The epidemic of 1854 was not strictly a separate invasion, but rather a resuscitation of the last, which had lingered in the south and east of Europe and the west of Asia until called into fresh activity by the Crimean war. Every country in Europe and America was again invaded. The incidents of the outbreaks in America threw great light on the conveyance of the disease by fomites. The epidemic of 1865–66, which was the first to come wholly by the Red Sea, spread rapidly over Europe and America; but had scarcely subsided when a fresh explosion occurred at the Hurdwar fair in India in 1867, whence it was carried to Persia and Russia, being re-intensified *en route* by the pilgrimage at Great Mesched in 1868, and the fairs at Nijni Novgorod in 1869 and 1870.

At the close of the Franco-German war every country in Europe was attacked except Great Britain, and America succeeded in averting its importation until 1873. By 1874 it had, however, disappeared everywhere on this side of India. In 1881–83 it prevailed in Arabia and Egypt; in 1884 it made its appearance in France, and soon raged throughout Italy and Spain. The influence of pure water supplies was brought into special prominence, not only in the case of single towns in Italy and Spain, but in the almost complete immunity enjoyed by Germany, which had previously suffered heavily in every epidemic.

Cholera lingered in the south until the end of 1885, since which date it had been absent from the continent of Europe until the isolated outbreak in Spain in 1890. This, Dr. Willoughby was convinced, was not imported from the East, but was a recrudescence of the epidemic of 1884–85, brought about by excavations in infected ground. Still cholera had, since 1888, been slowly but steadily advancing by the Persian Gulf and the extensions of that route. It had last year reached the shores of the Caspian and Black Seas, and had raged at Mecca, though Egypt had almost miraculously escaped, and it had persisted at Aleppo and the Syrian ports certainly as late as January of the present year. He had little doubt, that, as its march had closely corresponded with that in 1845–47, we might expect history to repeat itself in an invasion of southern and eastern Europe during the coming summer, unless, as in 1823 and 1839, it should retire, after having thus approached the confines of Europe. If, however, it had not already really died out, the vast increase of communication between the two continents rendered such recession less probable than it was fifty years ago. The paper was illustrated by a number of maps showing the great routes and the course of each epidemic in Asia, Europe, and America.

NOTES AND NEWS.

DURING the early part of May, according to the Cairo correspondent of the London *Times*, there have been in Upper and Lower Egypt large swarms of locusts, which have caused much alarm, as it is believed that they originate from eggs laid last year. The damage done to the young maize, sugar, and cotton is as yet insignificant, though some individual growers have had to re-sow cotton patches which had been devastated. The provincial mudirs have received orders to do everything in their power to secure the extermination of the locusts. The correspondent says that this is the most serious reappearance of an old Egyptian plague that has been recorded for about forty years.

— The National Geographic Society was organized in January, 1888, "to increase and diffuse geographic knowledge." It is incorporated under the laws of the District of Columbia, and has at present an active membership of about four hundred. The publication of a magazine was early determined upon as one of the means of increasing and diffusing geographic knowledge, and two volumes of the *National Geographic Magazine* have been published in the form of a quarterly journal. During the past two years it has been found that the form of publication adopted at the outset meets but imperfectly the needs of the society. In the first place, since the season of active work in the society includes the winter months only, there was an excess of material for the two earlier numbers and a dearth of material for the two later numbers of the volume; and in the second place, the necessity for holding articles until sufficient material for a number was received sometimes led to delay in publishing interesting and important matter. Accordingly it has been decided to discontinue the quarterly form and to publish the magazine in the form of a series of brochures, each issued as promptly as possible after reception of the material. While the *National Geographic Magazine* is edited by and constitutes the organ of the National Geographic Society, it is not limited to this function; and, as was announced in the first number of the journal, "its pages will be open to all persons interested in geography, in the hope that it may become a channel of intercommunication, stimulate geographic investigation, and prove an acceptable medium for the publication of results." The aim of the founders has been to form a continental rather than a local society. That this aim has measurably succeeded is indicated by the fact that although the National Geographic Society is only three years old there are fifty-seven non-resident members, distributed over twenty-seven states and territories. One of the means adopted by the National Geographic Society for increasing geographic knowledge has been, as is well known, that of exploration.

