recording the variations of the earth's magnetism, and so we may hope some day to get the material that is needed for a satisfactory study of these phenomena.

Dr. W. van Bemmelen, who has succeeded Professor van der Stok as Director of the Batavian Magnetic Observatory, has recently issued a new set of isogonic charts for the epochs 1500, 1550, 1600, 1650 and 1700. Magneticians owe a great debt of gratitude to this enthusiastic and painstaking investigator for the exhaustive search he has made for old magnetic data in the various European libraries. Only one who is engaged in similar work can appreciate the amount of love and perseverance necessary for such work. It is also exceedingly gratifying and commendable that the author gives in his publication the data upon which the charts are based.*

L. A. BAUER.

U. S. COAST AND GEODETIC SURVEY.

EXOTIC MOLLUSCA IN CALIFORNIA.

THE number of foreign molluscan species in California has notably increased in the past few years, and includes both terrestrial and marine forms, detected by various collectors in and around San Francisco bay.

With the single exception mentioned below, the introduction of these exotic forms has been purely accidental, simple incidents in the usual course of business traffic or commercial interchange.

First, among the land shells we find the well known snail *Helix aspersa*, a common European species, largely used for food on the continent and familiar to persons who have patronized the restaurants of Paris. This species was intentionally introduced or 'planted,' in California over forty years ago by Mr. A. Delmas, of San José, Santa Clara county, who brought the stock from France and turned it out among the vineyards on the west bank of the Guadalupe, a small river that flows northerly through Santa Clara Valley and empties into the southerly end of San Francisco bay near Alviso. The soil where the snails were placed is a rich sandy loam and the place well shaded. When the summer heats reach the maximum, the *Helices* descend into the ground several feet, hiding in the cracks that form, as the ground dries, and the gopher-holes also furnish cool retreats and protection. The region above named is one of exceeding fertility. It was settled by a few French families. The introduction of *H. aspersa* by Mr. Delmas was made for edible purposes, or in common parlance 'with an eye to the pot.' Mrs. Bush, of the Normal School in San José, informs me that the snails have thriven, and have extended their territory from the starting point on the west bank of the stream to the easterly side, and have multiplied to such an extent, that in some instances they are troublesome in the gardens. Mr. Delmas, the elder, also planted *H. aspersa*, in San Francisco and Los Angeles. I have never met with it in my collecting rambles in San Francisco or the outskirts of that city, nor heard of its having been detected by any collector. This particular plant was probably a failure, for a more unfavorable region than that of San Francisco forty years ago, with its cold sea winds, fog, sand-dunes and shifting sands and sparse ligneous scrubby vegetation it would be hard to find. At the present day the chances for success are altogether better, for the greater area of the city is covered by residences, with plats of grass, garden patches and flower-beds which are frequently watered and the general conditions are more promising. It would doubtless

*In connection with above paper there were exhibited 30 lantern slides, consisting of portraits of prominent magneticians, views of magnetic observatory buildings and instruments, and of photographic traces derived from magnetographs.

find a congenial environment in Golden Gate Park; its occurrence there is only a matter of time. I have learned recently that some party in the westerly section of the city propagates or did propagate *H. aspersa*. Mr. Fred L. Button, of Oakland, has informed me that it occurs* in many of the gardens and private grounds in that place, and that one of his neighbors employed a man half a day 'cleaning them out of his garden.' Professor Keep, of the Mills College, last summer collected 'a fine living specimen' at Pacific Grove, Monterey, which is more than fifty miles south of the original Delmas plant on the Guadalupe.

It is now common in East Side Park and is also reported as occurring in Elysian Park in Los Angeles. These are, no doubt, the descendants of the stock planted by Delmas so many years ago.†

Mr. W. G. Binney, in his 'Terrestrial Air-breathing Mollusks of North America etc.' (Vol. V., July, 1878), reports *H. aspersa*, as found "In gardens in Charleston, S. C., and vicinity, where it has existed for fifty years; * * * it has also been found at New Orleans and Baton Rouge; Portland, Maine; Nova Scotia; Santa Barbara, Cal.; Hayti; Santiago, Chili; etc.;" and Mr. Binney, if I am not mistaken, has raised them in his grounds at Burlington, N. J. As he says, "it evidently is a species peculiarly adapted to colonization."

