system, and originated, like the earth, from out of the solar atmosphere. Meteorites are most probably fragments of planets, and a large proportion of them include iron in their composition, often as carbides, in the same form as ordinary cast iron; that is to say, a part of the carbon is free, and a part is in chemical union with the iron. It has been shown, besides, that all basalts contain iron, and basalts are nothing more than lavas forced by volcanic eruptions from the heart of the earth to its surface. The same causes may have led to the existence of combinations of carbon with other metals.

The process of the formation of petroleum seems to be the following: It is generally admitted that the crust of the earth is very thin in comparison with the diameter of the latter, and that this crust encloses soft or fluid substances, among which the carbides of iron and of other metals find a place. When, in consequence of cooling or some other cause, a fissure takes place through which a mountain-range is protruded, the crust of the earth is bent, and at the foot of the hills fissures are formed; or, at any rate, the continuity of the rocky layers is disturbed, and they are rendered more or less porous, so that surface waters are able to make their way deep into the bowels of the earth, and to reach occasionally the heated deposits of metallic carbides, which may exist either in a separated condition or blended with other matter. Under such circumstances, it is easy to see what must take place. Iron, or whatever other metal may be present, forms an oxide with the oxygen of the water. Hydrogen is either set free or combined with the carbon which was associated with the metal, and becomes a volatile substance; that is, naphtha. The water which had penetrated down to the incandescent mass was changed into steam, a portion of which found its way through the porous substances with which the fissures were filled, and carried with it the vapors of the newly formed hydrocarbons; and this mixture of vapors was condensed wholly or in part as soon as it reached the cooler strata. The chemical composition of the hydrocarbons produced will depend upon the conditions of temperature and pressure under which they are formed. It is obvious that these may vary between very wide limits; and hence it is that mineral oils, mineral pitch, ozokerite, and similar products differ so greatly from each other in the relative proportions of hydrogen and carbon. I may mention that artificial petroleum has been frequently prepared by a process analogous to that described above.

Such is the theory of the distinguished philosopher, who has framed it not alone upon his wide chemical knowledge, but also upon the practical experience derived from visiting officially the principal oil-producing districts of Europe and America, from discussing the subject with able men deeply interested in the oil industry, and from collecting all the available literature on the subject. It is needless to remark that Dr. Mendeleeff's views are not shared by every competent authority; nevertheless the remarkable permanence of oil-wells, the apparently inexhaustible evolution of hydrocarbon gases in certain regions, almost forces one to believe that the hydrocarbon products must be forming as fast as they are consumed, that there is little danger of the demand ever exceeding the supply, and that there is every prospect of oil being found in almost every portion of the surface of the earth, especially in the vicinity of great geological disturbances. Improved methods of boring wells will enable greater depths to be reached; and it should be remembered, that, apart from the cost of sinking a deep well, there is no extra expense in working at great depths, because the oil generally rises to the surface or near it. The extraordinary pressures, amounting to three hundred pounds per square inch, which have been measured in some wells, seem to me to yield conclusive evidence of the impermeability of the strata from under which the oil has been forced up, and tend to confirm the view that it must have been formed in regions far below any which could have contained organic remains.

AT Reykjavik a society has just been established, under the presidentship of Professor B. Grondal, called the Icelandic Naturalists' Society, the chief aim of which is to found a museum of natural history for Iceland, to be the property of the country. For this purpose it is not only intended to collect specimens of the fauna, flora, and mineral deposits of Iceland, but also to obtain by exchange, or in any other convenient manner, specimens from abroad.

OPEN-AIR TRAVEL AS A CURER AND PREVENTER OF CONSUMPTION, AS SEEN IN THE HISTORY OF A NEW ENGLAND FAMILY.[1]

"For my own part, I intend to hunt twice a week during my stay with Sir Roger; and I shall prescribe the moderate use of this exercise to all my country friends as the best kind of physic for mending a bad and preserving a good one." — *Sir Roger de Coverley*, chapter xiii. p. 101, Goldschmidt, Edinburgh, 1889.

