they give from the immediate necessities of the organism. Touch, the most immediate and least inferential of the senses, is least subject to illusions; while sight is so very much so, that the blind often say they have an advantage over the seeing in being free from visual illusions. The illusions of bodily motion are much nearer to those of touch than to those of sight, and yet they can under certain conditions be induced through visual impressions. Of this the writer has recently had two interesting examples. He was standing upon the floor of a railroad-depot, the boards of which were laid with a considerable open space between them; and the shadow of an electric light was moving up and down by the swinging of the light in the wind. Looking at the floor, it seemed as though the shadow were stationary, and the floor-boards moving. From this it followed that the person on it was moving too, and the writer distinctly felt the swinging sensation: in fact, his attention was called to the phenomena by this feeling of motion. The other observation was as follows: while riding in the cars and looking out of the window, the trees and all are seen to move in the opposite direction. If, now, one looks in a mirror so situated that it reflects the passing landscape, which, however, must not be visible except in the mirror, one has the illusion of moving in the opposite to the real direction of motion, owing to the reversal of the image in the glass. In both these cases an immediate bodily sensation is induced by a more or less unconscious inference through visual sensations.

HEALTH MATTERS.

Scarlet-Fever.

ONE of the most valuable communications which we have received in answer to the series of questions which were propounded relative to scarlet-fever in *Science* of Dec. 16, 1887, is that from the pen of Dr. Henry B. Baker, secretary of the State Board of Health of Michigan. The arrangements which Dr. Baker has instituted for obtaining information from every town and village of the State are so thorough and complete, that the deductions made from the statistics thus obtained are especially valuable and trustworthy.

Dr. Baker does not believe that scarlet-fever ever arises *de novo*, but, judging from researches by Dr. Klein and others, thinks it is possible that the pre-existing case may have been a cow or some other animal, and not a human being. There is no doubt in his mind that scarlet-fever is a communicable disease; and he gives the following instances which have come under his own personal observation, tending to prove this communicability:—

(*a*) A child about four years old was taken sick with scarlet-fever a few days after putting on a cloak made in a room in which was a little girl convalescent from scarlet-fever.

(*b*) A young woman came into the (small) residence in which a child was sick with scarlet-fever, remained less than an hour, rode several miles into the country, where in a few days she was taken sick with scarlet-fever.

(*c*) Members of the family into which was introduced the young woman mentioned above, in a few days were taken sick with scarlet-fever, and one of them died.

In reference to the communication of bovine scarlet-fever to man, either by contagion or the milk of affected animals, he has no information except that which has already been given relating to the Hendon dairy, of which he says that the evidence of scarlet-fever being communicated from diseased milch-cows is given by Mr. Power and Dr. Klein, who traced outbreaks of scarlet-fever to milk received from diseased cows on the Hendon farm in England. Milk from these cows was distributed by all the distributers of milk from the Hendon farm except one, and this was the only district supplied by milk from this farm which was not affected with scarlet-fever. Dr. Klein obtained from these cows a particular microbe identical with the micrococcus found in persons affected with scarlet-fever. Other cows inoculated with the micrococcus from scarlet-fever patients became affected with a cutaneous and visceral disease similar to that which affected the Hendon cows. We have already (*Science*, Feb. 10, 1888) referred to the fact that these observations of Power and Klein are disputed by Professor Crookshank, who investigated the matter for the English privy council. Crookshank believes that the disease was cow-pox, and not scarlet-fever, and that, as a natural sequence, the outbreak of scarlet-fever attributed by Klein to the Hendon cows had no connection with them whatever. In Dr. Baker's opinion, a person who has had scarlet-fever is probably liable to communicate the disease to others until after the completion of the process of desquamation (peeling or scaling of the outer skin), which process also occurs to surfaces in the interior of the body, and which, on some external parts, *may* not be completed for two or three months. But without bathing, and change of clothing or its thorough disinfection, a person may communicate scarlet-fever many months after desquamation has ceased. Cases illustrative of this are recorded on p. 257 of the 'Report of the Michigan State Board of Health for 1885,' p. 275 of the report for 1884, and p. 219 of the report for 1886.