— The annual report of Daniel Draper, Ph.D., director of the New York Meteorological Observatory for the year 1890, shows that during the past year the daily work of the observatory has been uninterruptedly kept up, and complete registers have been obtained of the temperature and pressure of the air; of the direction, force, and velocity of the wind; of the total amount of every rain, the temporary variation of every shower, and the depth of every snow. Not a day, even including Sundays and holidays, has been lost. The registers containing all this large amount of information have been properly arranged and filed away in suitable books. Readings are taken at Smithsonian hours, and also hourly readings from self-recording instruments. Eye observations of clouds are recorded, and the daily and monthly means, etc., are calculated from the instrumental records.

— Bulletin No. 49 of the Ohio Agricultural Experiment Station contains a communication from Mr. G. B. Strong of Cuyahoga County, Ohio, giving an account of his experience in spraying plum-trees the past season. He sprayed forty trees with London purple, at the rate of one pound to 150 gallons of water. Three applications were made, the first one being applied when the fruit was about the size of a small pea. The spray was put on until the leaves began to drip. Twenty-five bushels of plums were gathered from the forty trees, and not one per cent of the crop was stung. Two trees in the vicinity that were not sprayed had all their fruit stung. The foliage was injured somewhat, so Mr. Strong says that the solution was too strong, and that hereafter he will use one pound of London purple to 200 gallons of water, spraying more lightly, and applying only twice unless a third application becomes necessary. It is probable that Paris green would be better for spraying plum-trees than London purple, as it usually contains less soluble arsenic, and consequently is less liable to injure delicate foliage. It may be used at the rate of three ounces to fifty gallons of water. Some spraying experiments were also made by Mr. William Miller, a leading fruit grower of Ottawa County, Ohio. Having two pear orchards several rods apart, the fruit of which had for some years been greatly injured by the plum curculio, he determined to spray one of them. The larger orchard, containing several hundred trees, was accordingly sprayed twice with London purple — four ounces to fifty gallons of water. The fruit in this orchard was very much less injured by the curculio and other insects than that in the other orchard, which had not been sprayed. Mr. Miller also found the spraying machine a decided help in fighting the curculio in his plum orchard, although he did not rely upon it altogether, but used the jarring method part of the time. In 1888 the station sprayed a number of pear trees with London purple in the proportion of eight ounces to fifty gallons of water. At the same time other trees were sprayed with the same mixture, except that half a peck of fresh slaked lime was added. It was then found that while the trees sprayed with London purple alone had their foliage decidedly injured by the application, those sprayed with the lime and Lon-

don purple were not affected. In 1890 these experiments were repeated in such manner as not only to show the effect of adding lime, but also to determine whether Paris green or London purple is the more liable to cause injury to the foliage. The results of these experiments fully confirm those of 1888 and 1889 in showing the advantage of adding lime, and they further show that Paris green is much less liable to injure foliage than London purple.

— The Massachusetts Board of Health, who for some years past have been experimenting on the treatment of sewage by land filtration, have recently issued a report on the subject, in which they remark that sewage can be more efficiently filtered through open sand than through sand covered with soil. Very fine material like dust in the upper layers of a filter prevents access of air, and when wet, may do this so thoroughly that purification of the sewage is entirely prevented. By allowing periods of intermission, however, so as to allow the upper layers of the filter to dry, a high degree of purification may be attained. The quantity which can be dealt with is, however, then much below that which can be purified when the upper layers are composed of open sand, through which the sewage will rapidly disappear, leaving room for air to enter and come in contact with the thin layers of liquid covering the particles of sand. Filtering areas of sand covered with soil are much increased in efficiency by digging trenches in the direction of a slight incline, about two feet deep and six feet apart, and filling them with coarse sand, the upper layers of which should be removed about once a month and replaced by clean sand. From bacteriological experiments it was found that when the filters were in proper working order the number of organisms in the effluent from the filters were never more than two per cent of those in the raw sewage, and the board think this result may be much improved. Fine sand was found to make a very good filter, being capable of purifying sewage at the rate of 9,600 gallons per acre per day, the number of bacteria in a cubic centimetre of the sewage being reduced from 591,000 to 2,000, and the ammonias to a quarter of one per cent of those in the unfiltered fluid. Garden soil made a very poor filter, but a mixture of fine sand and gravel gave extremely good results, as 25,000 gallons would be purified by it per acre per diem in winter, and 42,000 gallons in summer; the bacteria being reduced from 350,000 per cubic centimetre in the sewage to 14,000 per cubic centimetre in the effluent. Peat was totally inefficient. A filter of sand and loam gave good results as far as purity was concerned, but the rate of filtration was only one-third as great as that of the sand-and-gravel filter.