I have always doubted its occurrence at Santa Barbara; it has never been confirmed by any collector to my knowledge. It was, in the first instance, credited to this place on the testimony of a communication to the Zoological Society of London, by Professor Edward Forbes, in which were described the shells collected in the course of surveying voyages of Captain Kellett and Lieutenant Wood of the Royal Navy, in the ships *Herald* and *Pandora*. The locality marks and labels were, unfortunately, badly mixed, and confusion was the inevitable result—Lower California species were credited to the far north, and so on.

A recent careful inquiry made for me by a friend utterly failed to obtain any data, showing its existence at Santa Barbara* or thereabout at any time.

From the foregoing it will be seen that this species is fully established on both coasts of the United States and it is likely to extend its territorial domain in harmony with the prevailing spirit of the times.

Living *Helix pomatia*, a larger species, also European, has been imported by a leading grocery firm in San Francisco to supply its patrons. This is the snail *par excellence* of Continental epicures and was propagated on an extensive scale in the palmy days of ancient Rome as a dainty for the patrician palate on festal occasions; it is not unlikely that sooner or later this species also will be found in some congenial spot outside of the grocery store and in course of time become an inhabitant of California.

More than fifteen years ago a species of slug, *Amalia Hewstoni*, made its appearance in the grass plots of San Francisco; it was described by Dr. J. G. Cooper. It soon became a nuisance; even a regularly ordained clergyman spoke of it as 'a slimy brute'; however this may be, it has now 'expanded' its territory so as to include Seattle in the north and San Diego in the south. Dr. Pilsbry says it may be identical with the

My esteemed friend, the late Dr. Newcomb, who lived in Oakland many years, may have planted some in his garden as an experiment. He had at one time on his grounds several living California forms of different species.

† I have been told that the employees in the park are of the opinion that it was incidentally introduced with foreign plants. They are not aware of the Delmas fact. Its presence in the park may, perhaps, be due to both.

* Vide my paper 'On *Helix aspersa* in California,' in Annals of New York Acad. Sciences, May, 1881, pp. 129–139.

European *A. gagates*; it is not a native Californian. In addition to examples of *Helix aspersa* I have recently received specimens of *Zonites* (*Vitrea*) *cellaria* Müll. and *Zonites* (*Vitrea*) *draparnaldi* Beck, and the little bulimoid, *B. ventrosus* Fer, all from the lawns and flower-beds of Oakland, collected by Henry Hemphill..

Of the above, *Z. cellaria* has an almost world-wide distribution through the instrumentality of commerce. On the Atlantic side from Quebec to Charleston, S. C., along the coast, inland (in greenhouses) at Alleghany City, Pa., and Detroit, Mich. *Z. draparnaldi* is found in the greenhouses of Seattle according to Dr. Pilsbry and has before been reported as occurring in Oakland. The little bulimoid form detected by Mr. Hemphill has not, to my knowledge, been previously found anywhere in North America. It is a continental species. I do not find in the books, any intimation of its occurrence in the British Isles though its absence from territory so comparatively near is remarkable. It has been reported from Bermuda. The occurrence of these European forms of *Zonites* and *Bulimus* in the gardens of Oakland are quite likely due to plant importations. A single example of the little *Helicodiscus lineatus* Say, was noticed by me several years ago, as having been collected in Oakland by Mr. Hemphill. Binney* says of this peculiar form, that it "inhabits all of the Eastern, Central and Pacific Provinces, having been found from Gaspé to Texas; on the Rio Chama, New Mexico; in Idaho; in Oakland, Cal." This is misleading, as it has not been detected anywhere within the Pacific province as defined by him outside of Oakland, and only here in the single instance above mentioned. Mr. Hemphill has also collected *Cochlicopa lubrica* Müll. (= *Ferrussacia subcylindrica* L.) on Grizzly Peak back of the university grounds at Berkeley. This form has heretofore been reported from Oregon and Alaska, and presumably belongs to the circumboreal fauna.

