The glass was found to contain much more silicium than the ordinary mixtures, so that this electric furnace should be useful if glasses of this kind are desired; it would be too expensive for ordinary purposes, however. Another furnace, which has some advantages over the arc type, is that in which powdered carbon or cryptol is used as the heating material. In these the ingredients to be fused are placed in a container, which is then surrounded by the resistance material, thus insuring an efficient heat insulation, while at the same time considerably reducing the radiation losses. The resistance material must not be packed in tightly; the grains should also be of uniform size, and evenly distributed round the crucible. If required, the furnace may be arranged in such wise as to produce a higher temperature at one part than at another. One difficulty with this type of furnace lies in the high current intensity employed, but this can now be regulated, thanks to the invention of a suitable regulating rheostat, consisting of an insulated cylinder filled with the powdered material. A block of carbon at the bottom forms one electrode, while the second consists of a rod of carbon, which is pushed down among the loose material. The conducting mass may be distributed around the crucible in several ways; in some methods, for instance, triangular strips of carbon are placed in contact with the crucible with a view to concentrating the current at certain points. In this way the glass may be fused at low temperatures as compared with the temperature of the arc. The furnaces may also be regulated to give any temperature up to 1,600 to 1,700 deg. C., with a precision of from 10 to 15 per cent. The potential employed in connection with these experiments was about 100 volts.

SOME RECENT DISCOVERIES IN OCEANOGRAPHY.

The superficial area of the sea is two and a half times larger than that of the earth, while its mass or volume is enormous. Supposing that the basin holding the seas had been emptied at the time when Jesus Christ was born, and assuming that some enormous river had been allowed to run into it at the rate of 1,093 cubic yards per minute, the basin would still be empty, as it would require a total period of 600 years more before the seas would attain their present level. As may well be conceived, such a body of water must conceal many extraordinary things—but this is a possibility which has attracted attention only within comparatively recent times. The study of the earth itself has been attended with lesser difficulties, but we are now so familiar with our globe that its continents and islands are beginning to pall upon the curious mind, so that more attention is being given gradually to the ocean.

Two of the most prominent oceanographers of modern times are the Prince of Monaco and M. J. Thoulet. In 1899, the Geographical Congress, which met at Berlin, appointed a committee to prepare and publish a bathymetric map. As the necessary funds were not available the Prince of Monaco generously came forward and offered to take all the expenses upon himself, and the map was duly prepared in this way, under the auspices of Messrs. Sauerwein and Tollemer.

This valuable map has just been published and a copy was presented quite recently to the Académie des Sciences. It clearly shows the actual state of our knowledge regarding ocean depths, and the outline or profile of submarine lands, all the data being based upon soundings so far taken by hydrographers and oceanographers of all nations. Moreover, it also indicates the composition of submarine soils.

The map prepared and issued by M. Thoulet is one of the French coast (the submarine portions, of course), up to a distance of six miles from the shore; it shows the depths and—what is an entirely new feature—the lithologic composition of the whole zone in question, and indicates whether the ocean bed consists of mud, sand, stone, shell, rock, or algæ, etc. Devoted as it is merely to a fraction of the ocean, this map is much more detailed, while that of the Prince of Monaco is more a general bird's-eye view of the whole.

So far, but little is known about the bed of the ocean, but a few broad features may easily be picked up very soon, so that after a study of the Prince's map it is not difficult to translate the different shadings of color into differences of altitude, etc.; the student will then promptly discover that there are very many features of resemblance between the earth above and that below the bosom of the vasty deep. In fact, one is practically a replica of the other, both possessing hills, plains, mountain peaks, valleys, ravines, etc. The Atlantic Ocean, for instance, covers two vast valleys; one of these passes between the Cape Verde islands and the Azores, and is of great depth. It runs close up to Europe and comes to an end close to the British Islands, where a ridge or crest of land separates it from the basin of the North Sea. The other valley runs in the main parallel to the first, from which it is separated by an elongated strip of land of which the Azores form a super-marine continuation. This strip does not exceed a depth of 9,850 feet, while its height amounts to 6,560 feet. The first valley, like its *confrère*, is also very deep, its bottom being situated at a depth of nearly four miles below the surface. Passing along South America, and leaving the Bermudas to the left, it passes along Newfoundland and Labrador, finally ending just south of Greenland. The sub-Atlantic landscape thus consists of two vast parallel valleys, separated from each other by a range of mountains. Further north the land lies higher and the sea is, relatively speaking, shallow. Between Greenland and the Continent, close to Iceland and the Channel Islands, there is a huge plain free from any depressions worthy of mention. It is quite clear that at one time England was connected to the continent.