Dr. Baker has personally known of instances where articles of clothing, books, etc., have retained infection for a few weeks; but he has known, by means of reliable information, of the infection having been retained for much longer times. For instance, a trustworthy physician informed him that a patient of his, being cold, went to a closet and procured a cape worn by his brother one year before, during convalescence from scarlet-fever. In a few days he was himself taken sick with scarlet-fever. Dr. Baker thinks that boards of health should not require reports of cases of scarlet-fever to be made to them unless the people themselves have by law made provision therefor. Nothing is gained by boards of health, or other servants of the people, attempting to dogmatically force people to do what their intelligence, or lack of it, does not lead them to see is right and just. Boards of health should strive to put the facts before the people, and to execute existing laws.

The *people* should by law require that prompt report be given to the local health-officer, on the occurrence of a case of scarlet-fever. Proper penalty should be affixed to the violation of this law, and the law should be enforced by the prosecuting attorney. The report should be required to be made by every householder, hotel-keeper, keeper of a boarding house, or tenant, who shall know, or shall be informed by a physician, or shall have reason to believe, that any person in his family, hotel, boarding-house, or premises is taken sick with scarlet-fever. The notice should state the name of the person sick, and so designate the house or room in which the person is as to enable the health-officer to enter at once upon his duties of restricting the disease as promptly as the fire department enters upon the restriction of a fire. The penalty should not be enforced against a householder, etc., if the case is at once properly reported by the physician. Every physician should be required to report to the local health-officer every case of scarlet-fever which comes under his observation. A fee should be paid by the people to the physician who makes such a report for the public good.

The reasons why notice of scarlet-fever should be given are similar to those why public notice of a fire should be promptly given by whoever gains the knowledge first. The common safety of life is endangered by keeping such knowledge secret. No one person's or few persons' interests should be permitted to weigh against the interest of humanity at large.

If the law permits, it is the duty of the board of health to act as promptly for the restriction of the disease as the fire department acts for the restriction of a fire, and for similar reasons: life and property are in jeopardy so long as the case is not isolated.

The law should require the health officer[1] (*a*) immediately to investigate the subject, and, in behalf of the board of health of which he is an executive officer, (*b*) to order the prompt and thorough isolation of those sick or infected with such disease, so long as there is danger of their communicating the disease to other persons; (*c*) to see that no person suffers for lack of nurses or other necessaries because of isolation for the public good; (*d*) to give public notice of infected places by placard on the premises, and otherwise if necessary; (*e*) to promptly notify teachers or superintendents of schools concerning families in which are contagious diseases; (*f*) to supervise funerals of persons dead from scarlet-fever; (*g*) to disinfect rooms, clothing, and premises, and all articles likely to be infected, before allowing their use by persons other than those in isolation; (*h*) to keep the president of his

[1] In cities so large that this work cannot be done by the health-officer, a sufficient number of experts should be employed in this work.

own board of health, and the secretary of the State board of health, constantly informed respecting every outbreak of scarlet-fever, and of the facts, so far as the same shall come to his knowledge, respecting sources of danger of any such diseased person or infected article being brought into or taken out of the township, city, or village of which he is the health-officer.

The spread of scarlet-fever can generally be prevented by the plan of prompt notification, thorough isolation, and complete disinfection of all infected substances. But when this plan has come into general operation, there is needed a plan for the prevention of the introduction of the disease from without the jurisdiction. Quarantine officers should be required to be as watchful and strict to prevent the introduction of scarlet-fever as of small-pox, because the loss of life by scarlet-fever is many times greater than by small-pox. For results of perfect and of imperfect compliance with this plan, see the diagram (A) presented herewith; see also Proceedings of Michigan State Board of Health, January, 1887, where it is shown that there was a probable saving of 3,718 lives from this one disease in the first eleven years after the adoption of this plan by the Michigan State Board of Health.

Probably much may be done to prevent well persons from contracting scarlet-fever when they are exposed to it. Statistics seem to prove that the rise and fall of this disease are controlled by the temperature and humidity of the atmosphere; scarlet-fever rising after the temperature falls, and falling after it rises. The reasons why are stated in Dr. Baker's paper on 'Some of the Cold Weather Communicable Diseases' (with diagrams), in the Transactions of the Michigan State Medical Society, 1887.

A very great number of reports have been received by the Michigan State Board of Health from reliable physicians, stating facts which show that scarlet-fever is conveyed by "direct communication," "exposure while visiting," etc.