IT is a curious coincidence, that, at the same meeting of the Climatological Association, the president should give you some information gleaned from my recorded cases as to the connection of pleurisy with phthisis, and I should present the history of my father,[2] cured, as I believe, of severe phthisical symptoms by a journey in an open chaise, and by persistent daily walking of from five to six miles during the rest of his life. In connection with this, I shall endeavor to show, that, by the same persistent open-air treatment of his children during their periods of growth, he was able to prevent the occurrence of the same disease in a large number of his descendants, who, in consequence of himself and his wife being tuberculous, and also first-cousins, must have been very strongly predisposed to it.[3]

I have a record of this journey as kept by my father in 1808, when he was thirty-five years of age. I found it recently, tied up in a bundle of old papers which had been resting quietly hidden for over half a century. It is a very compact, precisely written statement of that journey, showing, indirectly at least, its benign effects upon him.

It is eminently suggestive to me of the proper treatment of certain cases of phthisis; and, in the hope that it will be suggestive to others also, I now lay it before this society. To some sensitive minds it may seem to be of too private and personal a character to be placed thus freely before any public assembly. I have no such feeling when questions of human health and happiness are involved.

In 1808 my father was undoubtedly threatened with consumption. He had cough, hemoptysis, anorexia, diarrhœa, and general malaise, with fever and great debility. On Aug. 29 of that year, when thus ill, he started, with a friend as his companion and driver, in an open, one-horse chaise for a tour through New England. At that time it will be recollected that there were no cars, and travel was had in one's own carriage or in public coaches holding nine persons. These were driven over turnpikes or private roads. There were hotels, more or less comfortable, at which travellers could sleep and get food, in every town. This record lets us more or less distinctly into the feelings, physical and mental, of every day of the month during which the journey lasted. A glance at the map[4] will show that the travellers went from Salem, Mass., down into Rhode Island, thence by way of Connecticut up through the hills of western Massachusetts to Albany and Troy, and back through Massachusetts to New Hampshire, Vermont, and Maine, and then to the home from which he started. During the trip he travelled 748 miles, passed through 113 towns and cities, and the time spent in this daily open-air exercise was thirty days. During that time he went through all stages of feeling of mental discouragement and of physical weakness up to a real enjoyment of life.

Allow me to refer briefly to these changes. Starting from Sa-

[1] Read before the American Climatological Association, June, 1889, by Henry L. Bowditch, M.D., of Boston, Mass.

[2] Capt. Nathaniel Bowditch, the father of American mathematics.

[3] I am well aware, that, since the brilliant discovery by Koch of the bacillus tuberculosis, some writers deny that phthisis can be inherited. But surely this opinion I cannot think true. All my medical experience is directly against it. Moreover, we all admit that a certain deterioration of the vital power of the whole, or an abrasion of a part, of the body, is necessary for the life and propagation of the bacillus and consequent production of tubercular phthisis. Hence, as far as active out-of-door life tends to the production of perfect health in a person or a family, it would seem, *a priori*, that the course pursued by my father, which undoubtedly was of such infinite service in his own case toward the cure of phthisis, must have been of great use to his children as a preventive, by making them all robust from their earliest years. By so doing he opposed any tendency to poor constitutions, impressed on them from their births; which tendencies, if they had not been counteracted from early life, would, I believe, have made his descendants easy recipients of phthisis.

[4] A large map was shown at the meeting, marked by circles on the towns where the nights were passed. These circles were entirely black at first, indicating great depression of mind and body, and they became gradually lighter as the patient got better. Those over the last half of the journey were not only free from any shade, but were surrounded by a red border, indicating the comfortable feeling of returning health.

lem (black) with the prominent signs of phthisis, he was so much exhausted, and had hemoptysis after a drive of twenty-five miles to Milton, that the landlord of the hotel advised his friend to take him home to die, as he could not possibly drive to Taunton the next day, as proposed. I derive this last statement, not from the journal, but from family tradition. The travellers were both of them plucky, and not only made that next day's journey, but the sick man felt somewhat better at evening, and notes in the latter part of his record the condition of the country before arriving at Taunton. His fifty miles since leaving Salem had evidently done no harm, but rather good. Anorexia had gone, as he "dined" (with relish, apparently, because he could get nothing else) "on bacon and eggs." Arrived at New Bedford next day, he feels able to visit a friend. He examines a factory. He makes remarks on the inhabitants he met and their employments. Though still having some fever, he feels so much better that much darkness is removed from the circle. Still more refreshed after a night's sleep, and having still less fever, he visits a coal-mine recently discovered in the vicinity.

