brownish; longitudinally striate; fracture more or less fibrous; upon transverse section tangentially striate, with yellowish bast fibres; almost inodorous, sweetish, afterward bitter and nauseous."

It contains a whitish-yellow resin, which is claimed to be the active principle.

Azedarach disturbs the digestive tract, causing, in large doses, vomiting and diarrhœa. It is a fatal narcotic poison in still larger ones, but its qualities are not well known. It is usually given, however, for intestinal worms, in decoction, or in syrup of the fresh root. Dose, 4 to 8 gm. (ʒ i. ad ʒ ij.).

Birds become stupefied by eating the berries, and fatal cases of poisoning by the seeds have occurred in India.

Allied Plants.—*Melia Indica* Brandis. *Margosa*, another Indian plant of the genus, has a bitter bark and wood. It is used as a tonic. *W. P. Bolles.*

AZORES.—The Azores or Western Islands lie about 2,000 miles from Boston, 1,400 miles from the Lizard Point, in England, and 800 from the coast of Portugal, of which they are a possession. The islands are nine in number and are divided into three distinct groups, about one hundred miles apart: Santa Maria and San Miguel forming the southeastern portion, Flores and Corvo the northwestern, and the remaining five the central division. The total area of the islands is about 1,000 square miles, and the population is estimated at 300,000. San Miguel is the largest island, being 40 miles long and 10 broad. Fayal and San Miguel are the two islands which are generally visited and with which there is the best communication. One can reach them by steamers from New York and Portugal, and possibly by sailing vessels from Boston. The whole system of islands is of volcanic origin, and their outlines in consequence are rugged and picturesque. The coast line is precipitous, and the central portion of each island rises in mountain peaks, which vary in height from 1,889 feet (San Miguel) to 7,613 feet (island of Pico). There are no natural harbors, and vessels lie in the open roadstead off the principal ports. A breakwater has been under construction for a long time at San Miguel, but it is not yet completed.

The vegetation is rich and luxuriant, and both tropical and subtropical fruits—the fig, orange, banana, loquot, pineapple, prickly pear, guava, pomegranate, and lemon —grow in the open air. Flowers bloom in nearly infinite variety, and the gardens of San Miguel and Fayal contain an almost endless diversity of tree, flower, and fruit. There are no fewer than forty plants peculiar to the islands. Besides these there are about four hundred species which are found in Europe, and three hundred and forty which are not found in Europe, but are common to Madeira, the Canary Islands, and the Azores (Roundell).

The climate is a mild and moist marine one, and very equable at all seasons of the year. The mean annual temperature is 62° F. The extremes are stated to be 86° and 45° F. The range between winter and summer is from 10° to 15°. The night temperature is generally not more than four degrees cooler than the day. The summer is enervating at 70° F., and one is drenched with perspiration on the slightest exertion. The mean temperature for winter is 58°, for spring 61°, for summer 68°, and for autumn 62° F. The three coldest months are usually January, February, and March. In winter it sometimes feels chilly and damp, and one seldom leaves home without an umbrella. The humidity is so great that wallpaper will not adhere, and the veneering of furniture strips off. The mean annual relative humidity is 76 per cent. and for winter it is 77 per cent. The mean annual rainfall is 38.5 inches. The wind blows with great force at times and there are frequent storms. "The prevailing direction of the wind in winter is from the south, southwest, and northwest, and in summer from the northeast, east, and north" (Solly, "Medical Climatology," 1897).

Ponta Delgada, in San Miguel, is the largest city of the islands. It has a population of 25,000 inhabitants. There is a good theatre, a public library, numbers of fine gardens, ancient churches and government buildings, public markets, etc. There are comfortable accommodations here as well as at Horta, the principal town of Fayal, and the food is generally good. Twenty-seven miles from Ponta Delgada by carriage road, through beautiful and wild scenery, is the Valle das Furnas, where are hot sulphur springs of a temperature of from 56° to 212° F. All contain sulphur, iron, alum, and silica in varying proportions. Besides the public bath houses, built by the Government and free to all, there are also private baths. The bath tubs are cut out of solid limestone or lava rock, and have taps for hot and cold water, the hot coming from the sulphur spring, and the cold from the water impregnated with iron. The bathing season begins in June and lasts for six months, during which time a large number of people frequent Las Furnas. The general custom is to hire lodgings and to take meals at the hotels. The various diseases for which these springs are beneficial are chronic rheumatism, which is almost invariably benefited; paralysis, syphilis, skin diseases (especially eczema), dyspepsia, and internal troubles.

