA W. Boott, Bot. Cal. ii, 241.

506. CAREX SITCHENSIS Prescott, Mem. Acad. Petr. ser. 6, ii, 168. Lobos Creek, Lake Merced.

507. CAREX OBRUPTA Bailey, Proc. Cal. Acad. ser. 2, iii, 104. Fort Point.

508. CAREX GLOBOSA Boott, Linn. Trans. XX, 125.

509. CAREX PSEUDO-CYPERUS L. var. COMOSA W. Boott, Bot. Cal. ii, 252.

GRAMINEÆ.

510. *Panicum Crus-galli* L. spec. 83. Near the shore between South San Francisco and Visitacion Valley. "Barn-yard Grass."

511. *Ischæmum leersioides* Munro, Proc. Am. Acad. iv, 363. "Collected in San Francisco near a Chinese warehouse, Bolander." Not again seen.

512. PHLEUM ALPINUM L. spec. 88. Bluffs above Fort Point.

513. *Phalaris Canariensis* L. spec. 79. Cemeteries, Mission Hills, South San Francisco. "Canary-Grass."

514. *Polypogon Monspeliensis* (L. spec. 89). Mission Hills, South San Francisco.

515. *Polypogon littoralis* (With. Bot. Arr. t. 23), Wet places, Mountain Lake, Presidio.

516. AGROSTIS VERTICILLATA Vill. Delph. 74. Common in wet places.

517. *Gastridium australe* Beauv. Common. "Nit-Grass." The earliest specific name of this plant appears to be *lendigerum*.

518. CALAMAGROSTIS ALEUTICA L.—Bot. Cal. ii, 282.

519. STIPA EMINENS Cav. Ic. v. 42, t. 467. Mission Hills. "Feather Grass."

520. SPARTINA STRICTA (Ait. Kew. i, 104). Salt marsh at Visitacion Bay, South San Francisco. "Cord-Grass."

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*The nomenclature of the Carices is that of Bailey's revision.

521. *Cynodon dactylon* (L. spec. 85). About the northern part of the city, Islais Creek and South San Francisco. "Bermuda-Grass."

522. DANTHONIA CALIFORNICA Boland. Proc. Cal. Acad. ii, 182. Common.

523. *Avena fatua* L. spec. 118. Common on the hills.

524. TRISETUM BARBATUM Steud. Syn. Gram. 229. Common.

525. TRISETUM CANESCENS Buckl. Proc. Phil. Acad. 1862, 100. Bot. Cal. ii, 296.

526. DESCHAMPSIA CÆSPITOSA (L. spec. 96).

527. DESCHAMPSIA HOLCIFORMIS Presl. Rel. Hænk. i, 251.

528. DESCHAMPSIA ELONGATA (Hook. Fl. Bor.-Am. ii, 243, t. 228).

529. *Holcus lanatus* L. spec. 1485. "Wet places Willows San Francisco, Bolander." "Meadow Soft-Grass."

530. *Lamarckia aurea* (L. spec. 107). Hill between South San Francisco and Visitacion Bay.

531. PHRAGMITES COMMUNIS Trin. San Fancisco — Bot. Cal. ii, 300. "Reed."

532. *Dactylis glomerata* L. spec. 404. Common. "Orchard Grass."

533. KŒLERIA CRISTATA (L. spec. 94). Mission Hills, Presidio.

534. MELICA IMPERFECTA Trin. Mem. Acad. Petr. 1840, 59, & Ic. Gram. t. 355. Common in shaded places. "Slender Melic-Grass."

535. MELICA BROMOIDES Gray. Proc. Am. Acad. viii, 409. "Melic-Grass."

536. DISTICHLIS MARITIMA Raf. Salt marshes South San Francisco, Presidio. "Spike-Grass."

537. GLYCERIA PAUCIFLORA Presl. Rel. Hænk. i, 257. Swampy places. "Manna-Grass."

538. GLYCERIA DISTANS L. Mant. 32.

539. GLYCERIA CALIFORNICA (Munro in Benth. Pl. Hartw. 342).

540. *Poa annua* L. spec. 99.

541. *Poa pratensis* L. spec. 99. "Kentucky Blue-Grass, "June-Grass."

542. POA TENUIFOLIA Nutt. in Buckl. Proc. Phil. Acad. 1862, 96.

543. POA DOUGLASII Nees, Ann. Nat. Hist. ser. 1, i, 284. Lone Mountain, bluffs of the sea shore. "Sand-Grass."

544. ERAGROSTIS POÆOIDES Beauv. var. MEGASTACHYA Gray.

545. *Briza media* L. spec. 103. Mission Hills, Ocean View. "Quaking-Grass."

546. *Festuca Myurus* L. spec. i, 109.

547. FESTUCA TENELLA Willd. spec. i, 419.

548. FESTUCA MICROSTACHYS Nutt. Pl. Gamb. 187.

549. *Festuca pauciflora* Thunb. Jap. 52.

550. *Bromus maximus* Desf. Atl. i, 95, t. 26.

551. *Bromus racemosus* L. spec. 114.

552. BROMUS CILIATUS L. spec. 113.

553. CERATOCHLOA GRANDIFLORA Flor. Bor.-Am. ii, 253, t. 235.

554. *Lepturus incurvatus* (L. spec. 1490). Bay shore South San Francisco. June—July.

555. *Lolium temulentum* L. spec. 112.

556. *Lolium perenne* L. spec. 122. Abundant about Mountain Lake.

557. *Triticum repens* L. spec. 128. "Couch-Grass," Quitch-Grass."

558. *Hordeum nodosum* L.

559. *Hordeum murinum* L. spec. 126.

560. *Ammophila arundinacea* Host.
Extensively planted to anchor the drifting in the dunes of western San Francisco.

561. ELYMUS SIBIRICUS L. spec. 123.

562. ELYMUS CONDENSATUS Presl. Rel. Hænk. i, 265. Mission Hills.

Lagurus ovatus L. was collected last year in waste places about Calvary Cemetery, but may not be established.

EQUISETACEÆ.

563. EQUISETUM TELMATEIA Ehrh. Swamp at Visitacion Bay. Ravine ending at Laguna de la Puerca. February—April. "Horse-tail."

564. EQUISETUM ROBUSTUM A. Br. Am. Jour. Sci. xlvi, 88. Covering hillsides near Lake Honda and west of the Italian Cemetery. "Scouring Rush."

OPHIOGLOSSACEÆ.

565. BOTRYCHIUM TERNATUM * Thunb. Fl. Jap. 329, t. 23.

FILICES.

566. POLYPODIUM VULGARE L. spec. 1544. "Near San Francisco," Bot. Cal. ii, 334. We have not seen it in our limits. "Common Polypody."

467. POLYPODIUM CALIFORNICUM Kaulf. Enum. Fil. 102. Common about rocky ledges, and summits in the outskirts of the city. —Var. *Kaulfussii* Eaton, with fronds often nearly as thick as those of *P. Scouleri*, in exposed situations near the sea —Var. *intermedium* H. & A. with larger and thinner fronds in more sheltered places.

568. POLYPODIUM SCOULERI Hook. & Grev. Ic. Fil. t. 56. Rocky summits of the Mission and South San Francisco hills. "Leathery Polypody."

569. GYMNOGRAMME TRIANGULARIS Kaulf. Enum. Fil. 73. Mission Hills, Point Lobos, South San Francisco, Ravines of Lake Merced. "Gold Fern."

570. PELLÆA ANDROMEDÆFOLIA Fée, Gen. Fil. 129. Sunset Heights. "Cliff-Brake."

571. PELLÆA ORNITHOPUS Hook. Sp. Fil. ii, 143, t. 116. Hills of the bay shore near Visitacion Bay.

572. PTERIS AQUILINA L. spec. 1533. Common. "Brake," "Bracken," "Eagle-Fern."

573. ADIANTUM EMARGINATUM Hook. Sp. Fil. ii, t. 75. Mission Hills, South San Francisco, ravines near Lake Merced and Laguna de la Puerca. February—April. "Maidenhair."

574. WOODWARDIA RADICANS (L. Mant. p. 307). In a saline marsh at Visitacion Bay, and in a stream running from near Ocean View to Lake Merced. "Chain-Fern."

575. ASPLENIUM FILIX-FŒMINA * (L. spec. 1551). Marsh at the northern end of Lake Merced, and in a stream emptying into Laguna de la Puerca. "Lady-Fern."

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*Zoe, ii, 4.

576. ASPIDIUM RIGIDUM Swartz. var. ARGUTUM Eaton. Point Lobos, sides of ravines near Lake Merced, Strawberry Hill. "Californian Male-Fern."