The following statements are taken from the reports of the health-officers to the Michigan State Board of Health, showing that scarlet-fever may be conveyed by clothing, etc., and after a long period of time has elapsed since the first case occurred (with the name of health-officer and locality subjoined): —

"A man living in Detroit who has a child living in this neighborhood came to see her, and in a short time the little girl was sick of scarlet-fever. It was ascertained that he had been living with a family who were afflicted with the same." — Dr. S. HOLCOMB, health-officer, Southfield Township, Oakland County.

"By the presentation of the dress of a little girl who died at Jackson to a little girl living here." — Dr. SAMUEL DUBOISE, Unadilla Township, Livingston County.

"A woman brought the disease from Canada in her clothing. and gave it to the children where she staid. Case No. 1 took it then, and case No. 2 took it from the children at school." — E. F. WOOD, health-officer, Isabella Township, Isabella County.

"The only source of contagium that I have been able to discover was through letters received from a family residing in Mount Pleasant, which was then affected with it." — Dr. J. P. COOPER, health-officer, Ithaca Township, Gratiot County.

"I have but one case of contagious disease to report this week, that of Miss N. F., age seven years. The source of contagium is peculiar. Miss G. H., of Grass Lake, Jackson County, Mich., sick with scarlet-fever, wrote a letter to the mother of this patient, and she (the little girl) had the envelope in her mouth. Seven days later she came down with the disease. It seems certain that she contracted the disease in that manner, as there is no other way that I can account for the appearance of the disease in that part of the township." — Dr. H. C. MAYNARD, health-officer, Hartford Village, Van Buren County.

"Last June one of Mr. More's children had scarlet-fever. Strange to relate, but one of them had it. The 10th of this month [November] the carpets were taken up, and Fannie, and Lulu, a cousin living near by, romped and played on them while in the yard. In a little over a week both of them were taken sick with scarlet-fever. No precautions were taken after the case had occurred last June, and hence the outbreak nearly four months afterwards." — Dr. M. E. BISHOP, health-officer, South Haven Village, Van Buren County.

The 'Report of the Michigan State Board of Health for 1884' contains, on p. 276, the following accounts of methods of spread of scarlet-fever: —

Dr. A. L. Ambrose, health-officer of Hanover Township, Jackson County, reported three cases of scarlet-fever where the source of contagium was a washtub which had been used several weeks previously by a family having the scarlet-fever. In four cases the contagium was left in houses that had not been properly disinfected. In one case the germs of the disease remained in the bedding that had been used by a scarlet-fever patient six or seven months previously. In one case the disease was taken from "old rags of eighteen to twenty months' standing."

Nov. 19, Dr. N. W. Andrews, health-officer of North Muskegon, writes, "There was, some six or eight months ago, a mild case of scarlet-fever in the adjoining house: at the time, the people who now have the case had some household furniture stored there, which has lately been moved into their own house. I can find no other cause for the outbreak than that the contagium was communicated by means of the tapestry, which had been stored in a room where the child when sick had been allowed to go."

The following interesting statements are extracts from a letter received Aug. 23, 1884, from Rev. Fayette Hurd of Grand Blanc, Mich., giving facts concerning scarlet-fever near the village of Laingsburg, Shiawassee County, during the month of December, 1880: —

"About Dec. 20, 1880, the family were in the garret of the house, gathering up rubbish that had been collecting there for some time. They put into a basket to be burned a number of magazines, pictures, pieces of cloth, window-curtains, carpet-rags, and an old rubber doll, which belonged to a family that had the scarlet-fever in the same house during the winter of 1874–75. The boys gathered up a good many of the pictures, and the girl took the doll, which belonged to the child who had the disease in 1874, and was, I think, used by her when sick with scarlet-fever. The curtains were hung in the windows of the room during the sickness in 1874–75.