From this time there is almost steady improvement. He visits Newport (109 miles from Salem), admires the harbor, but notices its lack of shipping (to which in Salem, with its fleets of ships and their long, wealth-bringing East India voyages, he had been long accustomed). At Providence (141 miles from Salem) he finds friends, and has pleasant meeting with them. Nothing is said of illness. On the contrary, he has his "Rosinante harnessed" the next day, with the intention of driving out of his intended route, in order to visit the cotton-factories at Pawtucket Falls. Arriving at Hartford (195 miles from Salem), he is altogether better, finds good fare and a fine hotel. He meets there the judges in their circuit, and has pleasant and profitable conversation with them at the hotel at which they were stopping for the night.

At New Haven (256 miles from Salem, and twelve days of open-air travel) he calls on President Dwight of Yale College, and regrets that the eminent Professor Silliman is absent, He visits the library, and finds it wanting in most of the modern English, French, and German scientific works he had been so long acquainted with, and had studied in Salem. At New Haven he makes, for the last time, any allusion to his health, in the following words: "I have a little pain in my breast, but my appetite and general health are good."

After this date, till he arrived home, his record seems like that of a common traveller. He makes no complaints, but describes brightly the places, friends, and others met, exactly as if he were well, and travelling for pleasure only.

At Albany he makes an especial and extra journey to Troy with a party of transiently met friends, leaving his chaise for nearly two days in the former city. He found the trip "very pleasant." On return to Albany from Troy, he had driven 432 miles in nineteen days.

Starting for home, he appears delighted while travelling through a "picturesque" country, and meeting at the various hotels intelligent company whose society he was able generally to enjoy.[1] He visits the village of Canaan, and describes in detail what he saw of the Shakers, and heard an extraordinary sermon delivered *at* him, among others, as one of the "outside mankind." I forbear quoting from it. His appetite was becoming ravenous. They would not give him at one tavern, as he says, "half as much as I wanted for my dinner." Finally he arrived home at Salem, so the record states, "in much better health than he had when starting."

His subsequent course in regard to himself and to his children induces me to believe that the journey, though benefiting him immensely, had not wholly cured him; but it had proved to him the absolute need he had of regular, daily, physical, open-air exercise. Afterward, under walks of one and a half to two miles, taken three times daily during thirty years of life, all pulmonary troubles disappeared. He died in 1838, from carcinoma of the stomach, one lung presenting evidences of an ancient cicatrix at its apex, both being otherwise normal. He was sixty-five years old; i.e., thirty years after the journey.

[1] This was not always the case, however, for at one town he met one gentleman, "a member of Congress," who was apparently stupid enough. "He scarcely spoke a syllable during the evening."

Having thus experienced in his own case the vast benefits resulting from constant, regular exercise out of doors, he apparently determined that his children should be early instructed in the same course. As soon as we were old enough, he required of us daily morning walks down to a certain well-known divine's meeting-house, about three-quarters of a mile or a mile from our home. I remember them very well for the tricks played with my brothers on our way down, and for sundry twinges of conscience, felt even at this moment, at the thought that we sometimes decided that the sight of the "weathercock on Dr. Bentley's steeple," though seen more than a quarter of a mile from our proper destination, was near enough to our father's directions.

If any of us, while attending school, were observed to be drooping, or made the least pretence even to being not "exactly well," he took us from school, and very often sent us to the country to have farm-life and out-of-door "play to our hearts' content." Once he told me to go and play, and to "stay away from study as long as you choose." In fact, he believed heartily in the old Roman maxim of "a healthy mind in a healthy body." In consequence of this early instruction, all of his descendants have become thoroughly impressed with the advantages of daily walking, of summer vacations in the country, and of camping out, etc., among the mountains. These habits have been transmitted, I think, to his grandchildren in a stronger form, if possible, than he himself had them.

You will readily agree with me that such habits are among the surest guaranties against the prevalence of phthisis in a family. Before detailing the actual result of these habits upon our family, I must state the prospective chances of our escape from the malady. My father married his cousin, who, after long invalidism, died of chronic phthisis in 1834. Certainly a consanguineous union of two consumptives foreboded nothing but evil. They had eight children (born respectively in the years 1805, 1806, 1808, 1809, 1813, 1816, 1819, 1823). Two (born 1809 and 1813; i.e., one and five years after the journey) died, one at eleven, and the other at birth. All the others either are now alive, or they arrived at adult life and married, and have had children and grandchildren, but not a trace of phthisis has appeared in any of these ninety-three[1] persons.

Now, I ask the consideration of this question: To what cause can we attribute this extraordinary immunity from the disease which is generally regarded as showing the influence of heredity and of consanguineous unions more, perhaps, than most other complaints?