Las Furnas itself is situated in the valley of the Furnas, which is the bottom of a vast crater of an extinct volcano. In this valley are the various boiling springs, with masses of white vapor hanging over them. A roaring noise is heard, as the hot gases issue from the earth. The *Caldeira Grande* supplies the sulphur water to the baths, and is enclosed by a wall some six feet in height. The water in this tank-like enclosure boils in a most furious manner and with a great noise. It furnishes nineteen gallons per minute (Roundell). The ground about is covered with patches of white sulphur and alum, streaked with orange and red. In another part of the valley is the *Boca do Inferno*, or "Mouth of Hell," a dark pit of unknown depth filled with boiling mud, constantly thrown up with a great smoke and noise. This mud is collected by the people and used as an external application in skin diseases. All the geysers or springs are said to boil most furiously when the wind is east.

So far as the climate in general of these islands is concerned it is applicable to such cases as require a mild, equable, moist climate. It is therefore suitable for patients who are suffering from neurasthenia, from Bright's disease, from nervous affections, from hay fever, etc., and for those who are convalescing from the grippe and from other acute diseases. "There is comparatively little sickness on any of the islands—very rarely any regular fevers or epidemics of any kind prevail" (Junkin). The water supply is from springs, wells, and cisterns, and is generally good.

From a personal visit to Fayal and Pico, the writer can testify to the charm and fascination of these strange islands with their ancient and primitive customs, beautiful scenery, and delightful and ever-varied walks, drives, and excursions. One can hardly conceive of a more entrancing place for the lover of nature, or one more restful and refreshing for the weary and overworked. The only drawback is the long journey there, which is almost prohibitory to a sufferer from sea-sickness.

For a very interesting and extended account of these islands the reader is referred to Mrs. Charles Roundell's "A Visit to the Azores," and also to the two papers by Canfield and Junkin on "The Azores as a Health Resort." *Edward O. Otis.*

AZULE SPRINGS.—Santa Clara County, California. Location, 12 miles west of San José. These springs are not in use as a resort, but the waters are bottled and shipped in large quantities to all parts of California and even more distant points. An analysis by a chemist whose name we have been unable to secure resulted as follows:

One United States Gallon Contains:

Solids.	Grains.
Sodium chloride	86.73
Sodium carbonate	52.19
Potassium chloride	10.90
Potassium carbonate	2.85
Magnesium carbonate	78.16
Magnesium chloride	17.42
Calcium carbonate	10.05
Silica	3.20
Organic matter	0.18
Total	261.68

Free carbonic acid gas, 153.77 cubic inches; temperature, 59.6° F.

This is a good example of the alkaline-saline-carbonated class of waters. The analysis shows considerable resemblance to that of the Nassau Seltzer Springs in Germany. The water possesses antacid, aperient, diuretic, and tonic properties. *J. K. Crook.*

BACTERIA, PATHOGENIC, AND OTHER PATHOGENIC MICRO-ORGANISMS.

The Schizomycetes or Bacteria.

These are the smallest and at the same time the most interesting of all known living organisms. While most bacteria are harmless—some of them, indeed, being of the greatest use in the economy of nature, by producing the decomposition of dead animal and vegetable matter, without which life on the earth would be impossible—others are the cause of various infectious diseases in man and animals. Bacteria are very widely distributed in nature, and are present in the air, water, soil, and also in the food and bodies of animals.

Historical Review of the Development of Bacteriology.—Although most of the important discoveries of bacteria in their relation to disease are of comparatively recent date, from the earliest days of medicine, and long before these micro-organisms were known to exist, minute living germs were thought to be concerned in the production of many diseases. Before entering, therefore, into a detailed consideration of pathogenic bacteria, it may be interesting and instructive to review briefly the more important steps which lead up to the development of bacteriology as a science.

The first authentic observations of living micro-organisms of which there is any record are those of Athanasius Kircher, a Jesuit priest, in 1671. The compound microscope dates from 1590, but this observer was the first to find in putrid meat, milk, vinegar, cheese, etc., minute living organisms or "worms," invisible to the naked eye, which he concluded must be the cause of putrefaction. Kircher, however, did not describe the form or character of these "little worms," and with the microscopes in use in his day he probably did not see bacteria, as we now understand them. Nevertheless, his observations seemed to substantiate the view that infective diseases might be caused by substances which, introduced into the body, give rise at first to no symptoms but increase till they bring about disease: the opinion held at that time by many physicians being that if putrefaction is produced by living organisms outside the body, when these organisms are found in the blood, etc., they must necessarily cause putrefaction there also.