* Manual of American Land Shells, Bull. U. S. N. Mus. No. 28, 1885, p. 75.

MARINE SPECIES.

Having completed our review of the terrestrial species, we may now consider the marine forms, which are confined almost exclusively to San Francisco bay.

The presence of the Virginia oyster in this region is wholly due to business enterprise; its introduction dates from about the time of the completion of the overland railways. Upon the completion and operation of the transcontinental lines certain of the San Francisco oyster dealers commenced the importation by the carload of small or seed oysters, one and two years old, from the Atlantic side, for planting in San Francisco bay, where after a couple of years they attain a marketable size. These importations of *Ostrea Virginica* have been continued ever since, as this species, owing to some unfavorable peculiarities in the new environment, does not increase sufficiently to meet the demands of trade.

The importations of the seed oysters for the nine years, ending with 1895,* amounted to 15,271,000 pounds, costing $350,000.

As an incident of these importations we find several familiar species have been unintentionally introduced, some of which have already established themselves, and appear to be permanently naturalized, as well as others that are gaining a foothold.

The most important of these accidental introductions is the common sand-clam, *Mya arenaria* of the Atlantic Seaboard, variously known as the 'soft-shelled,' 'squirt,' 'long-necked,' clam, and 'mananose.'

There probably has never been in the history of commerce an instance of an accidentally introduced animal species that has proved so economically valuable as this.

* Report of U. S. Fish Com. for 1896.

It was first detected on the eastern shore of the bay, in November, 1874, by Mr. Hemphill, and was soon after described from his specimens, which were about two-thirds the average adult size, by the late Dr. Wesley Newcomb, as *Mya Hemphillii*. It has multiplied wonderfully and is found everywhere in the Bay region, and has apparently crowded out certain indigenous forms like *Macoma nasuta*, before the advent of *Mya*, one of the commoner clams; it is now comparatively scarce. While the shells of *Macoma* are abundant in the kitchen-middens and aboriginal shell-heaps and mounds that are so numerous on the adjacent shores, not a sign of *Mya* has been detected. There is not the slightest doubt of the introduction of the latter form in the way indicated.

Some fifteen or twenty years ago, it happened that I was an invited guest at a clam-bake on the Sausalito shore, and made the acquaintance of the presiding genius of the culinary department, himself an interesting specimen, a cross between fisherman, clam-digger, cook and sea-dog, a sort of 'alongshore jack-at-all-trades.' We had a prolonged confab about clams and clam-bakes. The discussion closed with the remark by him, "what a heap o' shekels I could have made in early days, if these squirt-clams had been in the bay."

Notwithstanding the great increase in the population of San Francisco, Oakland and other cities and towns in this general region and the consequent increased demand, the clam-beds exhibit no hints of depletion. They furnish an abundant supply of wholesome and nutritious food, and that, too, at an exceedingly low price, for the solid meats are retailed in the markets at fifty cents per gallon.

Plantings of *Mya* have been made at Santa Cruz and perhaps elsewhere in the south, and in Shoalwater bay in the north. The latter by Captain Simpson, of San Francisco, many years ago, who informed me that his experiment was a success and had resulted in an ample harvest. It has also been planted elsewhere on the coast of Washington and in Coos Bay near Marshfield, Oregon.

The fusiform species, *Urosalpinx cinereus* Say, the oyster-drill of the Atlantic coast, was discovered on the oyster beds near Belmont on the westerly shore of the San Francisco bay as long ago as 1889, by Mr. C. H. Townsend, of the United States Fish Commission. It was detected last year by Mr. E. E. Smith, of Stanford University, near Redwood City, on the same side of the bay, to the south of Belmont.

Mr. Hemphill collected it in 1898 on the old oyster beds on the Alameda flats of the Eastern Shore, a dozen or more miles from the other localities. At the last named place Mr. Hemphill has recently detected the 'slipper shell,' *Crepidula convexa* Say var. *glauca* Say. The familiar form, *Modiola plicatula* Lam., was found, living, at a point three miles north of Stanford University, in 1894, by Mr. N. F. Drake. This species which ranges on the Atlantic side, from Nova Scotia to Georgia, was particularly abundant fifty years ago in that part of the city of Boston known as the Back-bay district, now traversed by beautiful streets and avenues and exhibiting many fine examples of architecture. By the filling in of this extensive area several hundred acres of wet and dry marsh-land and mud-flats, countless thousands of this *Modiola* were buried alive. It remains to be seen, whether at any point on the Pacific Coast, this form will become approximately as abundant.