577. ASPIDIUM MUNITUM Kaulf. Enum. Fil. 236. Golden Gate Park, Point Lobos, Fort Point, Laguna de la Puerca. "Shield-Fern."

SALVINIACEÆ.

578. AZOLLA CAROLINIANA. Willd. Sp. Pl. v, 541. Lobos Creek, Mountain Lake, Presidio Marsh. "Water-Fern."

ADDENDA.

50*a*. SAGINA CRASSICAULIS Watson Proc. Am. Acad. xviii, 191. About pools south of Mountain Lake. June—September.

104*a*. *Melilotus alba* Lam. Encyc. iv, 63. About Islais Creek. June—September. "White Melilot," "Spike-Clover."

123. PRUNUS DEMISSA grows 6–12 feet high on the northern slope of a high hill near the bay in South San Francisco.

133*a*. POTENTILLA RIVALIS Nutt. T. & G., Fl. i, 437. Abundant about the margin of Laguna de la Puerca. March—July.

263*a*. BÆRIA MACRANTHA Gray. Proc. Am. Acad. xxiii, 231. This plant is represented at Point Lobos by a form with broad leaves and 2–5 pappus awns, which connects it rather closely with *B. chrysostoma*. It is here unquestionably annual.

428*a*. ATRIPLEX NUTTALLII? Perhaps this species, but no fruit has been obtained. The plant forms a spreading clump several feet broad within a fence near the entrance to Black Point Reservation.

Page 355, after No. 207 insert—

DIPSACEÆ.

DIPSACUS SYLVESTRIS. Mill Dict. n. 2. Behind and above the Presidio proper. Collected by Miss Faustina Butler. "Wild Teasel." This is the first time this species has been brought to our notice, although *D. fullonum*, the "Fuller's Teasel," is thoroughly naturalized and covers considerable tracts about the Oakland and Alameda fields and at Tamalpais.

MUSCI.

The following list of mosses credited to San Francisco, is appended in the hope that more careful search will add to their number. Almost all the notes here given are due to the researches of Mr. H. N. Bolander.

1. EPHEMERUM SERRATUM (Schreb. Phasc. 9, t. 2). "On the grounds in fields and meadows, Mission Dolores."

2. SPHÆRANGIUM MUTICUM (Schreb. Phasc. t. 1, fig. 11, 12). "With the preceding."

3. PHASCUM CUSPIDATUM Schreb. Phasc. 8, t. 1. "With the preceding."

4. PLEURIDIUM BOLANDERI Muell. Jæger Musc. Cleist. 32. "Near San Francisco."

5. GYMNOSTOMUM CALCAREUM var. PERPUSILLUM Sulliv. Pac. R. Rep. iv, 185. "On clayey soil near San Francisco."

6. WEISSIA VIRIDULA Brid. Bryol. Univ. i, 334. "At and around San Francisco."

7. TRICHOSTOMUM ANOMALUM (Bruch. & Schimp. Bryol. Eur. t. 169). "Near San Francisco."

8. TRICHOSTOMUM FLEXIPES Bryol. Eur. t. 171. "Common on shaded ground and decaying trunks from San Francisco to Mendocino County."

9. DESMATODON NERVOSUS B. & S. var. EDENTULUS B. & S. *D. Californicus* Lesq. Cat. Pac. Mos. 10, *Barbula atrovirens* of Bot. Cal. "Decayed ground and old walls of clay (adobe) San Francisco."

10. BARBULA VINEALIS Braun. Brid. Bryol. Univ i, 830. "Around San Francisco on rocks and stones near the bay."

11. BARBULA FLEXIFOLIA Hampe, Linnæa, xxx, 456. "Sandy ground and boulders near the coast."

12. BARBULA VIRESCENS Lesq. Trans. Am. Phil. Soc. xiii, 4.

13. BARBULA CYLINDRICA Schimp. Syn. (ed. 2), 208. *B. Beecheyi* Lesq. Ms. Bot. Cal. ii, 372).

14. BARBULA ELATA Dur. & Mont. Fl. Alger. "Near San Francisco, mixed with the two preceding species."

15. BARBULA CONVOLUTA Hedw. Musc. Frond. i, 86, t. 32. "In gardens at San Francisco."

16. BARBULA BOLANDERI Lesq. Trans. Am. Phil. Soc. xiii, 5. "On rocks near the Bay of San Francisco."

17. BARBULA AMPLEXA Sulliv. & Lesq. Mus. Bor.-Am. Exsicc. (ed. 2), n. 140. "On stones in springs near San Francisco."

18. BARBULA SUBFALLAX Muell. Bot. Zeit. xx, 338. "Near San Francisco."

19. BARBULA MARGINATA Bruch. & Schimp. Bryol. Eur. t. 158. "On rocks near San Francisco."

20. BARBULA BREVIPES Lesq. Mem. Calif. Acad. i, 12. "Mud walls, Mission Dolores, in mats an inch broad or more."

21. FISSIDENS LIMBATUS Sulliv. Pac. R. Rep. iv, 185, t. 1. "Common around San Francisco."

22. POTTIA STARKEANA (Hedw. Musc. Frond. iii, 82, t. 34). "Mission Dolores on clayey ground."

23. GRIMMIA CALIFORNICA Sulliv. Pac. R. Rep. iv, 187, t. 4. "Around San Francisco, common."

24. GRIMMIA WATSONI Lesq. & James Man. 140. With the preceding.

25. GRIMMIA MONTANA Bruch. & Schimp. Bryol. Eur. t. 250. "On schistose rocks and granite [?] boulders San Francisco."

26. ENTOSTHODON BOLANDERI Lesq. Trans. Amer. Phil. Soc. xiii, 10. "On clayey soil near the bay of San Francisco."

27. FUNARIA MEDITERRANEA Lindb.—*F. calcarea* of Bot. Cal. "Mission Dolores."

28. BARTRAMIA STRICTA Bruch. & Schimp. Bryol. Eur. t. 316. "On moist rocks and ground near San Francisco."

29. WEBERA TOZERI (Grev. Scot. Crypt. Fl. t. 285). *Bryum Tozeri* of Bot. Cal. "Borders of roads and ditches about San Francisco."

30. BRYUM ALBICANS Brid. "A more slender form on rocks watered by springs, San Francisco."

31. BRYUM CALIFORNICUM Sulliv. Pac. R. Rep. iv, 186, t. 6. "Common around San Francisco, on the ground in grassy places."

32. BRYUM OCCIDENTALE Sulliv. Pac. R. Rep. iv, 188, t. 7. "Near San Francisco."

33. BRYUM ARGENTEUM L. spec. 1120. "Near San Francisco."

34. ATRICHUM UNDULATUM L. spec. 1117. "Mission Dolores."

35. ALSIA CALIFORNICA (Hook. & Arn. Bot. Beech. 162). Common.

36. PTERYGONIUM GRACILE L. Mant. ii, 310. "On ground and rocks.

37. HYPNUM ARENARIUM Lesq. Trans. Am. Phil. Soc. xiii, 13. "Covering the sand among bushes near the shore."

38. HPYNUM ILLECEBRUM Schwæg. Spec. Musc. ii, 225. "Shady, sandy ground, San Francisco."

39. HYPNUM MYOSUROIDES L. spec. 1130. "Near San Francisco in dry woods."

40. HYPNUM CALIFORNICUM Lesq. Trans. Am. Phil. Soc. xiii, 13. "On rocks and dry sand near the Bay of San Francisco."

41. HYPNUM BREWERIANUM Lesq. l. c. 12. "On metamorphic sandstone around San Francisco."

42. HYPNUM ADUNCUM Hedw. Musc. Frond. iv, 62, t. 24. "In swamps near San Francisco."

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Mrs. S. W. Burtchaell, 575 Market St., San Francisco.
Prof. D. H. Campbell, Palo Alto, Cal.
Mrs. E. C. Campbell, 1120 Central Ave., Oakland, Cal.
Miss Evelina Cannon, 1402 Bush St., San Francisco.
Daniel Cleveland, San Diego, Cal.
Miss K. E. Cole, 572 Twelfth St., Oakland, Cal.
J. W. Congdon, Mariposa, Cal.
Mrs. Elwood Cooper, Santa Barbara, Cal.
L. W. Cushman, College City, Cal.
W. C. Cusick, Union, Or.
Miss Fanny Davies, 1622 Washington St., San Francisco.
James Denman, 2101 Webster St., San Francisco.
Mrs. S. W. Dennis, Grand and Santa Clara Ave., Alameda, Cal.
Mrs. R. F. Dodd, 2241 Central Ave., Alameda, Cal.
Miss S. F. Donnelly, 608 Fillmore St., San Francisco.
Mrs. Emma Douglas, Mayfield, Cal.
Thomas H. Douglas, Mayfield, Cal.
Miss Emily A. Easton, 109 Fell St., San Francisco.
Miss Jessie S. Easton, 109 Fell St., San Francisco.
Miss Alice Eastwood, 819 Market St., San Francisco.
Miss Emily Edmunds, 2524 California St., San Francisco.
Gustav Eisen, 819 Market St., San Francisco.
Miss Kate Elliott, Hotel Mirabeau, San Francisco.
Miss Florence Emerson, 1030 24th St., San Francisco.
Mrs. L. D. Emerson, 1030 24th St., San Francisco.
Mrs. W. B. Ewer, 1513 Clay St., San Francisco.
Miss Edith B. Falkenau, 355 Devisadero St., San Francisco.