Not long after this, in 1675, Anthony van Leeuwenhock, a citizen of Delft, Holland, a linen draper by trade, who practised the art of grinding and polishing lenses, constructed a microscope with which he was able to observe in rain water, in putrid infusions, in human saliva, in intestinal evacuations of man and animals, and in the scrapings between the teeth, numbers of living "animalcula," as he called them, varying in form and size and in the character of their motion. Of these he gave descriptions and drawings which are remarkable for their accuracy, considering the imperfect optical instruments at his command, and there is little doubt that he really saw some of the larger species of bacteria, probably spirilla. Leeuwenhock made no attempt to assign any importance to these organisms regarding any rôle they might play in relation to disease, his work being conspicuous for its purely objective and unspeculative nature. But his contemporaries and those who immediately succeeded him seized upon the idea of these animalcules causing a great number of diseases, even in cases in which they were not found, reasoning from analogy that they must be present, until there arose a veritable craze of the germ theory of disease or *contagium animatum*. Then later followed a reaction, and the idea for a time was ridiculed out of existence. And so throughout the history of medicine this theory continued to be often asserted and as often again denied, on speculative grounds, until well into the present century, when the question was finally settled by actual observation and experiment.

Among those who at this early date (the end of the sixteenth and beginning of the seventeenth century) held to the doctrine of *contagium animatum* were Lange and Hauptmann, who shortly after Leeuwenhock's investigations advanced the opinion that puerperal fever, measles, smallpox, typhus, pleurisy, epilepsy, gout, and many other diseases were due to animal contagion. And in 1701 Andry and Linné assumed the same origin for syphilis, and Lancisi (1718) for malaria. Antonius Plenciz, a physician of Vienna, who published his deductions in 1762, maintained that not only were all infectious diseases due to micro-organisms, but that the infective material could be nothing else than living animals or plants. On these grounds he endeavored to explain the variations in the incubation period of different diseases. He insisted also that special germs were concerned in the production of each infectious disease. Plenciz believed, moreover, that these micro-organisms were capable of multiplication in the body, and suggested the possibility of their being conveyed from place to place through the air, etc. Besides these deductions he also made original investigations into the processes of putrefaction and fermentation, and having found animalcules in all decomposing material, he became so thoroughly convinced of their causative relation to these processes that he formulated the law that decomposition of animal and vegetable matter takes place only by means of and through the increase of living organisms.

Still all this was entirely a matter of speculation only, unproved by direct experiment; but the theory advanced was so plausible and the arguments used in its support were so logical and convincing, that in spite of great opposition and ridicule it continued to gain ground, and in many instances the conclusions reached by these early philosophers have since been shown to be correct.

Meanwhile the question which most attracted the interest of all investigators into the cause of infectious diseases was: What is the source of the micro-organisms which are supposed to produce these processes? Are they the result of vegetative changes in the substances in which they are found—the theory of *generatio æquivoca*, or spontaneous generation; or are they reproduced from similar pre-existing organisms—the vitalistic theory? This question is intimately connected with the investigations into the origin and nature of fermentation and putrefaction, for it was in these experiments that the theory of spontaneous generation was overthrown and the germ theory established.

Of those who most vigorously advocated the idea of *generatio æquivoca* was Needham, who, in 1749, attempted to prove experimentally the truth of his opinions. He placed a grain of barley in a watch glass containing water, covered it carefully, and allowed it to germinate. On later examination he found living micro-organisms present which he maintained were the effect, not the cause, of the decomposition and due to vegetative changes in the grain itself. Again, he boiled meat infusions and kept them in tightly corked flasks; in these also living organisms developed. As all life must have been destroyed by the boiling, and the closed flasks shut out apparently everything from without, Needham concluded that the organisms present could have been produced only from the dead material by spontaneous generation.