If any one can see any other explanation than the influence of this original journey upon the health of one of the great-great-grandparents, conjoined with his wise management of his own health subsequently, and his fastening upon his descendants, even to the present day, the virtues of open-air life, I hope he will frankly say so. Truth should be forever our motto; and the man who will convince me of the error of any scientific, or apparently scientific, statement I may utter, and which, if not corrected, may lead others astray, I regard not as an opponent, but as my foremost friend.

I submit these facts and thoughts for candid, mature, and practical consideration and use in the treatment all are called to make of this terrible scourge of all parts of this Union. For my own part, I fully believe that many patients now die from want of this open-air treatment. For years I have directed every phthisical patient to walk daily from three to six miles; never to stay all day at home unless a violent storm be raging. When they are in doubt about going out, owing to "bad weather," I direct them to "solve the doubt, not by staying in the house, but by going out."

A cloudy day, or a mild rain, or the coldest weather, should not deter them. If the weather be very cold, let them put on respirators before leaving the house, and be thoroughly wrapped in proper clothing for the season. I direct them never to stand still and gossip with friends in the open street, as by so doing they are much more liable to get a chill than while walking. Hence, summer and winter alike, my patients usually get plenty of fresh air, uncontami-

[1] The number of their descendants amounts now (1889) to 8 children, 31 grandchildren, 50 great-grandchildren, 4 great-great-grandchildren: total 93. It may be noted, that, of the two who were born in 1809 and 1813, one died when eleven years old (1820), and the other at birth (1813); while the writer and reader of this paper was born twenty days before the journey began.

nated, in a great part at least, by the previous breathing of it by themselves or by other occupants of the house. This course, I believe, might be pursued in any part of our common country. I am certain that I know of patients who have become well, and able to attend to the business of life, under this course. May we not also at times send our patients over short distances in open vehicles, instead of thousands of miles off in ill-ventilated cars to an entirely different climate? Have any of us ever sufficiently tried this open-air journeying at home, so to speak; that is, in the region of the country where the patient lives, wherever that may be?

Certainly this proposed course has at least two sound physiological principles in its favor: viz., a gentle exercise, for many hours in each day, of the whole frame; and an almost perpetual change of air drawn in with each respiratory act, as occurs while driving in a carriage open at the front, and in walking. I have no objection to drugs, properly chosen, and I almost always administer them; but if the choice were given me to stay in the house and use medicines, or to live constantly in the open air without them, I should infinitely prefer the latter course in case of my being threatened with pulmonary consumption.

HEALTH MATTERS.

Typhoid-Fever should be reported to the Health-Officer.

TYPHOID-FEVER is a disease which the State Board of Health of Michigan has declared to be "dangerous to the public health," and as such it comes under the law requiring physicians to report to the health-officials. Any physician who shall neglect to immediately give such notice "shall forfeit for each such offence a sum not less than fifty nor more than one hundred dollars." After Oct. 1, any householder who shall refuse or wilfully neglect immediately to give such notice shall be deemed guilty of a misdemeanor, and is liable to a fine of one hundred dollars, or, in default of payment thereof, may be punished by imprisonment in the county jail not exceeding ninety days.

It seems important that the people generally shall understand this new law, which applies to scarlet-fever, diphtheria, small-pox, and all such dangerous diseases, as well as to typhoid-fever; but at this time of the year typhoid-fever is usually most prevalent, and it is especially dangerous in times of drought: therefore the safety of the people may now be greatly promoted by having every case of typhoid-fever reported to the health-officer, who is by law (Section 1, Act 137, Laws of 1883) required to promptly attend to the restriction of every such disease. A new law, which takes effect Oct. 1, makes it a misdemeanor, punishable by fine or imprisonment, for the health-officer knowingly to violate that section of the law, or for any person knowingly to violate the orders of the health-officer made in accordance with that section. But the actual penalties which are incurred by the violation of these laws are the death penalties to many of the people, about one thousand being lost in Michigan in each year from typhoid-fever. The saving of a large proportion of these lives is the real reason for the effort, in which it is hoped all the people will join, for the restriction of typhoid-fever and other dangerous diseases.