Miss Isabel L. Grant, Berkeley, Cal.
Miss Mary Grant, Berkeley, Cal.
Jean M. Hahn, Hopkins Academy, Oakland, Cal.
Miss Amanda Hansen, 828 Fulton St., San Francisco.
Mrs. C. E. Hansen, 828 Fulton St., San Francisco.
Dr. H. W. Harkness, Pacific-Union Club, San Francisco.
Frank E. Harris, 31 Post St., San Francisco.
Miss Emily S. Harrison, 26 Haight St., San Francisco.
Dr. H. E. Hasse, Soldiers' Home, Los Angeles Co., Cal.
Dr. V. Havard, Fort Russell, Wyo.
Prof. T. L. Heaton, Fresno, Cal.
Prof. L. H. Henderson, Olympia, Wash.
J. W. Hendrie, Sound Beach, Conn.
Miss Jennie Hewston, 926 Pine St., San Francisco.
Miss C. H. Hittell, 808 Turk St., San Francisco.
J. W. Hobson, 1037 Post St., San Francisco.
Miss Frances Hodgkinson, 1513 Pierce St., San Francisco.
Miss Kate Hodgkinson, 1513 Pierce St., San Francisco.
S. W. Holladay, corner Clay and Octavia Sts., San Francisco.
Miss Sarah W. Horton, 964 18th St., Oakland, Cal.
Miss Jennie J. Houston, 1107 Golden Gate Ave., San Francisco.
Thomas Howell, Portland, Or.
Miss Caroline L. Hunt, 1520½ Vallejo St., San Francisco.
Mrs. Edward Hunt, P. O. Box 125 Oakland, Cal.
James M. Hutchings, 112 St. Ann's Building, San Francisco.
Miss Fidelia Jewett, 711 Jones St., San Francisco.
F. O. Johnson, Berkeley, Cal.
Marcus E. Jones, 125 W. 3d South, Salt Lake City, Utah.
Miss Vesta L. Jordan, 2519 Washington St., San Francisco.
Charles A. Keeler, Berkeley, Cal.
Mrs. Paris Kilburn, 404 Ellis St., San Francisco.
Mrs. Mary W. Kincaid, 2219 Pacific Ave., San Francisco.
B. Frank Leeds, Santa Clara, Cal.
Dr. A. Liliencrantz, 819 Market St., San Francisco.
Mrs. W. E. Loy, 2207 Scott St., San Francisco.
John MacLean, 16 Ellis St., San Francisco.
Miss Agnes M. Manning, 1215 Sutter St., San Francisco.
Mrs. Ella L. Manson, 2010 Gough St., San Francisco.
Miss Lillie J. Martin, 711 Jones St., San Francisco.

M. J. McDonald, 1701 Gough St., San Francisco.
Mrs. M. J. McDonald, 1701 Gough St., San Francisco.
Miss Effie A. McIllriach, 1030 24th St., San Francisco.
John McLaren, Golden Gate Park, San Francisco.
Mrs. Mary F. McRoberts, San Francisco.
Theodor Michaelis, 703 Sutter St., San Francisco.
Miss Mabel M. Miles, Box 1518 Anaheim, Cal.
George O. Mitchell, 1034 Pine St., San Francisco.
Mrs. Anna J. Monro, 1816 Baker St., San Francisco.
Miss Mary T. Mooney, 1031 Chester St., Oakland, Cal.
Mrs. D. W. Nesfield, 1503 Pacific Ave, San Francisco.
Miss Margaret C. Nesfield, 1503 Pacific Av., San Francisco.
Rev. J. C. Nevin, 1319 Santee St., Los Angeles, Cal.
Miss Nellie M. Owens, 1111 Pine St., San Francisco.
Dr. Edward Palmer, Dept. of Agriculture, Washington, D. C.
S. B. Parish, San Bernardino, Cal.
Miss Mary Elizabeth Parsons, San Rafael, Cal.
Dr. Joseph Pescia, 1520 Talyor St., San Francisco.
Carl Purdy, Ukiah, Cal.
Prof. Volney Rattan, San Jose, Cal.
C. C. Riedy, 432 Montgomery St., San Francisco.
G. P. Rixford, 1713 Pierce St., San Francisco.
Miss Mary A. Roper, 712 Sutter St., San Francisco.
Miss Sara W. Scruggs, 1036 Valencia St., San Francisco.
Prof. Wm. M. Searby, 859 Market St., San Francisco.
Mrs. L. H. Sharp, 939 Geary St., San Francisco.
W. H. Shockley, Candelaria, Nev.
Edmund C. Shorey, Kohala, Hawaii, H. I.
Emory E. Smith, 1409 Van Ness Ave., San Francisco.
Miss Jessie Smith, 304 Bartlett St., San Francisco.
C. F. Sonne, Truckee, Cal.
George Spaulding, 1109 Clay St., San Francisco.
Mrs. M. O. Stanton, 1426 Washington St., San Francisco.
D. C. Stone, 1513 Sacramento St., San Francisco.
Miss Bertha E. Stringer, 2007 Taylor St., San Francisco.
W. N. Suksdorf, White Salmon, Wash.
Mrs. Florence R. Swett, 2116 Sutter St., San Francisco.
Miss Lucy F. Swett, 6 Montgomery Ave., San Francisco.
Miss Bertha Tackle, 743 Minna St., San Francisco.
H. R. Taylor, Alameda, Cal.

Carlos Troyer, 538 Turk St., San Francisco.
Frank H. Vaslit, 705 Sutter St., San Francisco.
Mrs. S. E. Vaslit, 705 Sutter St., San Francisco.
Miss Alice C. Vincent, 1511 Sacramento St., San Francisco.
Dr. L. M. F. Wanzer, 205 Taylor St., San Francisco.
Mrs. Wm. Westhoff, 899 Pine St., San Francisco.
Mrs. S. A. P. Wheeler, Avalon, Santa Catalina Island, Cal.
Mrs. B. A. Wicker, 1327 Howard St., San Francisco, Cal.
Mrs. J. R. Wilson, 3042 16th St., San Francisco.

RECENT LITERATURE.

Contributions to American Botany, XVIII. By SERENO WATSON. I. Descriptions of some new North American species, chiefly of the United States, with a revision of the American species of the genus Erythronium. II. Descriptions of new Mexican species, collected chiefly by Mr. C. G. Pringle, in 1889 and 1890. III. Upon a wild species of Zea. IV. Notes upon a collection of plants from the Island of Ascension.

The species described in the first paper—*Arabis Macounii*, *Erysimum arenicola*, *Silene Macounii*, *Mimulus filicaulis*, *Cladothrix cryptantha*, *Eriogonum minutiflorum*, *E. deserticola*, *Zostera Oregana* and *C. Pacifica*—are all but one from the Pacific coast.

The revision of Erythronium more than doubles the number given in the author's Revision of the Liliaceæ. One new species, *E. montanum*, and two varieties, *E. grandiflorum* var. *parviflorum*, and *E. revolutum* var. *Bolanderi*, are described.

The second paper contains descriptions of eighty-four new species. Of the two genera proposed, Oligonema* belongs to the Asteriod Compositæ, and Neopringlea replaces the old genus Llavea of Liebman. Mr. Pringle deserves a more stable genus than this is likely to prove, for both the nearly related monotypic fern genera Llavea and Cryptogramme are with difficulty kept separate from Pellæa.

The third paper of the series is devoted to the description of a new species of Zea, *Z. canina* from Mexico, where it was believed to be the origin of the cultivated species. Its further cultivation will be looked for with interest. It undoubtedly differs greatly

* Since changed by the author to Golionema, Bot. Gaz. xvi, 267.

from any of the cultivated varieties, but these, as is well known, differ very much from each other, although supposed to have a common origin.