The greatest ocean depths, however, are not found in the Atlantic, as there are veritable abysses to be met with on the other side of the globe. Close to New Zealand the water attains a depth of five and a half miles in the Kermadec and Tonga ravines, which in themselves attain a height of 29,530 feet, while they are separated from each other by a chain of mountains of 9,850 feet height. There is also the Aleutian ravine, which reaches a depth of 23,000 feet. Mostly, sub-aqueous scenery is monotonous; there are no abrupt declivities or precipices, excepting in the vicinity of the coasts or near islands of volcanic formation, everything being rounded off and smoothed down by the action of the water. Close to the land there is somewhat more variety. The European plateau, for instance, slopes gradually away down into the depths, and a fair view can be obtained there, provided a maximum depth of 1,300 feet be not exceeded. At first, abundant vegetation and animal life are met with, but below the depth mentioned the scene changes; first, the light grows dimmer and dimmer, and the deeper we descend the lower does the thermometer fall, except in the case of the Mediterranean, where the temperature is, relatively speaking, high, as this sea is contained in what is practically a closed basin. In the Atlantic, by means of special bottles invented by Dr. Richard, one of the Prince of Monaco's collaborators, the temperature of the water was taken for a depth of 19,686 feet. The surface temperature of 68 deg. fell to 38 deg. at a depth of 6,562 feet. "After 2,000 meters" (6,562 feet), says Mr. C. Sauerwein, another of the Prince's collaborators, "the temperature falls but slowly as greater depths are attained, the cold being practically uniform and not subject to any changes of season."

Cold, darkness, and monotony—such are the characteristic features of the ocean bed. The composition of the floor itself is the only thing that changes, though this is only the case close to the coast, as no alteration (or very little) seems to occur at great depths. Investigations made with drags, dredgers, sounding apparatus, and the like, have shown that it is an error to assume that the bed of the ocean is covered with sand, as this latter is essentially a coast formation only found in comparatively shallow water, close to the shore. Mud begins to take its place the further we go afield—mud, or rather, ooze. Its origin varies considerably; a part consists of the alluvial deposits brought down by rivers. This ooze is of various kinds. Blue ooze is found close to schistous coasts, and its hue is imparted to it by organic substances and iron pyrites; it covers the floor of the Mediterranean and of the Arctic Ocean. Red ooze is merely the blue variety changed in color by the peroxidation of the iron; it is also formed of the alluvial deposits brought down by rivers flowing through land rich in iron, such, for instance, as the Congo and some rivers in Brazil. Green ooze, finally, owes its color to glauconite; it is found along rocky coasts where there are no rivers. In many places the sand or ooze is mixed with volcanic elements originating from terrestrial and submarine explosions. The inorganic world, however, is not the only source from which the ocean bed receives its supplies of material. The remains of organic creatures also contribute no mean share. The upper strata of the sea swarm with teeming animal life—algæ, crustacea, eggs, larvæ, etc.—of all kinds, which die daily in thousands and slowly sink downward to the lowest depths of the sea, thus forming a continual rain of corpses of algæ, diatoms, *et hoc genus omne* which descend from heights far exceeding those of Mt. Everest (33,756 feet) and other lofty terrestrial peaks. Protozoidal forms, foraminiferæ and radiolariæ (over a million of which would not weigh an ounce, but which are so fertile that one specimen can produce 70 million direct and indirect descendants in four days) also play a highly important part in this work. Due to their shells, the foraminiferæ form large quantities of calcareous deposits. The globigerinæ and orbulinæ (members of this family) form a special ooze which is found in the bed of the Atlantic, while the radiolariæ form silicious deposits which abound in the Pacific and Indian oceans, where a special kind of ooze is also found, viz., the pteropod ooze composed of the shells of pteropod mollusks which is found at the bottom of the Atlantic between Africa and America and near the Azores. These oozes, however, are not permanent, but merely represent a phase or stage. Red, blue, and brown clay is the only permanent compound; it is soft, greasy to the touch, and contains from 1 to 20 per cent of lime, a little vitrifiable earth, and organic remains. The oozes referred to above gradually turn into red clay, which thus becomes the final tomb of all that has lived, moved, and had its being in the sea.