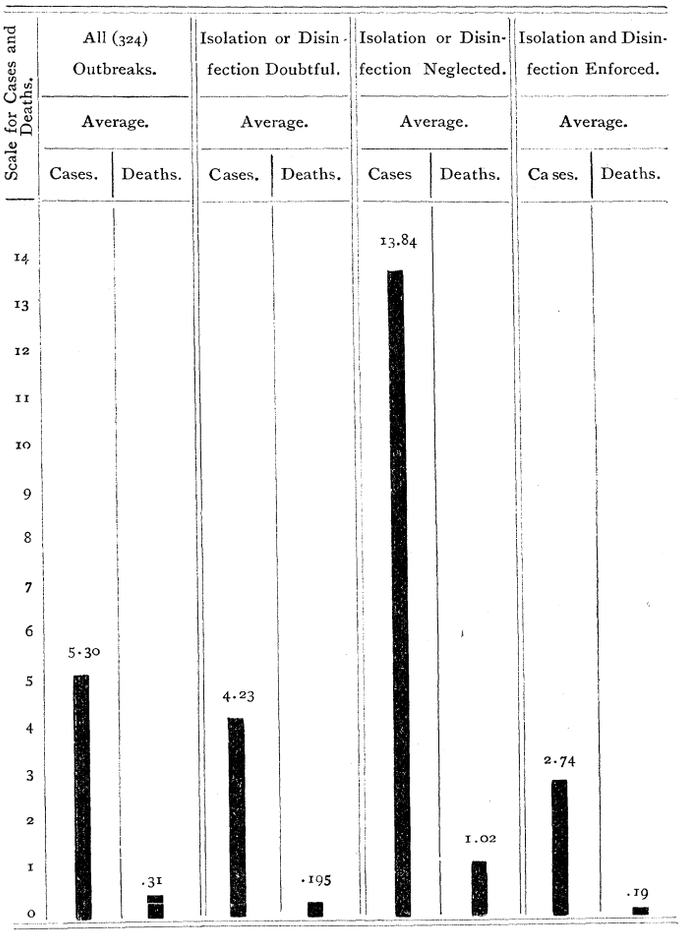

DIAGRAM A.

The things saved out were used by the children for two or three days. The rest of the rubbish was burned. Near the last of December the three children were taken sick with scarlet-fever."

The diagram (A) exhibits in a condensed form the experiences of the health-officers in Michigan relating to scarlet-fever during the year 1886. It shows, that, in the 324 outbreaks, the average number of cases was 5.30, and the deaths were .31 ; that in the 45 outbreaks in which isolation or disinfection, or both, were neglected, the average number of cases was 13.84, and the deaths 1.02 ; that in the 58 outbreaks in which isolation and disinfection were both enforced, the average number of cases was only 2.74, and the average number of deaths .19, the difference being an average of 11.10, and .83 deaths, indicating a saving in these 58 outbreaks of 644 cases and 48 deaths. This saving is shown not simply by comparison with those outbreaks in which nothing was done, but also with outbreaks in which either isolation or disinfection was enforced.

A table (compiled in the office of the secretary of the State board of health, from reports made by local health-officers) giving the basis for the diagram and foregoing statement is as follows : —

SCARLET-FEVER IN MICHIGAN IN 1886.

	(1) All Outbreaks. (324 Outbreaks.)		(2) Isolation or Disinfection not mentioned, or Statements Doubtful. (220 Outbreaks.)		(3) Isolation or Disinfection, or Both, Neglected. (45 Outbreaks.)		(4) Isolation and Disinfection Both Enforced. (59 Outbreaks.)	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
Totals....	1,716	100	914	41	623	46	179	13
Averages.	5.30	0.31	4.15	0.19	13.84	1.02	3.03	0.22

BOOK-REVIEWS.

Geology, Chemical, Physical, and Stratigraphical. Vol. II. By JOSEPH PRESTWICH. Oxford, Clarendon Pr. 8°.

THE present volume of Prestwich's 'Geology' treats of stratigraphy and physical geology, — the history of the earth as traced from the study of strata and fossils. In the first volume of this great work, which appeared in 1886, the composition of rocks, and the changes brought about in them by the various meteorological agencies on the surface, and by thermal and chemical action at depths, were discussed, and the nature of the disturbances which the rocks have undergone by the action of subterranean agencies, the elevation of mountain-chains, and the manner of volcanic action, were described. This discussion of dynamic geology is now followed by a geological history. As the handbook is mainly intended for use in Europe, the geological history of Europe, more especially that of Great Britain, is treated more fully than that of other countries ; but the author, after having described the geological history of a period in Great Britain, gives a sketch of the contemporaneous course of events in other parts of the world.