The collection of plants from the island of Ascension was made by Mr. E. J. Loomis, of the Nautical Almanac Bureau, Washington. Three new species, *Rubus nanus*, *Asplenium Ascensionis*, *Nephrodium (?) viscidum*, are described. K. B.

Descriptions of New Plants, chiefly Gamopetalæ, collected in Mexico by C. G. Pringle in 1889 and 1890. By B. L. ROBINSON. In this paper twenty-two species and several varieties of Mexican plants are described. The careful descriptions, full notes and good judgment displayed by the author show that he is likely to prove an acquisition to the ranks of American systematic botanists. The last two pages of the paper are devoted to the characterization of three new plants, *Mimulus Congdoni*, *M. gracilipes* and *Aster Engelmanni* var. *paucicapitatus* from the Pacific coast. K. B.

PROCEEDINGS OF SOCIETIES.

CAIFORNIA ACADEMY OF SCIENCES. *November 2, 1891.* President Harkness in the chair.

The Librarian reported 226 additions to the library, including donations from the State Mining Bureau, Dr. Harkness, T. S. Brandegee and the Zoe Publishing Co.

Professor O. P. Jenkins delivered a lecture on the ultimate structure of muscle and nerve, and modern appliances used in their investigation.

The following memorial notice was presented:

HENRY EDWARDS.

At a previous meeting of this Society there was announced the loss, by death, of a member who had in former years held important offices and taken an active interest in the affairs of the Academy; one who was well and favorably known to the public in general as well as in scientific circles. That member was Henry Edwards, the tragedian and entomologist.

Mr. Edwards was born in Herefordshire, England, August 27, 1830. His early life was devoted to the study of law, and later he took to the stage as a profession. In 1853 he sailed to Australia and thence to Peru, Panama and California, and from these coun-

tries he obtained the charming sketches for his book entitled "Mingled Yarns."

Mr. Edwards possessed one of the largest private collections of butterflies in the world, and his courtesy in identifying species for others was well known and appreciated by his correspondents.

In 1867 he was elected a member of the California Academy of Sciences, and on January 2, 1877, he became a life member. In 1874 he held office as a trustee of this Society. For three consecutive years (1875–77) he was the first vice-president of the Academy. In 1877 he moved to the east, continuing to the time of his death his interest in entomology and the augmentation of his collection.

Mr. Edwards published a number of valuable entomological papers, nôtably his "Descriptions of Pacific Coast Lepidoptera," and "Bibliographical Catalogue of the Described Transformations of North American Lepidoptera."

December 7, 1891. President Harkness in the chair.

Donations to the museum were reported from L. Belding, E. H. Fiske, F. O. Johnson, S. Giannetoni, A. V. La Motte, W. E. Bryant, H. W. Harkness, Mrs. A Van S. Sumner, Charles Fuchs.

The Librarian reported 205 additions to the library.

Specimens of slate from El Dorado County, California, prepared to show the toughness, cleavage and flexibility, were exhibited and a paper was read, prepared by Melville Attwood, on its chemical analysis.

Dr. David S. Jordan delivered a lecture on the "Salmon and Trout of the Pacific Coast." He first called attention to the fact that the ancient Greeks and Latins knew nothing of these fish, and that the earliest mention of them is to be found in a poem on the River Moselle, written in the middle ages. He then explained the derivation of the different names applied to them. Taking up the salmon of the Pacific coast the lecturer, after giving the details of their life history, stated that they were first described by Steller, the naturalist of Bering's expedition, who recognized five species, to which he gave the names *tschawytscha*, *keta*, *kisutch*, *nerka* and *gorbuscha*, respectively the king, dog, silver, blue-back and humpback salmon. Since Steller's time thirty-five different species of Pacific coast salmon have been described by various writers, but subsequent thorough study has determined the fact that Steller's

five species are correct, and his names have become the scientific specific names.

There should be no difficulty, he said, in readily distinguishing a trout from a salmon, the former having only nine or ten rays in the anal fin, while the latter has fifteen or sixteen.

As regards the trout, he said that four species have thus far been found in California. The Dolly Varden trout, *Salvelinus malma*, found in the headwaters of the Sacramento and its tributaries, has smaller scales than the others, and the body is covered with round red spots.

The other three species are black-spotted and resemble each other so closely as not to be distinguishable without some attention. The steelhead, *Salmo gairdneri*, commonly called the salmon trout, is better deserving that name than any other trout on the coast, as it approaches most nearly in appearance to the salmon trout, *Salmo trutta*, of Europe. Its distinctive character is the stout but not plump body, the comparatively square-cut tail, and especially the large scales, there being 135 in the lateral line.

Very closely resembling this is the rainbow trout, *Salmo irideus*, which differs in the plumper body, the smaller mouth and the more distinctly forked tail. The scales are about as large as in the steelhead, and the average is 135 in the lateral line. The question of the difference between these two species is open to a great deal of debate. The latest judgment is, that the two are distinct species, although closely resembling each other in all technical characters.

The remaining trout is the red-throated trout, *Salmo mykiss*, of which two varieties occur, the Lake Tahoe trout, *Salmo mykiss henshawi*, and the true *Salmo mykiss*, which is found coastwise in northern California. These differ from each other mainly in the color.

December 21, 1891. President Harkness in the chair.

One hundred and seven additions to the library were reported.

The Nominating Committee made their report, presenting a ticket to be voted for at the annual election.

January 4, 1892. Annual meeting. President Harkness in the chair.

Donations to the museum were reported from William F. Nolte. Otto Stoll, Sereno Watson, W. H. Brewer, George L. Goodale,

J. A. Allen and Herman Graf zu Solms-Laubach were elected honorary members.

William E. Ritter was elected a resident member.

The annual reports of the Board of Trustees, officers and curators were read and filed.

The report of the officers of election was read, and the following declared elected for the ensuing term:

President—H. W. Harkness.
First Vice-President—H. H. Behr.
Second Vice-President—J. G. Cooper.
Corresponding Secretary—F. Gutzkow.
Recording Secretary—J. R. Scupham.
Treasurer—L. H. Foote.
Librarian—Carlos Troyer.
Director of Museum—J. Z. Davis.
Trustees—W. C. Burnett, C. F. Crocker, D. E. Hayes, E. J. Molera, George C. Perkins, Adolph Sutro, John Taylor.

CALIFORNIA BOTANICAL CLUB. *November 19, 1891.* President Behr in the chair.

The following were elected to membership: W. N. Suksdorf, F. V. Kelsey, Jean M. Hahn, Miss Louise A. Littleton, L. M. Underwood, Edward N. Brandegee, Geo. O. Mitchell, Dr. E. R. Ballard, Douglas H. Campbell, Dr. Liliencrantz, M. W. Gorman, L. F. Henderson.

Professor Douglas H. Campbell read a paper on "Recent Methods in Botanical Research."

In introducing the subject, the writer first called attention to some misapprehensions of the real extent and aims of botanical science, arising from a two exclusive attention of the majority of students to the collection and classification of phænogams. While this is a necessary and important phase of the science, it is only one phase, a fact which is too often overlooked. This state of things is largely a survival of the old school of natural history that regarded each species as a separate creation, and consequently considered the collection and classification of these as the first task of the student.

As the methods improved, however, and it was possible to study the life-histories of plants, especially the lower ones, it became evident that a much closer union existed between different groups of plants than was formerly supposed, and gradually the theory of evo-

lution assumed greater and greater importance as a factor in explaining the origin of different forms. Thus arose the modern school of morphologists, whose aim is to establish a classification which shall represent as nearly as may be the phylogeny of the plant kingdom.

Among the earlier of these men were mentioned Hofmeister, De Bary, Tulasne, Thuret, Bornet, Pringsheim, and others.

The subject of vegetable physiology was next briefly touched upon, and some of the methods in use in various departments of the subject referred to. The chemistry of plants, with some brief notice of the methods used in determining the chemical constituents of plants was the first topic. This included some account of microchemical tests, and an explanation of water-cultures. In this connection attention was called to the experiments of Pfeffer and others with reference to the attractive force of certain chemical substances upon motile cells, such as certain bacteria and spermatozoids, as well as experiments dealing with the absorption of certain solutions by the living cell. The subjects of nutrition, assimilation, etc., were passed over, and only a brief reference was made to the important topic of bacteriology. The subject of physiology was finally dismissed with a hasty reference to one or two of the most important of the mechanical contrivances used in experiments in growth—the auxonometer and klinostat.