— At a meeting of the Paris Geographical Society in December last, a letter was read from M. Paul Crampel, the substance of which is given in a recent number of the *Scottish Geographical Magazine*. In his letter M. Crampel describes a dwarf race inhabiting the forests to the north of the Ogowè. M. Crampel found several families of this people at about 13° 20′ east longitude, and 2° north latitude, living among the Fans in a state of vassalage. When a Fan chief becomes sufficiently powerful, he takes under his protection a group of these dwarfs, and establishes them in the bush near his village. They then become his hunters, and, in exchange for the ivory and meat they procure, receive old rags, broken guns, manioc, etc. The Bayaga, on their side, enter this state of servitude voluntarily, for, having no plantations, they cannot otherwise procure vegetable food; but when their feudal lord is too exacting, they leave the neighborhood. Their average height is four feet seven inches. They are squarely built, well proportioned, and muscular. The color of the skin is a yellowish-brown, and hair grows all over their bodies. At first sight one is struck by the prominence of their bushy eyebrows and their high cheek bones. They have short necks, high shoulders, broad and rounded chests, strong arms, and thick wrists. When at rest, their feet are generally turned inwards, and their knees, calves, and feet seem as though they were all in one piece. Their general expression is one of fear, and when any one looks at them they hang their heads and appear to tremble. Each head of a family lives with his children and grandchildren, and into this little community no stranger blood is admitted. When a young Bayaga wishes to marry, he is provisionally adopted into the family of his intended bride, and, after a long period of service in hunting and collecting honey for the community, is allowed to marry; but he must still remain in the family of his wife until he has a son, and this son has killed an elephant. He may then depart with his wife, leaving the son in her stead. Polygamy is permitted, but the scarcity of women and the family organization place great obstacles in the way of its practice.

— For the preservation of hydrogen peroxide Kingzett recommends the addition of a small amount of ether. Experiments conducted by the author show, according to the *Medical Record*, that pure hydrogen peroxide lost, in twenty-eight days, 10 per cent; in ninety-eight days, 27.4 per cent; in two hundred days, 39 per cent; and in four hundred and ninety days, 89.2 per cent. The addition of sulphuric acid reduced these figures to 9, 23, 27½, and 68.3, respectively. Alcohol reduced them to 1.7, 4, 7.4, and 52.8, respectively, while ether still further reduced them, showing a loss of the peroxide in the times mentioned of 0, 1.3, 2.4, and 15.9, respectively.

— At the Royal Society *conversazione*, May 6, a great deal of interest was excited by the exhibition of sixty tools and utensils of the Roman period, found together in a pit in the Roman-British city of Silchester, Hants. These included an anvil, a pair of blacksmith's tongs, hammer, axes, gouges, chisels, adzes, a large carpenter's plane, two shoemaking anvils, two plough coulters, a standing lamp, a gridiron, a bronze scale beam, and others. Many of these articles were most remarkably like similar tools of the present day, the plane, which was evidently a "trying plane," and entirely of metal, being very suggestive of a Yankee origin. It is said to be the only Roman plane found in Britain. It would be interesting to know if this particular make of plane has ever been found elsewhere. It would seem as if the metal planes introduced the last few years are merely a reversion to an old type, a kind of atavism.