It will be noticed from the foregoing that twelve exotic species of Mollusks occur or have been detected in California.

1. *Helix aspersa* Müll.
2. *Amalia Hewstoni* Cp.
   (= *A. gagates*).
3. *Zonites* (*Vitrea*) *cellaria* Müll.
4. *Zonites* (*Vitrea*) *Draparnaldi* Beck.

5. *Bulimus* (——) *ventrosus* Fer.
6. *Helicodiscus lineatus* Say.
7. *Cochlicopa lubrica* Müll.
(= *Ferrussaccia subcylindrica* Linn.)

of Europe, and

8. *Ostrea Virginica* Gmelin.
9. *Mya arenaria* Linn.
10. *Modiola plicatula* Lam.
11. *Urosalpinx cinereus* Say.
12. *Crepidula convexa* var. *glauca* Say.

of the Atlantic seaboard.

With the exception of numbers 2 and 7 examples of the foregoing have been placed in the National Museum.

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LOS ANGELES, CAL.

SCIENTIFIC BOOKS.

MANUAL AND MECHANICAL PRODUCTIVITY.*

THE report of the United States Commissioner of Labor, Mr. Carroll D. Wright, recently issued, on 'Hand and Machine Labor,' * like all our reports from that source, is rich in facts and data. This report has, naturally, in consequence of its intrinsic importance, as well its admirable form and wealth of information, attracted much attention. Mr. Wright has himself given a resumé of the work in the March issue of *Gunton's Magazine;* London *Engineering* and the *Scientific American* devote space to a summary and we now find in the February number of the *Bulletin de la Société d'Encouragement, pour l'Industrie nationale*, an elaborate article by the distinguished French writer, M. E. Levasseur, in which the abstract of Mr. Wright's report constitutes the *pièce de résistance.* The facts illustrated in this remarkable document are, in substance, the following:

The comparison made is, in general, with the methods of the earlier times, antedating the present system of machine-production in which the hands and even the brains of the workmen are reinforced and made enormously more productive by the employment of machinery of great power, activity, accuracy and endurance. It is the comparison of the work and productivity of the days of unaided manual labor of the last century with the production of our own time of labor-aiding machinery and of industrial organization. The real progress described, surprising as it may seem, has actually taken place mainly in the last half century, and in large proportion since about 1870, the date of initiative assumed in Mr. Wells' famous 'Recent Economic Changes.' Within this period, the changes have been studied in eighty-eight principal industries and about seven hundred subsidiary lines. All the data are tabulated in convenient form and the presentation thus made is most admirably adapted for the purposes of the economist, the engineer and the manufacturer interested in the principles of economics controlling his art.

The general deductions are that, while the number of operations in the production of each article has usually considerably increased, and while the machine with its attendant turns out enormously larger product than the unaided workman, the time required for the production of a given amount of product has quite as extraordinarily decreased; the costs of prodnct have proportionally decreased; the market has been enormously expanded and, unexpected but true, the number of workmen has very greatly increased in each industry thus aided and their wages have followed the upward trend of production. Thus, lower prices of product, and larger production with rising wages for more workmen employed, have been consequent upon the work of the inventor and the genius of the 'entrepreneur,' as the economists, curiously, often denominate the manufacturer and the organizer of industries. Invention has immensely augmented, rather than displaced, labor in every manufacturing industry; not even excepting agriculture, where the inventor has supplied the mower and the reaper, the seeder and threshing machine to increase the effectiveness of the manual worker ten times over.

M. Levasseur, in his extended study of such comparisons of the work of the unaided hand with the work of that machine-assisted, traces the history of the introduction of inventions and machinery, with the gradual rise and more gradual fall of the ignorant prejudice of

* Thirteenth Annual Report; Washington Gov't Print. 1899. 2 Vols. Pp. 1597.