The rest of the paper was concerned with a somewhat detailed account of the progress that has been made in histological methods. After recalling the methods in vogue among the earlier botanists, the gradual advance in technique was followed with some reference to some of the most important discoveries resulting from these improved methods.

Owing to the necessities of the situation, zoologists were forced to adopt methods of fixing and hardening tissues for histological study almost from the first, and their methods were well perfected before botanists awoke to the necessity of improving their methods. Under such men as Strasburger, however, the methods have been so improved that to-day the botanist employs the same careful methods of preparation that the student of animal histology does.

The paper closed with an account of the methods used in preparing specimens for microscopical examination. This included fixing, hardening and staining, dehydrating, imbedding in paraffin, serial microtome sectioning, and mounting.

January 21, 1892. President Behr in the chair.

Dr. Behr read a paper on Insectivorous Plants, discussing Drosera, Utricularia, Darlingtonia and Dionæa, and made extended remarks about the pepsin contained in the leaves of *Carica Papaya*.

NOTES.

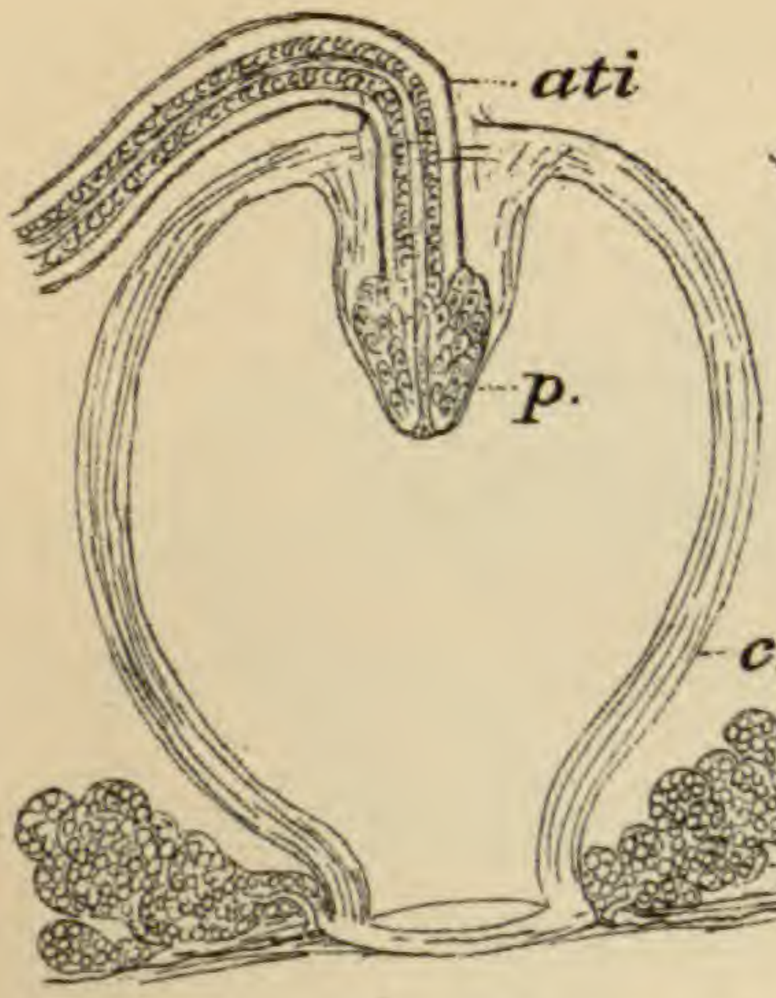
Mr. S. D. Dill, of the American Museum of Natural History, New York, has on his recent visit to this coast succeeded in completing the great series of woods of the United States, known as the Jessup Collection. This collection fills a great room, the sections being taken from perfect trees of good size, and are all of the same length, four feet eight inches when leveled and polished. They are so cut in the upper third as to show the surfaces in horizontal, vertical and tangential section. The trees of which examples were secured on this trip are *Amelanchier alnifolia*, Yehm Prairie, Washington, seven inches in diameter; *Prunus emarginata*, shores of Lake Washington; *Prunus subcordata*, Oregon, six inches; Manzanita, King's River Cañon, nine inches; *Populus angustifolia*, Colorado; *Quercus Palmeri*, Southern California; *Quercus agrifolia*, Newhall; *Quercus Jacobi*, Yehm Prairie; *Quercus Morehus*, Newcastle, sixteen inches; *Quercus Macdonaldi*, Santa Catalina Island; *Quercus Engelmanni*, Fall Brook; *Pinus latifolia*, Santa Rita Mountains, Arizona; *Sequoia sempervirens*, Santa Cruz Mountains, twelve feet; *Sequoia gigantea*, King's River, twenty feet. Nearly all the species of Quercus mentioned above are mere variations of other species already in the collection, but their value is not lessened by that fact. The difficulty of getting together this great collection has been immensely increased by the care taken to secure perfect trunks without branches, and with the bark uninjured; but its value as an exponent of the timber resources of our country cannot be too highly estimated.

Prof. L. M. Underwood, of De Pauw University, Greencastle, Indiana, desires series of the violets, the orchids, and the liliaceous plants (especially Allium, Brodiæa and Calochortus) of California.

INDEX.

[Simple lists not indexed.]

PLATE XIV.