— Sixteen graves have recently been uncovered at Fort Ancient, the site of the greatest of the earthworks of the mound-builders. The excavation is under the auspices of the World's Fair, and under the direction of Professor F. W. Putnam of Harvard, the field work being in charge of Warren K. Moorehead. The skeletons disclosed were those of eleven men, one woman, and four children. Five were in a good state of preservation, the others in various stages of decay. In one grave the bones were so nearly gone as to preserve only the outline in crusted ashes. In another the skull alone remained, in the jaws of which were the well-polished teeth. The skeletons were those of men averaging five feet two inches in height, the tallest being six feet two inches. The burials were from three to five feet below the surface. The skeletons rested upon hard clay. Around them had been rudely set up flat river stones, then earth had been filled in, and over all broad flat stones placed. There are evidences that the men had died in conflict. About the neck of one of the child skeletons was found a necklace of bears' teeth, and in two or three of the graves were found tomahawks and stone hatchets, but no relics of an especial value. The graves will be reconstructed exactly as found for the World's Fair exhibit of American antiquities, except that no earth will be over the skeletons.

— The House of Representatives in the new Diet of Japan, says the London *Journal of Education*, is extremely anxious to cut down the Budget, and a conflict is imminent between it and the government on this subject. Its proposals are sweeping, and if carried out would cause no little consternation in the education department. The grant for schools would be reduced from $800,000 to about half that sum. Some five years since, the late Viscount Mori, who perished by an assassin's knife on the day of the declaration of the constitution, just two years ago, established five great higher middle schools, in different centres throughout the empire, to act as feeders for the university, and to serve as a check on the growing congestion of students in the capital. These institutions are specially threatened by the parliamentary reformers, many of whom hold Spencerian views, and dislike government control in education. Generally speaking, this is a critical time for education in Japan. The rising generation is growing up

without those habits of instinctive obedience and reverence which characterized the previous civilization, and the capable teachers are all young and comparatively untried men. The question how to preserve sound morality and discipline in the schools is causing grave concern at headquarters. There is a conservative movement at full flow just now, the demand for foreigners as teachers is at ebb, the schools in most cases preferring Japanese who can help them translate. Foreign modes have never been so unpopular since the great revolution. There is a troublesome class in the capital known as *soshi*, a word which it is difficult to translate so as to convey an adequate meaning. They are not students, though so described sometimes, but rather political unattached meddlers, who would right all wrongs by the use of sword-sticks and bombs. They profess to be intense patriots, and are certainly in many cases reckless of their lives, and most deliberate in carrying out their plans. The only school in which anything of the *soshi* spirit has appeared is the Higher Middle School of Tokyo, some of the students in which have once or twice disgraced themselves.

— In the new number of the Journal of the Bombay Natural History Society, says *Nature*, Lieut. H. E. Barnes continues his interesting papers on nesting in western India. Speaking of house-sparrows, he says that no amount of persecution seems to deter them from building in a place when they have once made up their minds to it. At Deesa he found that a pair had built a large nest in the antlers of a *sambur* in the veranda. Another pair made a nest in the soap-box in the bath-room, and, although the nest was destroyed several times, they would not desist, and at last, "from sheer pity," he had to leave them alone. The most peculiar case was when a pair had a nest in a bird-cage hanging against the wall, just above where the *durzi* sat all day working, and close to a door through which people were passing in and out continually. The door of the cage had been left open, the previous occupant having been transferred elsewhere. Not only were four eggs laid, but the nestlings were reared, although the cage was frequently taken down to be shown to visitors. Once the eggs were nearly lost, a boy having taken them out. The fuss made by the birds led to the recovery of the eggs. The author has a curious note on another peculiarity of sparrows. "I have often," he says, "had to turn the face of a looking-glass to the wall to prevent them from injuring themselves, for immediately one of them catches a glimpse of himself in it, he commences a furious onslaught on what he imagines must be a rival, and, if not prevented, will continue fighting the whole day, only leaving off when darkness sets in, recommencing the battle at dawn the next day. I once tried to see how long it would be before the bird gave in, but after two days, seeing no likelihood of his retiring from the unequal contest, I took pity on him and had the glass covered up. The bird did not seem in any way exhausted, although I do not think that he had a morsel of food for two days."