A good deal more might be said about the strange beings which inhabit deep waters, feeding upon the bodies and excrementa continually raining down from the upper layers of the waters. But oceanography is not a pursuit of mere curiosity; its aims lie deeper and are of greater value, viz., the determination of the configuration and lay of submarine lands so as to facilitate the laying of cables, the discovery of spots where submerged peaks lie so near to the surface as to be a menace to passing ships, and the sounding of vast abysmal depths. Further than this, the sea and the sun are two great factors determinative of climate, and this is another reason why oceanography cannot fail to be of the greatest interest and value to mankind.

Meantime, the publication of the new maps in question has proved of immense value, and too much honor cannot be paid to the Prince and his collaborators for their devotion to science—a devotion which so far has brought them nothing but empty admiration and eulogies.

SCIENCE NOTES.

Some interesting facts concerning the mineral adulteration of textiles in every-day utility have been published by the Lancet, of London. According to this authority, whereas one hundred years ago the rustling of a lady's silk dress was attributable to the high quality of the silk, it now rustles owing to the impregnation of 36 per cent of salts of tin. Epsom salts, which have hitherto been mostly employed for medicinal purposes, are widely adopted for giving weight to flannel. Similarly, the old-fashioned pure linen used for table cloths is now largely substituted by cotton filled with china clay, starch, and size, while our linen collars are also founded upon base materials with simply a linen facing.

The process of slow distillation of metals readily fusible in a perfect vacuum, elaborated especially by Herr Karlbohm, has for some years led to results so favorable that it was desirable to see these processes extended to metals less fusible. Vessels of quartz are now coming into more general use with the result that much progress has been made in their manufacture as described by Herr Krafft in the Chemische Berichte. When the quartz reservoirs are not too thin, they may be raised to the temperature of 2,552 deg. F., while sustaining a perfect vacuum, without fear that they will be crushed by the effect of atmospheric pressure. At this temperature he has obtained the rapid distillation of a series of metals, among which are zinc, cadmium, silicium, tellurium, antimony, lead, bismuth, and silver. Copper and gold also distill at the maximum temperature of the experiments, but more slowly; their rapid distillation would require a higher temperature. The experiments have been confined to the laboratory, but the results have been so decided and encouraging that their application to the industrial rectification of metals is expected.

A series of interesting experiments to investigate by means of kites the relationship between the circulation of the upper and the lower strata of the atmosphere, in order to know what winds to expect, are to be carried out by the British Meteorological Society, which has devoted a portion of the government appropriation to this work. An experimental station is to be established in England, and instruments provided for kite ascents and other methods of investigations. The researches are to be international in character, for on certain days kites will be sent up simultaneously in England, France, Germany, and Russia. Mr. W. H. Dines, F.R.S., who is the leading authority upon this subject in England, will superintend the experiments, and he will be assisted by Col. Capper of the military balloon section at Aldershot, and Capt. Simpson of the steamship "Moravian," during his passages between Plymouth and Australia. The vessel will be provided with suitable kites, wire, winch, and the ingenious meteorograph, the invention of Mr. W. H. Dines, who has carried out important work in this branch of meteorological investigation on a government vessel off the west coast of Scotland. In these researches a string of kites was used, the largest of which was 12 feet high, with an area of 156 feet, and a weight of 20 pounds. The kites were flown on steel wire hawsers attached to a winch, wound by steam. A height of 10,000 feet was reached and recorded. The greatest danger attending these investigations is the liability of the steel wire being fused by lightning during thunderstorms.