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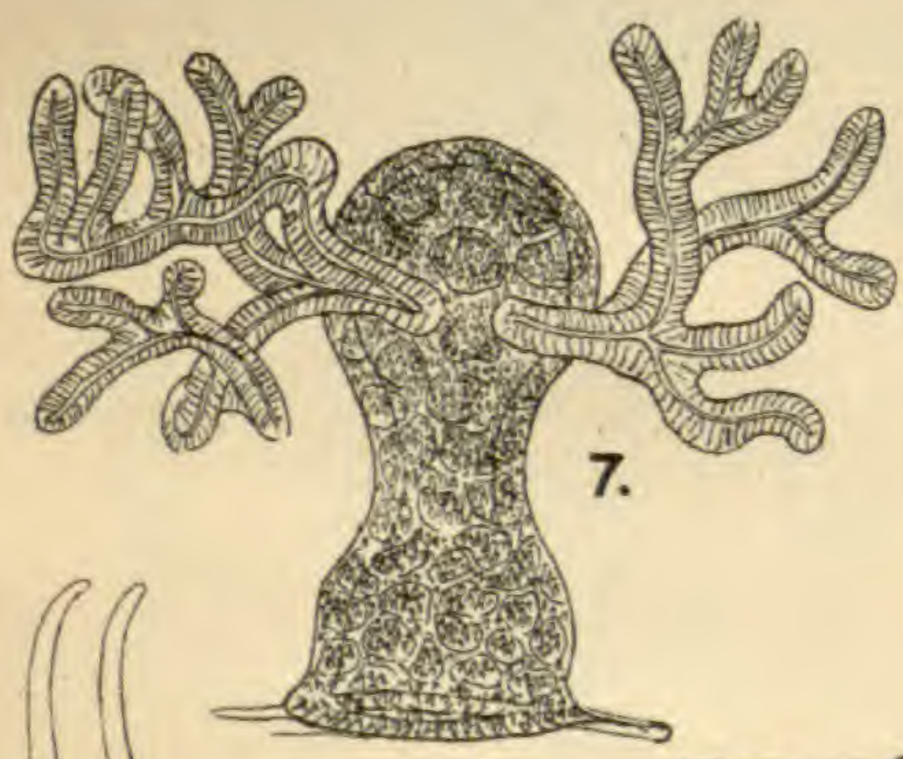
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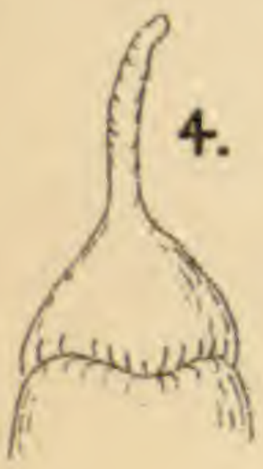
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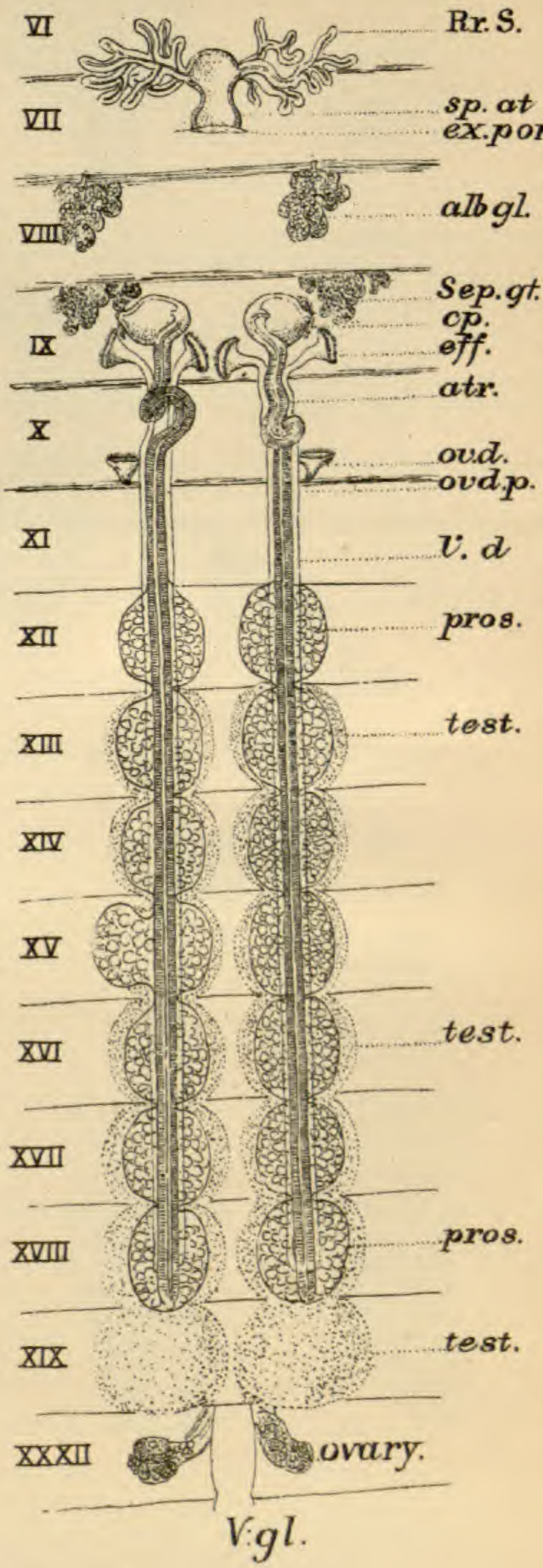
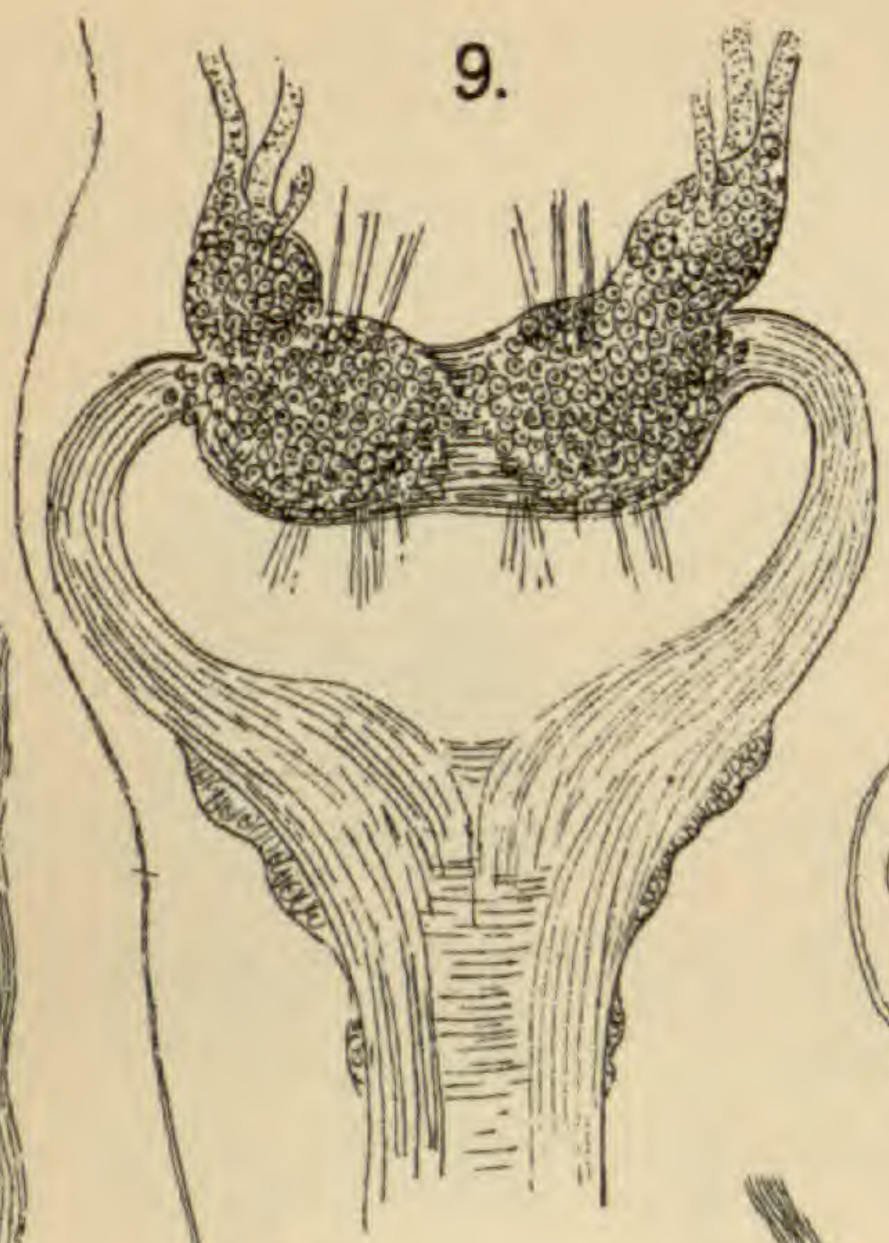


GUSTAV EISEN DEL.

SUTROA ALPESTRIS

PLATE XV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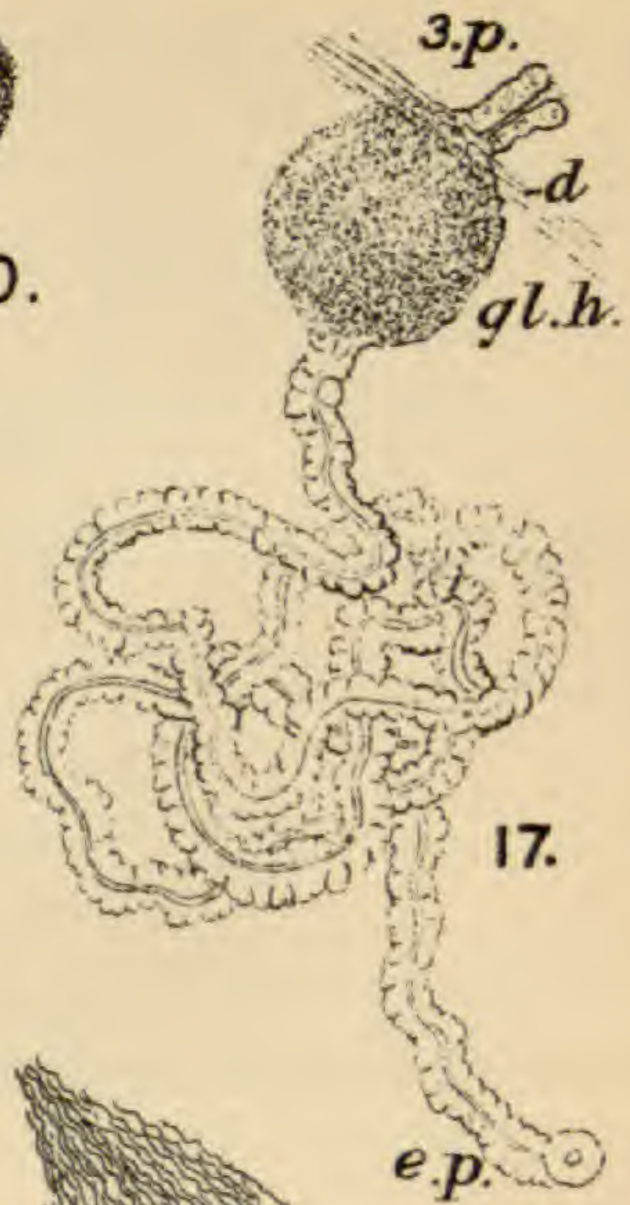