— From a report of Professor A. E. Dolbear, the electrician of the Portelectric Company, we learn that during the past year experiments have been carried on at the New England Portelectric Station in Dorchester, with the view of determining the best conditions for building and operating a commercial line employing the method known as the "Portelectric," to which we have before referred in *Science*. As the whole scheme was a new one, every step was a tentative one. The oval track is 2,784 feet long, and the curves are much too short to attain the high speeds attainable on a straight line. When the car was first sent round the track, it made the circuit in about two minutes; now it has made it in fifty-one seconds. The hindrances to still swifter travel are only the mechanical ones of proper track and alignment. That this is so is evident from the fact that an acceleration of six feet per second has been observed upon the iron car, which weighs about 500 pounds; an acceleration which if maintained for thirty seconds would give it a speed of 180 feet per second — a little more than two miles a minute. The friction of the present structure is therefore the only impediment; and it is equally obvious that the strap rails used, the lack of stiffness in the beam carrying the upper rail, and the severe wedging of the wheels as they go round the sharp curves are the factors. These, of course, can be entirely remedied. The experimental car is hollow, and has an interior capacity of about five cubic feet, and is therefore capable of holding about 10,000 letters, which would weigh 180 pounds; or the space could be filled with other packages needing transportation. It is probable that a still greater capacity in the car could be had with as great efficiency in power and speed. On account of the fact that the car closes its own circuit in the coil where it chances to be, it happens that numbers of cars can be running upon the same track at once, each one taking its supply of electrical energy independent of the rest. Suppose, then, a line between Boston and New York. If the speed be, say, two miles a minute, then, if a car left, every five minutes, they would be ten miles apart. If this rate of despatching a car be maintained for all-day service, there would be $12 \times 24 = 288$ cars one way per day, and if each one's load was, say, 250 pounds, they could transport thirty-six tons per day. If the track were double, as it probably would be, it could transport twice that amount.

— On the 7th of April last, says *The Missionary Herald*, the Harris School of Science at Kyōto, Japan, was opened and the Science Hall dedicated. The building is 110 by 65 feet, with a wing for a laboratory, and has connected with it an astronomical tower. The cost was about $15,000, which, with $85,000 for endowment, was the gift of an American, who desires that scientific instruction shall be conducted under Christian influences.

— Some remarkable electrical phenomena accompanying the production upon the large scale of solid carbon dioxide are described by Dr. Haussknecht of Berlin in a recent number of the *Berichte* of the German Chemical Society, of which *Nature* of May 14 gives a brief account. In order to obtain large quantities of solid carbonic acid it is found most convenient in practice to allow the liquid stored in the usual form of iron cylinder to escape into a stout canvas bag, best constructed of sail-cloth or some such strong fabric, instead of the usual lecture-room receiving apparatus, the cylinder being inclined from the vertical so as to permit of a ready and uniform exit from the opened valve. The liquid under these circumstances issues at pressures varying from sixty to eighty atmospheres, and a compact snow-like mass of solid carbon dioxide is formed in the canvass receiver, owing, as is well-known, to the extreme lowering of the temperature of the liquid due to its sudden expansion and the accompanying absorption of heat. When the experiment is performed in the dark, the canvas receiver is seen to be illuminated within by a pale greenish-violet light, and Dr. Haussknecht states that electric sparks ten to twenty centimetres long dart out from the pores of the cloth. If the hand is held in these sparks the usual pricking sensation is felt, similar to that perceived on touching the conductor of an electric machine at work. Dr. Haussknecht further states that the phenomenon is very noticeable in the dark whenever there is a leakage in any portion of the compressing apparatus or the manometers connected therewith. The reason assigned for this development of statical electricity is similar in principle to that usually accepted in explanation of the hydro-electric machine of Sir William Armstrong. As the liquid carbonic acid is issuing from the valve it becomes partly converted into gas, which is violently forced through every pore of the canvas. Moreover, carried along with this stream of gas are great quantities of minute globules of liquid, which are brought in forcible contact with the solid particles already deposited. Dr. Haussknecht therefore considers that the electrical excitation is due mainly to the violent friction between these liquid globules and the solid snow. It is very essential for the successful reproduction of these electrical phenomena that the carbon dioxide should be absolutely free from admixed air; that prepared artificially yielding much finer results than that obtained from natural waters, which latter contains considerable quantities of air. The luminosity is not generally developed in the interior of the receiver until a crust of solid carbonic acid from one-half to one centimetre thick has been deposited, which renders the probability of the correctness of the above theory all the greater. Dr. Haussknecht has constructed a special form of apparatus, with which he is now experimenting, with the view of being able to determine the sign, nature, and quantity of the generated electricity.