And the doctrine of evolution at the present time rests upon as secure a foundation as the Copernican theory of the motions of the heavenly bodies."

In closing, the speaker took the precaution to observe that his purpose had not been to enable those who had not made a study of these subjects to leave the room in a condition qualified to decide upon the validity or the invalidity of the hypothesis of evolution, but to put before them the principles by which all such hypotheses must be judged, and to make apparent the nature of the evidence and the sort of cogency which is to be expected and may be obtained from it: and he should consider that he had done his hearers the greatest service it was in his power to do, if he had convinced them that the question under discussion was not one to be dealt with by rhetorical flourishes or by loose and superficial talk, but one that requires the keenest attention of the trained intellect and the patience of the most accurate observer.

A SERMON PREACHED BY THE MICROSCOPE.

The mineral polishing powder lately brought into use under the name of electro-silicon consists, as shown by the microscope, entirely of silicious or flint shells of the *diatomaceæ*, species *epidiscus*, each shell being a flat disk. We recently measured their diameters and found them to average $\frac{1}{2000}$ inch, while the thickness was $\frac{1}{8000}$ inch. Therefore, when piled up like coin (and in this way they appear in the mineral), 8,000 of these are one inch thick; while a square inch can contain more than 2000x2000, or over 4,000,000, such disks; and the number present in every cubic inch is thus more than 8000x4,000,000, or over 32,000,000,000. When we consider that the thickness of the deposit in Nevada, where this mineral is found, is reckoned in hundreds of feet, and the length by hundreds of miles, we can only be struck by the immensity of the organic creative power with which the atoms of matter are endowed, a power which forms these atom-like objects, in regular shape and in numbers to be counted, not by millions of millions, but by countless myriads. Not this alone: but this power also ornaments most of the species in the most tasteful and intricate manner: an ornamentation which is revealed only by the most powerful microscope.

When we were once visiting the cathedral of Strasbourg, Germany, an architect in our company made the remark that the artisans who cut the ornamental stones had expended just as much care in giving the utmost finish to the highest parts at the top of the spire, where scarcely ever any one had a chance to admire their admirable workmanship, as to every part of the cathedral below, where it is daily seen by the worshippers. "But," said our friend, "those men labored not so much for their wages as they do now a days (often trying to cheat in the value of their work when they have a chance); but in those good old times, every artisan labored for the glory of God; it was a species of religious enthusiasm which induced them to finish their work there as conscientiously as anywhere else, although it could only be seen by God."

Considering the discoveries of the exquisite ornamental finish of those little objects belonging to the hundreds of species of *diatomaceæ*, what is more natural than that the religious enthusiasm of the mediæval church builders is taking hold of the microscopists of our day, who really are enabled to see what God wrought thousands of centuries before it could be seen by any human creature? And these wonders have waited through all these ages before the fact could be appreciated and acknowledged; that the creative power is infinitely great, even in the infinitely small.

WHY IS THE SEA SALT?

According to Professor Chapman, of University College, Toronto, the object of the salting of sea water is to regulate evaporation (see page 98, current volume). This suggestion does not answer the question: why, or by what cause, the sea became so salt; but it assumes to tell us wherefore or for what object the sea is salt. The cause of the saltness should be answered first; and if, after we have ascertained this, it is proved that the salting accomplishes a secondary ultimate purpose, the other question arises. But we believe that a careful consideration of the Professor's hypothesis will quickly expose its fallacy.

In the first place, then, the sea is salt as a simple and necessary consequence of the fact that it must contain all the soluble matter which the rains have washed out of the most exposed portions of the earth's crust, and which the rivers have carried, and are still carrying, to the ocean. And as the rivers do not carry water as pure as that which evaporates from the sea, because they all, without any exception, carry various salts in solution, which can never be raised from the ocean by evaporation, the sea has, in the course of ages, become more and more salt; and the process is still going on. Such a nice regulation of the amount of evaporation as the Professor suggests is quite unnecessary, as it is well known that the regions under the influence of the evaporation of our large fresh water lakes are not much different in agricultural value or sanitary conditions from those under the influence of salt water evaporation, the sole conditions for agricultural success being, next to the nature of the soil, a liberal supply of moisture and solar heat; while in a sanitary point of view, a moderate supply of both is more desirable.