The volume deals naturally with two classes of geological data, — paleontological and physiographical. The description of the evolution of life in the various periods and areas is profusely illustrated by carefully selected illustrations, part of which are printed in the text, while others are shown on lithographed plates. The cuts show the characteristic classes and orders which are peculiar to the greater divisions, while the plates show characteristic genera of each group. In discussing the lesser divisions of formations, figures representing important species are inserted in the text. By this arrangement of illustrations, and by a careful choice of the best among the available material, the author has succeeded in making the volume very instructive and useful to the student. He dwells at some length on the results of recent discoveries, and on the important part played by sponges and foraminifera in building up certain sedimentary strata. The relation of the globigerina ooze of the deep seas to the chalk is fully discussed ; and the author shows that the physical conditions of the deep sea of the present time, with its cold polar water, and those of the cretaceous sea, which was probably not so deep, and certainly not so cold, were so different that their deposits must necessarily be different. He compares the chemical and physical composition of the chalks to that of the globigerina ooze, and shows that the former is far purer than the latter, and that no equivalent deposit is forming at the present time. "The conditions under which it was deposited were peculiar and special ; and, though it presents many points of analogy to the calcareous ooze, there are none of identity ; and the chalk stands alone among the British strata in its peculiar structure and origin. It is for these reasons that I have taken the opportunity of making the foregoing remarks, not because the chalk forms an exception to the general rule of constant change, but because its features are so clear and so well marked that it serves better than most other deposits to illustrate this law of unceasing variation."

The range of genera and species of the same period through space is also briefly described. The geophysical problems which geological history has to treat are wisely confined to the concluding chapters, where the student will find the most important theories held by physicists discussed, so far as they can be proved or refuted by geological data. The author himself advocates the theory of a thin crust, a solid nucleus, and a viscous magma between the two, as he believes that the motions of the earth's crust can only be explained by such a theory.

The volume has a very full index, and is accompanied by a geological map of Europe compiled by William Topley and T. G. Goodchild. The colors adopted resemble, for the most part, those proposed by the International Geological Congress, with the exception of the Trias, Permian, and Siluro-Cambrian, for which the tints more familiar to English geologists were retained.

NOTES AND NEWS.

ABOUT one hundred and fifty scientific men and women of Washington gathered in the hall of the Columbian University on the evening of Thursday, April 5, to pay their tributes to the memory of Dr. Asa Gray, the eminent botanist, and to listen to addresses by several of his intimate friends and co-workers. The president of the meeting was Professor Langley, secretary of the Smithsonian Institution, who opened the exercises with a brief tribute to the memory of Dr. Gray. Professor Chickering delivered the first address, giving a sketch of the life and life-work of Dr. Gray, tracing the gradual unfolding from the pioneer's life of boyhood to the finished scholar and true scientist of middle and later life. The world is indebted to him, he said, for popularizing botany. He put into plain English that which interested people. He had a genius for work. Work was a delight. He was never in a hurry. He had time for social enjoyment with his friends, as well as for investigation and the preparation of a great number of books. He conducted a very large correspondence, but he economized time and labor even in this. He often returned a letter containing a great number of questions with simply 'yes' or 'no' written at the bottom of each. Professor Chickering also spoke of the honors that had been heaped upon him. He was a member of the Royal Society of London, and, of the Institute of France, one of the eight immortal foreign members. Professor Chickering spoke of the last year of his life as the happiest, and closed with an eloquent tribute to his memory. Dr. Vasey of the Agricultural Department spoke of the influence Dr. Gray exerted upon botanical science. He began with a review of the state of botanical knowledge before his time, spoke of his studies under Dr. Torrey in New York, of his botanical text-books, and of his investigations of the collections made by the government and by private individuals. He spoke in detail of his work ; said that during his lifetime the number of known botanical species upon the continent of North America had increased from 4,081 to more than 11,000, and the number of volumes of his school-books published was more than half a million. Prof. L. F. Ward of the National Museum spoke of Dr. Gray's relations to the discovery of the theory of evolution, showing that Mr. Darwin had the greatest confidence in him, and intrusted to him, almost before he did to any other, the secret of his great discovery. Dr. Gray was one of the first to understand and appreciate the importance of Mr. Darwin's work, and did more than any other to make it acceptable