outer limit of the nebula will be about half a million miles further out, the temperature being zero at the outer limit. This means that molecular motion will not there exist. The forces there acting will be gravitation and the repelling action of light waves from the central nucleus.

The entire mass of Neptune will exist in a space far more highly rarefied than any Crookes tube vacuum.

It is, of course, possible for such nebulæ to exist, but it certainly is impossible to believe that such a nebula can throw off a system of planetary bodies. The greater part of our solar nebula must have existed as solid meteoric matter, with a temperature approaching alsolute zero. Only the central part, which is now represented by the sun, was largely gaseous, and at a higher temperature.

DISCUSSION AND CORRESPONDENCE.

INSTABILITY OF THE WATER SUPPLY OF THE RIO GRANDE.

TO THE EDITOR OF SCIENCE: In 1540 when Coronado's men were exploring on the Rio Grande, they reported arriving eighty leagues below Tiguex at a place where the river vanished into the ground. Some Amerinds of the region told them it reappeared again much larger farther down. This they did not verify.

As their report of this disappearance, I believe, has usually been ascribed to 'Spanish exaggeration,' it is interesting, as well as important, to place beside it Humboldt's mention, in his 'Political Essay on New Spain,' p. 213 (English translation by John Black), of a similar phenomenon, which took place in 1752.

> The whole bed of the river became dry all of a sudden for more than 30 leagues above and 20 leagues below the Passo, and the water of the river precipitated itself into a newly formed chasm and only made its reappearance near the Presidio de San Eleezario. This loss of the Rio del Norte remained for a considerable time; the fine plains which surrounded the Passo and which are intersected with small canals of irrigation, remained without water and the inhabitants dug wells in the sand with which the bed of the river was filled. At length after the lapse of several weeks the water resumed its ancient course, no doubt because the chasm and the subterraneous conductors had filled up.

From this it seems fair to infer that the Spaniards of 1540 were witnesses of a phenomenon which repeated itself in 1752.

Springs have also been known to be changed, in that region, by earthquake shocks, and it would, therefore, appear that in the past there has been considerable instability in the water supply. There is a probability that a large branch entered the Rio Grande, from the northeast, just above El-Paso, in Coronado's time, which has since vanished, leaving only marshy spots where it once ran. These changes in volume of springs and in stream-flow have, it is needless to say, an important bearing on the archeology of that district.

F. S. DELLENBAUGH.

SPECIAL ARTICLES.

BIOLOGICAL SURVEY OF THE WATERS OF SOUTHERN CALIFORNIA BY THE MARINE LABORATORY OF THE UNIVERSITY OF CALIFORNIA AT SAN DIEGO.

THE marine biological survey undertaken by the Department of Zoology of the University of California of the Pacific Ocean adjacent to the southern coasts of the state in 1901,* continued for six weeks in the summer of 1902 at San Pedro, with a limited amount of shore work and some attention to the plankton of San Pedro harbor, and transferred in the summer of 1903† to San Digeo or, more specifically, to Coronado on the peninsular side of the Bay of San Diego was again taken up during the holiday intermission of the university for a period of three weeks from December 15, 1903, to January 6, 1904. The committee of the Chamber of Commerce of San Diego, which raised the funds for the work of the preceding summer provided also, in the

* W. E. Ritter, 'A Summer's Dredging on the Coast of Southern California,' SCIENCE, Vol. XV., p. 53, 1902.

† W. E. Ritter, 'Preliminary Report on the Marine Biological Survey Work carried on by the Zoological Department of the University of California at San Diego,' SCIENCE, Vol. XVIII., pp. 360–366, 1903.

main, for the explorations of the winter. The laboratory was again opened in the boat-house, partially equipped and courteously placed at the disposal of the Chamber of Commerce by the Coronado Beach Company. The laboratory was fortunate in again securing the services of Mr. Manuel Cabral as collector, and the power boat *St. Joseph,* by means of which it was possible to have collections made in the early morning ten to fifteen miles off shore from Coronado brought to the laboratory early in the forenoon for the day's work.

The climatic conditions were ideal for winter work. Bright sunshine every day and an equable temperature obviated the necessity of artificial heat in the laboratory, and no storms interfered with the regular trips of the collector. Tides at this season of the year are also favorable, reaching lowest levels in the afternoon, while in the summer the best tides for shore collecting all occur before daybreak or early in the morning. The persons engaged in the survey and subjects of their investigations were as follows: Professor W. E. Ritter, director of the laboratory, *Balanoglossus, Tornaria,* pelagic and littoral tunicates; Assistant Professor Charles Kofoid, pelagic Protozoa; Dr. Alice Robertson, Bryozoa and Copepoda; Mr. L. H. Miller, assistant in zoology, and Mr. R. D. Williams, a graduate student, working with Professor Kofoid on the Protozoa and Miss Margaret Henderson continuing her work of last summer with Dr. H. B. Torrey, on the pelagic Cœlenterata.