We must, however, give credit to Professor Chapman for his experiments; he proved that the amount of evaporation of fresh water, compared with that of salt water under the same circumstances, may differ largely; so that the evaporation becomes less and less, in proportion as the relative amount of salt increases. But we would give this fact an interpretation different from that of the Professor. In the condition of things preceding the carboniferous era, when the rivers had not yet dissolved so much saline matter out of the exposed earth's surface, nor the rivers carried it to the seas, the ocean necessarily contained much less salt than at present; therefore the amount of evaporation must have been much larger. This condition of things was not favorable to animal existence but it was to vegetable life; and this may partly explain the excessively luxuriant vegetable growth which was the parent of our coal deposits. When in the course of ages the ocean became more salt, the evaporation became less; the air was not so continually overcharged with moisture, and was more favorable to animal life. If the saltness has since increased continually, and the dryness of the air has augmented in proportion, we must not be surprised that regions of the earth, once fertile and inhabitable, have become dry deserts. We know this to be the case with the lands on which Babylon, and Palmyra, and other cities, were situated, which, as well as the whole of Upper Egypt, Palestine, etc., were formerly more fertile than they now are, considering the dryness of their atmosphere. In order to become convinced of the influence of moisture on vegetation, one needs only to visit the dry highlands of New Mexico and Colorado, and compare the vegetation there with the moist southern part of Louisiana. If we take the former in summer, and the latter in winter, so as to have the same temperature in both, the difference will be obvious and remarkable.

THE SPONTANEOUS COMBUSTION OF COAL AT SEA.

An intimation of the fearful aggregate of suffering entailed by frequent losses of ships by fire at sea is given in the fate of the crew of the San Rafael, intelligence of which has just been received. The San Rafael, of Liverpool, with a cargo of coals, was bound for Valparaiso: off Cape Horn she took fire; her crew escaped in three boats, two of which, with eleven persons, were picked up by a passing vessel after a period of dreadful suffering. The third disappeared, to be heard of no more until a party of seal-hunting natives reported to a missionary cruiser the discovery of the remains of eight men and one woman on a desert island near the cape, where they had perished with starvation. The instruments and papers found with them proved them to be the missing members of the San Rafael's crew. The details of their terrible fate have been given in the daily newspapers: the occasion of it, namely, the spontaneous combustion of coal at sea, its causes, and the means that may be adopted for preventing such disasters, are what we wish to call attention to here.

The frequency of such casualties has given rise to many enquiries by boards of trade and others, who have quite uniformly recommended ventilation as the best means of prevention. But experience shows that the more and better the ships were ventilated, the more frequent were the fires. On one occasion, four ships were loaded at Newcastle at the same time, with the same coal, from the same seam. Three of the ships, bound for Aden, were thoroughly ventilated: the fourth, for Bombay, was not ventilated at all. They were each carrying from 1,500 to 2,000 tuns of coal. The three ventilated ships were totally lost by spontaneous combustion; the fourth brought her cargo safely to port.

Repeated occurrences of this sort could not but shake the faith of shippers and underwriters in the saving efficacy of ventilation. A royal commission, made up of men like Dr. Percy and Professor Abel, was thereupon appointed to enquire into the matter, and their report, recently laid before Parliament, amply demonstrates the impolicy of ventilating cargoes of coal, especially for long voyages across the tropics; and points out clearly the conditions which lead to spontaneous combustion. Prominent among these is the development of heat due to chemical action, arising from the oxidation of substances contained in the coal. The best known of these are the combinations of iron and sulphur called iron pyrites. Moisture in the air facilitates this oxidation, which is accompanied by the development of heat, often intense enough to set the coals on fire. Obviously any increase of ventilation serves only to increase the vigor of the chemical action, and too often to ensure the destruction of the vessel. Another source of danger lies in the capacity of finely divided or porous carbon for absorbing and condensing within its pores large volumes of oxygen and other gases, with an attendant development of heat; moreover, the tendency to oxidation, which carbon and certain of its compounds possess, is favored by the condensation of oxygen within its pores, whereby the closer contact of the carbon and oxygen particles is promoted. Hence, the development of heat by absorption and the setting up of oxidation occur simultaneously; and as the heat increases, oxidation proceeds more and more energetically until the carbon is heated to the igniting point. The breaking up of the coal before and during shipment, by rough usage, favors this process.

The risks of spontaneous combustion are largely increased by the length of the voyage and the bulk of the cargo. For the most part fires occur in vessels carrying over 500 tuns, bound for the West Coast of South America, San Francisco, and Asiatic ports beyond the Mediterranean and Black Seas. Of such shipments four per cent were lost in 1874; and though they amounted to only 1,181 out of a total of 31,116 coal shipments to foreign ports, more than five sevenths of the fires occurred among them. There were seventy casualties of the sort in all, of which only ten occurred in shipments to European ports. The excess of fires by spontaneous combustion on long voyages seems all the more striking when we contrast the bulk of the European shipments—over ten and a half million tuns of coal—with the shipment of less than three million tuns to Asia, Africa, and America. And, as already remarked, the best ventilated vessels suffered most from these disasters.