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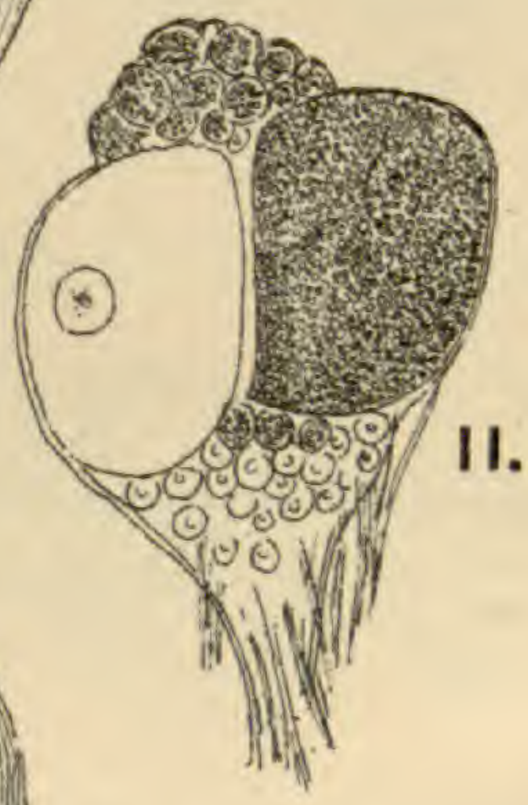
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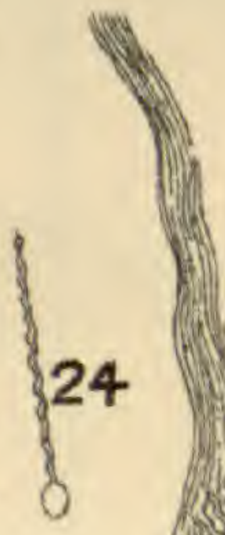
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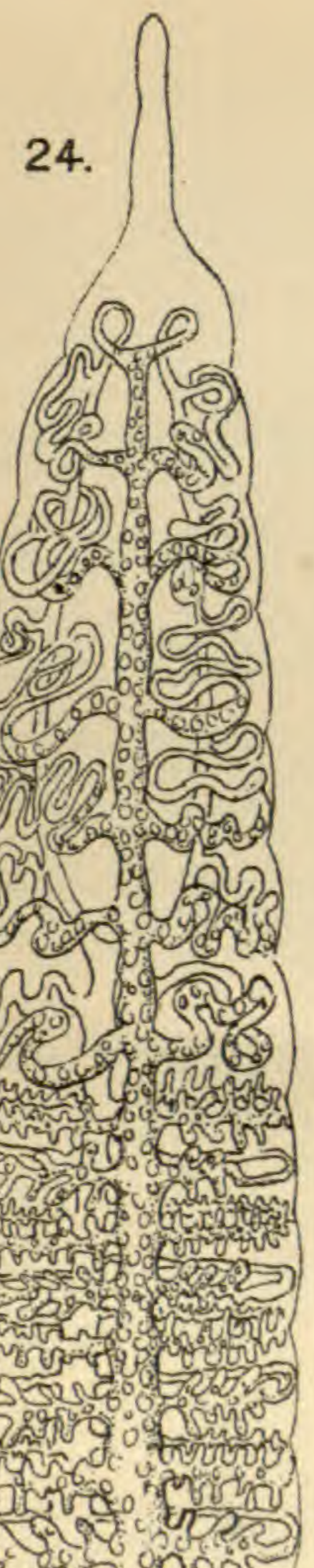
GUSTAV EISEN DEL.

SUTROA ALPESTRIS

PLATE XVI.



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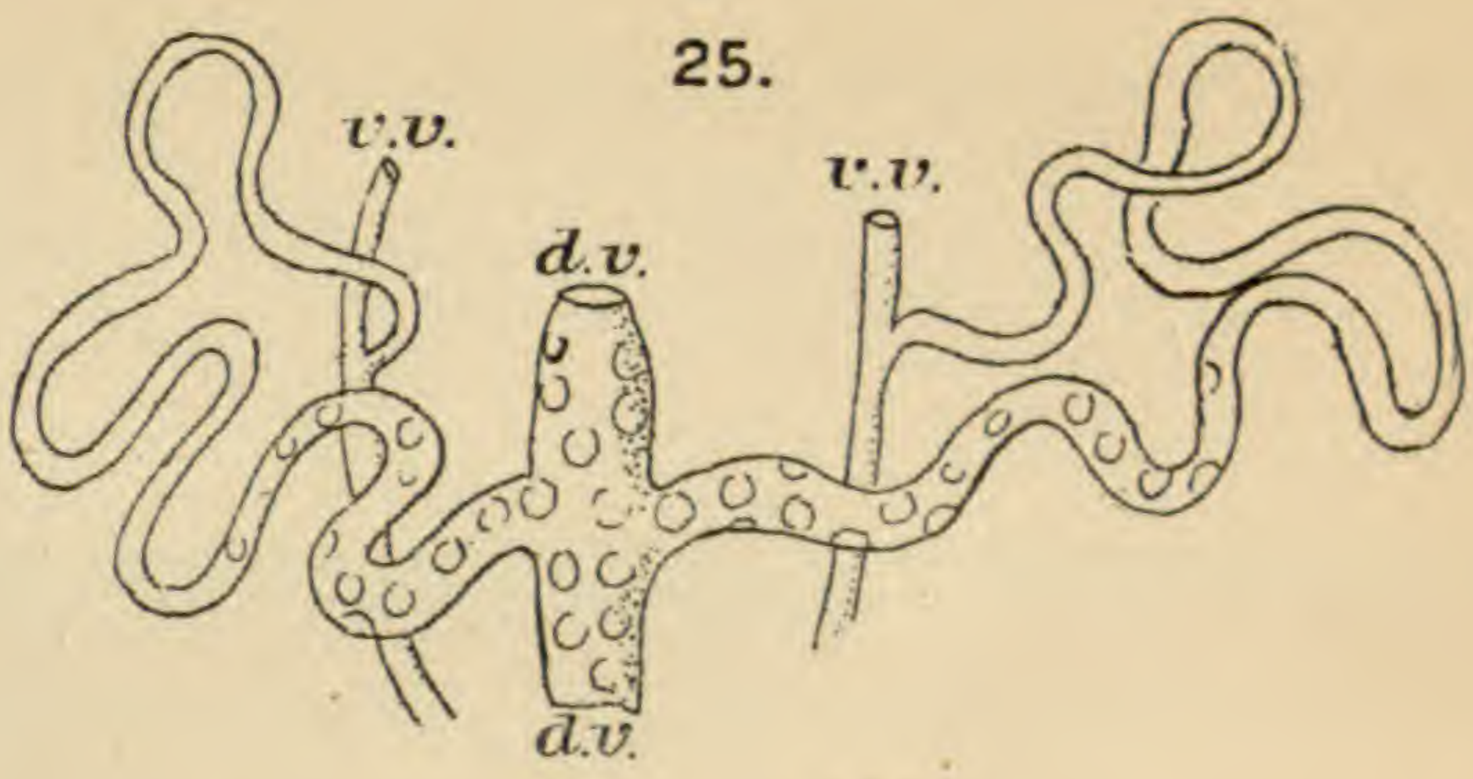

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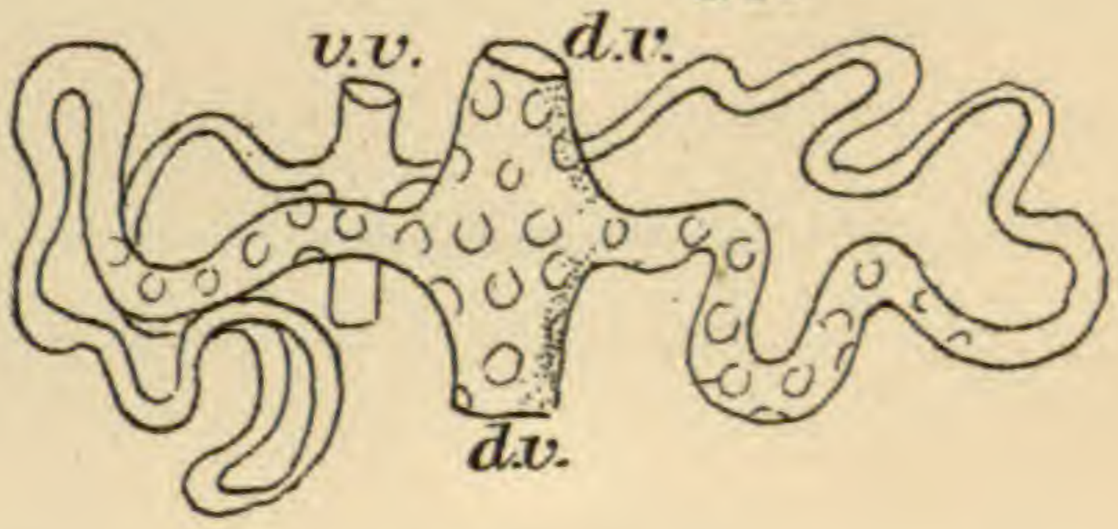