The physical observations made in the previous summer by Mr. H. M. Evans on temperatures and salinity were continued this winter by Professor W. T. Skilling, of the San Diego Normal School. These observations show, as might be expected, that the shallow bay waters have cooled down more than the surface waters of the adjacent ocean. Whereas last summer the bay waters were 4°–5° C. warmer than the ocean, they were in midwinter 1°–2° cooler. Temperature in summer in the bay ranged from 22.7° to 26.7°, in winter from 13.3° to 14.7° C. Surface waters in the adjacent ocean in summer ranged from 18° to 22.5° except during a cold spell August 27–31, when they fell as low as 14.8°. In winter the range was from 14.6° to 15.6°.

The salinity also declined slightly below the summer determinations, the average of the readings, reduced to Dittmar's standard, of ocean water at Coronado pier falling from 1.02455 to 1.023748; of the middle portion of the bay near the mouth of Glorietta Bight at Coronado falling from 1.02546 to 1.024274. Determinations of salinity were also made in the mid-channel between Coronado and San Diego at the ferry crossing, yielding an average of 1.023927.

The biological explorations of the winter were again directed in the main to the plankton. Quantitative examinations were made of the plankton of the Bay of San Diego near the laboratory and of Glorietta Bight. Surface waters of the ocean off-shore from Coronado were also examined, but the principal field of operations was 'Cabral's bank,' an uncharted area about ten miles off Point Loma with 60–90 fathoms of water, known to local fishermen. A number of hauls were also made in the adjacent deeper waters of the Coronado submerged valley.* In all of these localities there was a noticeable decrease in the quantity of the plankton as compared with that taken in similar hauls of our nets in midsummer. There was a marked diminution in the quantity of diatoms and a still more pronounced reduction in the volume and variety of the Peridinida. *Gonyaulax,* which was so abundant in August as to color the water and cause an appreciable odor along shore, was found in living condition but a few times though empty skeletons were still not infrequent. The Tintinnidæ, on the other hand, were abundant in the ocean waters and showed marked increase over summer ratios in the bay. The Radiolaria were also, relatively to summer conditions, greatly increased in numbers and variety in all collections made some distance off shore, but were not common

* George Davidson. 'The Submerged Valleys of the Coast of California, U. S. A., and of Lower California, Mexico.' Proc. Calif. Acad. Sci. Geol., Third Ser., Vol. I, pp. 73–103, Pls. 2–10, 1897.

in bay and coastal waters. The Acantharia, which in summer abound in shore and bay waters, were less abundant everywhere this winter. The Spumellaria were also somewhat reduced in frequency, while the Nassellaria were greatly increased and diversified in waters near the 100 fathom line, where the major part of our oceanic collections were made, rivaling if not surpassing in richness the *Challenger* collections from the tropical Pacific as reported by Haeckel.

The Cœlenterata are reported by Dr. H. B. Torrey to be fewer in the winter collections, both as species and as individuals, in all orders but the Siphonophora, where numbers were much larger, especially of *Diphyes*.

The Entomostraca were less abundant than in summer, especially in shore waters. *Sapphirina* was found several times and an apparently new 'peacock form' allied to *Calocalanus* was obtained. *Cyphonautes* was very common in all collections, and Ophio-, Echino- and Asteroplutei were not infrequent, indicating breeding of many echinoderms at this season of the year.

The pelagic Mollusca were more numerous than in summer. *Creseis* and young *Pneumodermon* were found, and young *Pleuropus* were very abundant in the oceanic collections.

Professor Ritter reports the presence of *Salpa, Doliolum* and *Appendicularia* though less abundant than in the summer. A small *Tornaria* of uncertain relationships was found this winter in small numbers on the bank where the large *T. ritteri* was found last summer.

A few collecting trips were made at low tides and some dredging was done off shore and in the harbor. *Ciona* was exceedingly abundant and of great size in loose colonies on the sand in the shoal waters of the harbor, and *Perophora* and sponges were in great breeding activity on the floats and piles near the laboratory. *Amphioxus californicus* was again collected on the 'middle ground' near the mouth of the harbor in shelly deposits, and *Dolichoglossus* was found in great abundance on the mud flats about the bay associated with another possibly new member of the genus. *Cerianthus* and *Renilla* were collected on the sand and the mud flats exposed at low tide. Many annelids were breeding in the mud flats about the harbor and in the False Bay. New collecting grounds on the ocean front near Pacific Beach were found on rocks exposed at low tide, which equal in richness and in variety of their fauna anything thus far found on the coast of California south of Monterey Bay.