Properly the conclusions of the commission are averse to ventilation in the cargoes of coal ships. They also point out that certain coals are intrinsically dangerous for shipment on long voyages: also that it is dangerous to ship pyritic coals wet, and coals much broken up in mining and transportation.

In the course of the enquiry, a curious and unexpected circumstance was revealed, showing the far-reaching effects of social changes and improvements. Arthur Helps would have been charmed with it. No two things would seem to to be more remote and independent of each other than the increase of schools among the poor and the increase of fires at sea: yet the latter seems in a measure directly due to the former. In this way: The presence of iron pyrites in coal is one cause of spontaneous combustion in coal cargoes. At the mines, boys were formerly employed to pick the "brassy lumps" out of the coal. The first effect of the Education Act was to withdraw those boys from the coal chutes and send them to school. The pyrites were no longer picked out; and straightway a remarkable increase occurred in the burning of coal ships at sea!

THE YELLOW FEVER EPIDEMIC.

Telegraphic reports from Savannah, on the 23d September, state that over two thousand people are stricken with yellow fever in that city, and eight thousand more are appealing to the country for relief and for means of preventing the spread of the infection. The disease has broken out in Charleston, and it is feared that it will extend its ravages to other Southern cities. Several cases have already occurred in Baltimore. There is a widespread feeling of concern lest, before the autumn frosts, the malady will gain a foothold in the more thickly populated cities of the Middle States. The probabilities and known features of the disease, however, all tend to remove, in this last respect, the ground for alarm. Yellow fever is not contagious from person to person, and its occurrence serves only to mark the presence of its special cause, which is generated outside the human body. The conditions for its existence must be such as are favorable to the germs which develope after being received into the system. The germs, however, are capable of being transported in infected vessels, clothing, and merchandise, and herein lies the chief danger. Militating against this are the rigid quarantine regulations which will be enforced, and the fact that the first frost to which they are subjected instantly destroys the organisms. On the other hand the disease, even when imported out of its indigenous region, is greatly promoted by auxiliary causes, such as overcrowding, defective drainage, filth, and similar negligence in sanitary precautions. It will be seen, therefore, that the prevention of the epidemic is even more in the hands of the people individually than in those of the authorities; and the importance of every person assuring himself that his immediate surroundings are in clean and healthy condition is evident.

We have so frequently pointed out the way to avoid filth diseases that it is difficult to write anything other than repetition of previous advice. We have before us the latest and best work on the subject, "Filth Diseases and their Prevention," by Dr. John Simon, F.R.C.S., and beyond all else the author states that impure water is the "chief way by which filth infections get entry into the human body." Shallow wells in thickly populated regions, he mentions as especially dangerous; and wells adjacent to privies and other filth deposits are the chief means by which enteric fever spreads in such neighborhoods. Old moldy dust heaps, wet house refuse awaiting removal, the filth of ill kept streets, leaky drains, and traps not gas tight and not freely ventilated, are other prolific causes of disease. The best disposition of house refuse, swill included, is to burn it; and carbolic acid, chloride of lime, copperas, and other cheap disinfectants should be freely employed in privies, cellars, stables, and outhouses. Filtering bad water is of little avail; where there is none other to be had, boiling with a lump of charcoal in the vessel is a good precaution.

The suffering in Savannah is augmented through lack of money to provide for the care of the sick, and there is an urgent demand for prompt assistance. Subscriptions are being raised by many organized bodies in this and other Northern cities. We trust that the call will meet a most generous response. Money may be transmitted to Hon. W. H. Wickham, Mayor of New York city, who will forward it to the Savannah authorities. We appeal to all who can afford it to do something for the sufferers, and to do it at once.

Wood Preservatives.

According to observations made on a railroad in Germany, the proportion of renewals was, with oak sleepers (not treated) after 12 years of service, 74·48 per cent; with oak sleepers, treated with chloride of zinc, after 7 years, 3·29 per cent; with oak sleepers, impregnated with creosote oil, after 6 years, 0·09 per cent; with pine sleepers, impregnated with chloride of zinc, after 7 years of service, 4·46 per cent. The practice of this railroad, since the year 1870, has been to employ only oak for sleepers, which are impregnated either with chloride of zinc or with creosote oil.

MR. C. K. WOOD wishes us to state that he intended to write that Professor Airy's clock gained 2¼ seconds, not 274 seconds, in his letter on the weight of a body inside a hollow sphere, published on page 196 of our current volume.

A GOOD acid-proof cement is made by mixing a concentrated solution of silicate of soda with powdered glass, to form a paste. This is useful for luting joints in vessels exposed to acid fumes