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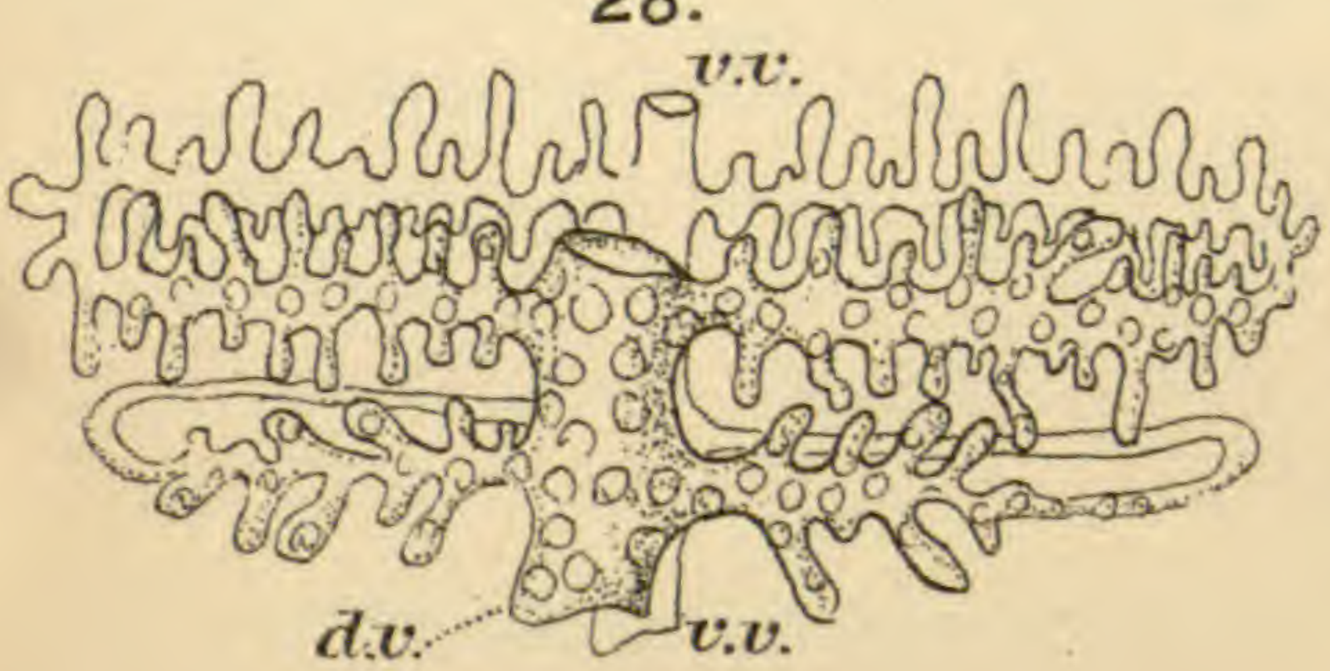

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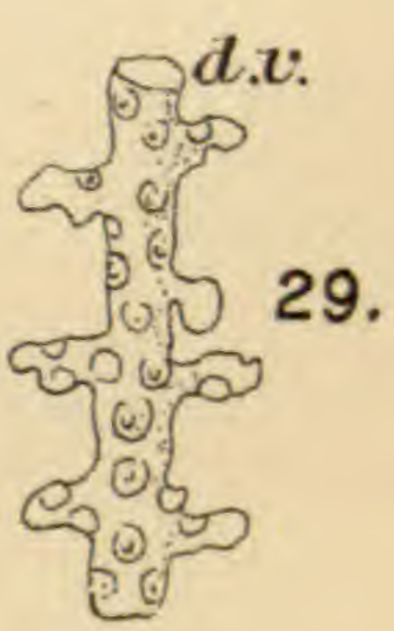

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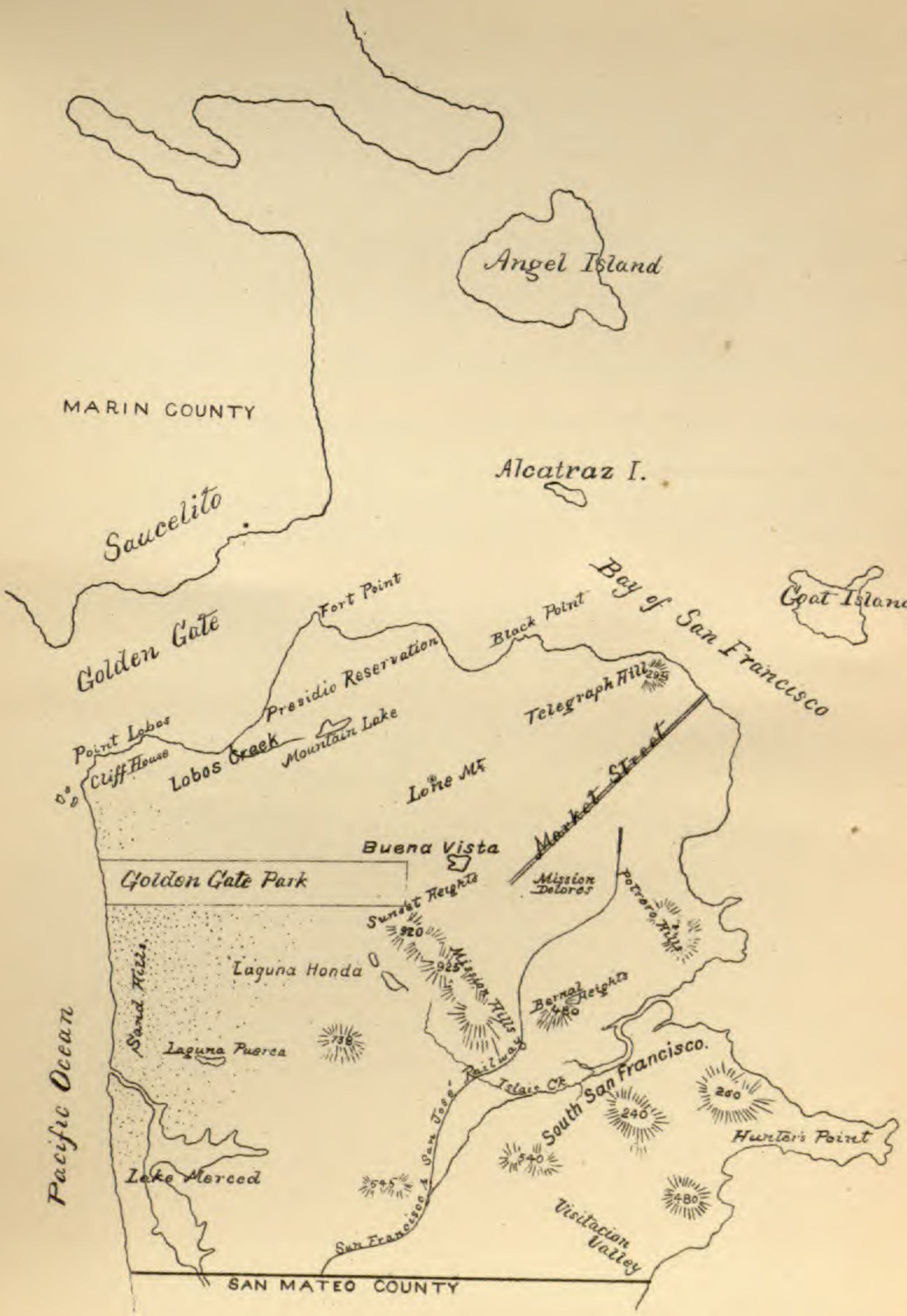
GUSTAV EISEN DEL.

SUTROA ALPESTRIS

PLATE XVII.



CITY AND COUNTY OF SAN FRANCISCO.

The following names of members were in some unaccountable manner omitted from the list of the California Botanical Club:

Mrs. Maggie Bowers, Ventura, Cal.
Mrs. F. Grayson-Crane, St. Helena, Cal.
M. W. Gorman, 75 N. 13th St., Portland, Oregon.
Rev. F. V. Kelsey, Helena, Montana.
Miss Louise A. Littleton, Zebra, Cal.
H. S. Nichols, Healdsburg, Cal.
Prof. Lucien M. Underwood, De Pauw University, Greencastle, Ind.