One of the most noticeable changes in the local fauna was an unusual development of a large bryozoan, *Bowerbankia,* in the harbor, forming masses often several feet in diameter. This species was dying out rapidly during our stay at Coronado, living zooids being very rare on the colonies. Another remarkable change was the development of *Donax californicus* in great numbers at Pacific Beach, where on a gently sloping sandy shore in the notoriously heavy breakers of the region these little lamellibranchs were found in enormous numbers, literally covering the beach on a strip several miles in length and fifty yards or more in width. The levels at which they occurred would bring them into the turmoil of the breakers with every tidal recession during plus tides and leave them exposed on the beach for several hours during minus tides. A similar occurrence at Long Beach near Los Angeles several years ago led to the formation of a fertilizer corporation to exploit these resources of the sea, but *Donax* disappeared before the stock was floated, as mysteriously as it came. Associated with *Donax* in what seems to be a commensal relationship is an undescribed Campanularian hydroid attached to the shell in small tufts between the umbo and siphons. This was sufficiently abundant to add an appreciable color to the banks of *Donax in situ* on the beach.

Chimæra was caught on the fishing banks and *Gyropleurodes* was taken in the Bay.

A great abundance of animal life is thus available at San Diego in winter months for the biologist, and the desirability of this location for the establishment of a marine station open throughout the year grows increasingly evident.

In furtherance of this object a Marine Biological Association was formed at a public

meeting of interested citizens of San Diego and vicinity September 27, 1903.

The by-laws as adopted designate the purposes of the organization and in part are as follows:

"The organization shall be called the Marine Biological Association of San Diego, for the purpose of securing the foundation and endowment of a scientific institution to be known as the 'San Diego Marine Biological Institution.'

"The general purposes of the institution shall be to carry on a biological and hydrographic survey of the waters of the Pacific ocean adjacent to the coast of South California, to build and maintain a public aquarium and museum and to prosecute such other kindred undertakings as the board of trustees may from time to time deem it wise to enter upon.

"The founding of the institution having been perfected and its endowment secured, the whole or such part thereof as may in the judgment of the trustees seem best shall, under such conditions as the trustees may impose, be transferred to the regents of the University of California, to become a department of the university coordinate with its already existing departments.

"The officers of the association shall be a president, vice-president, scientific director, secretary and treasurer. In addition there shall be a board of trustees consisting of seven members, three of whom shall be the president, vice-president and scientific director."

Officers were elected as follows:

President—Homer H. Peters.
Vice-President—Miss Ellen Scripps.
Scientific Director—Professor W. E. Ritter.
Secretary—Dr. Fred Baker.
Treasurer—Julius Wangenheim.
Additional Directors—E. W. Scripps and James MacMullen.

At a winter meeting of the board of trustees funds were guaranteed for three years which will enable the station to continue its work and expand it somewhat, perhaps to the extent of keeping the station in partial operation throughout the year in charge of a resident naturalist or fellow during the interim between the summer and winter operations. A public spirited patron of the laboratory has offered to grant the laboratory the use of a nineteen ton schooner, the *Loma*, former pilot boat of the port, equipped with power, for purposes of collecting, sounding, dredging, etc., and also to erect a temporary building for accommodation of the laboratory which may be located at La Jolla, fifteen miles from San Diego on the ocean front. The permanent location of the buildings will not be determined until a thorough exploration of several possible situations shall have been made.

Charles Atwood Kofoid.

The Necessity for Reform in the Nomenclature of the Fungi.*

The nomenclature question is almost entirely one of expediency. If the prevailing custom in making plant names has led to the establishment of a nomenclature that satisfactorily fills the requirements for accuracy and stability, and if it points out unfailingly the proper procedure where our increased knowledge of any given group of plants necessitates the modification of our ideas of generic limits, then any change in traditional methods, or any attempt to substitute other generic names for those now commonly used, would be a folly so great as to approach lunacy. Let us see what the facts are as regards the fungi. Fries, in his classical work 'Systema Mycologicum,' the final volume of which was published in 1829, recognized 243 genera of fungi. In the 'Sylloge Fungorum' of Saccardo, the eight original volumes completed in 1889 contain 1,685 genera and 31,927 species. Supplementary volumes have appeared from time to time, the last in 1902, bringing the total number of recognized genera up to 2,348 and the species to almost 50,000. The treatment of the fungi by Schroeter, Lindau, Hennings Dietel and Fischer in Engler & Prantl's 'Pflanzenfamilien' was completed in 1900. The usage here differs radically from that of Saccardo in many respects and the number of genera accepted is only 1,811, or 537 less than are recognized by Saccardo. A

* Read before the Botanical Section of the American Association at the St. Louis meeting.