HOW MUCH SHOULD A CITY PAY ITS HEALTH-OFFICER? — The Michigan State Board of Health has recently published a paper by its secretary, Dr. H. B. Baker, in which he asks the question how much the average city or village can afford to pay its health-officer. He answers this question in this way: "Statistics which cannot be questioned prove, that, in those localities in Michigan where the recommendations of the State Board of Health are carried out, about eighty per cent of the deaths from diphtheria and scarlet-fever are prevented by the thorough isolation of all infected persons, and the thorough disinfection of all infected persons, things, and places. Statisticians usually value a person in the prime of life as worth to the community about one thousand dollars." Dr. Baker thinks that in a village of fifteen hundred inhabitants a health-officer can easily save the lives of two children and one grown person in each year, and he concludes that such a village can well afford to pay its health-officer two thousand dollars for the prevention and restriction of scarlet-fever, diphtheria, and typhoid-fever — and make money by the transaction.

INGENUITY OF CRIMINALS. — The *Medical Press and Circular* finds in an Indian contemporary some curious instances of misapplied ingenuity on the part of certain habitual criminals in that country. The discovery on a prisoner of a heavy leaden bullet about three-quarters of an inch in diameter led to an inquiry into the object to which it was applied. It was ascertained that it served to bring about the formation of a pouch-like recess at the base of the epiglottis. The ball is allowed to slide down to the desired position, and it is retained there for about half an hour at a time. This operation is repeated many times daily until a pouch the desired size results, in which criminals contrive to secrete jewels, money, etc., in such a way as to defy the most careful search, and without interfering in any way with speech or respiration. Upwards of twenty prisoners at Calcutta were found to be provided with this pouch formation. The resources of the professional malingerer are exceedingly varied, and testify to no small amount of cunning. The taking of internal irritants is very common, but would-be inpatients very frequently overshoot the mark, and render recovery impossible. Castor-oil seeds, croton beans, and sundry other agents are employed with this object in view, and the medical officers of Indian prisons have to be continually on the lookout for artificially induced diseases, which baffle diagnosis and resist treatment. Army surgeons are not altogether unfamiliar with these tricks, but the British soldier is a mere child in such matters compared with the artful Hindoos.

REGULATION OF BREATHING IN SEASICKNESS. — Dr. Ivan A. Mitropolsky of Moscow recommends, on the ground of his own experience, the following simple method for preventing or aborting all symptoms of seasickness. According to *The Medical Record*, as soon as giddiness, nausea, etc., appear, the author shuts his eyes, and begins to make deep and slow inspirations and expirations. In a few moments (sometimes after three or four respiratory cycles) the symptoms disappear to yield to a comfortable subjective sensation. On their re-appearance, the same procedure is repeated again and again. If the recurrence be rather frequent, it is better to perform the procedure in a recumbent posture (with closed eyes). Since the time the author has begun to practise the method, he never yet suffered from vomiting when on board. In referring to this case in the London *Medical Recorder*, Dr. Idelson says that Dr. Mitropolsky seems to think that the means proposed by him is novel. Meanwhile, in the *British Medical Journal*, March 24, 1888, p. 676, he will find a very interesting note by Dr. J. J. Leiser, in which the writer says (1) that seasickness is caused by irregular and imperfect respiration, leading necessarily to an inadequate aëration of the patient's blood, which consequently becomes poisonous to his brain, and gives rise to sympathetic sickness; (2) that a system of regular, free breathing prevents sickness, or rapidly relieves it; and (3) that his experiments were successfully repeated by Drs. G. C. Stockman and C. W. C. Prentice, who, having selected ten suffering passengers, each seated himself with five of them, and "timed the breathing in the following manner: they (the doctors) raised the hand from the knee, indicating an inspiration, and down again for an expiration, thus timing the respirations to exactly twenty per minute. At the expiration of one hour the active symptoms in each case had entirely subsided." By this time the doctors had thoroughly educated their patients in the *modus operandi* of the cure. The cases continued to be permanent "cures" during the remainder of the voyage from Queenstown to the United States. The writers conclude by asserting that "the cure is infallible in all cases that persist in carrying it out."

HOT-AIR INHALATIONS IN CONSUMPTION. — From experiments in a number of cases, Dr. E. L. Trudeau of Saranac Lake, N.Y., concludes that (1) the therapeutic value of hot-air inhalations in phthisis is doubtful; and (2) the evidence obtained by the bacteriological study of the cases presented does not confirm the assumption that inhalations of heated air can either prevent the growth of the tubercle bacillus in the lungs of living individuals or diminish the virulence of this microbe when it has gained access to them.

THE BREEDING OF SINNERS. — The French Government hopes, apparently, by promoting marriages between male and female convicts, to bring back these stray sheep into the fold of morality and