This conclusion seemed indeed irrefutable at the time, but Bonnet, in 1762, suggested that possibly there were certain germs which were able to resist the boiling temperature, or that the flasks were not so tightly closed that no germs could enter. Then in 1769 Lazarus and Spalianzani showed experimentally the falseness of Needham's results, by demonstrating that if putrescible infusions of organic matter were placed in hermetically sealed flasks and boiled for an hour the infusions remained sterile; neither were living organisms found in the liquids, nor did they decompose. It was objected to these experiments that the high temperature to which the liquids were subjected so altered them that spontaneous generation could not occur. Spallanzani then simply cracked one of the flasks a little and allowed air to enter, when organisms and decomposition again appeared in the boiled solutions. Again it was objected that in excluding the oxygen of the air by hermetically sealing the flasks the essential condition for the development of putrefaction, which required the free admission of this gas, was interfered with. This objection was met by Schultze in 1836, who showed that the air could have access to sterilized infusions without causing putrefaction, if it were first freed from germs by passing it through strong sulphuric acid. Schwann effected the same thing in 1837 by passing the air through red-hot tubes; and Helmholtz in 1843 repeated and confirmed these experiments with calcined air. Again the point was raised that the heating of the air had perhaps brought about some chemical change which prevented the production of putrefaction. Schroeder and von Dusch then showed, in 1854, that if the air was filtered through cotton wool, by simply placing stoppers of this material in the mouths of the flasks before boiling—a device which has since proved of inestimable value in bacteriological work—the contained liquid was incapable of producing putrefaction. Similar results were obtained by Hoffmann in 1860, and by Chevreul and Pasteur in 1861, without a cotton filter, by drawing out the neck of the flask and bending it downward, the mouth being left open. Here the force of gravity prevents the suspended bacteria in the air from ascending, and there is no current to carry them upward into the liquid. Tyndall later (1876) showed by his investigations upon the floating substances in the air that in a closed chamber in which the air is not disturbed by currents, all suspended particles settle to the bottom, the superincumbent air being optically pure. He demonstrated beyond all doubt that the presence of living organisms in decomposing fluids was always to be explained either by the pre-existence of similar living forms in the fluid or upon the walls of the vessels containing it, or by the liquid being exposed to air which was contaminated by organisms.

But still another matter required explanation. A certain percentage of the experiments with infusions, which had been boiled for a considerable time and carefully protected from subsequent contamination, would now and then fail despite every precaution. Bonnet in 1762 had suggested the explanation of this, on the assumption that some organisms were perhaps capable of withstanding the boiling temperature, and still grow when the infusion cooled. Then Pasteur found that he could sterilize milk only at a temperature of 110° C., and later (1865) showed that the organisms which resist boiling temperature are reproductive bodies, now known as *spores*. But it was not until 1876 that the nature of spores was carefully studied and explained by Cohn, and afterward confirmed by Koch. These investigators proved that certain rod-shaped bacteria possess the power of passing into a resting or spore stage under peculiar conditions of growth, and that when in this stage they are much less susceptible to the injurious action of higher temperatures and other deleterious influences than when in their normal vegetative condition.

With this discovery the question of spontaneous generation was finally settled in the negative and the germ theory established. If living micro-organisms, some of them capable of producing the more resistant spores, were present in the air, soil, water, etc., it was easy enough to understand how irregularities occurred in previous experiments; nor could there longer be any doubt that bacteria were the cause, not the effect, of fermentation and putrefaction, and possibly also of disease.

But, in the mean time, little or nothing had been accomplished in the systematic classification of bacteria, although their forms were zealously studied microscopically as matters of curiosity. The first attempt at classification was made by Müller, of Copenhagen, in 1786, who divided micro-organisms into two main divisions—*monas* and *vibrio*. But he, like all the earlier naturalists, owing to lack of sufficiently powerful microscopes and inadequate knowledge of the biology of bacteria, fell into grave errors of classification. Thus various motile organisms, which are now recognized to be of vegetable origin, were commonly included among the infusorians or unicellular animal organisms. Even Ehrenberg, in 1838, and Dujardin, in 1841, though their work shows considerable progress in this direction, failed to arrive at a satisfactory classification of bacteria; these authors dividing bacteria into four orders—*bacterium*, *vibrio*, *spirillum*, and *spirochaëte*—and including them with the infusorians. Perty, in 1852, was the first apparently to draw attention to the vegetable origin of bacteria; and Robin, in 1853, then suggested their relationship to the algæ. But it remained for Cohn in 1854, and Naegeli in 1857, to bring anything like system into the confusion which had previously existed regarding the classification of bacteria. It was Naegeli who established their resemblance to the fungi, in that they were chlorophyll-free plants, and gave them the name of *schizomycetes* or fission fungi to indicate their mode of reproduction; and Cohn confirmed and emphasized this relation of bacterial species to the vegetable kingdom, and first employed the term *bacteria* for the entire class of these micro-organisms, studying their various groups more carefully.

At the same time, the physiological properties of bacteria were studied, with as much, if not more, success than their morphology and classification. Stimulated by the discovery of the microbic origin of the processes of fermentation and putrefaction,—the specific cause of one form of which, alcoholic fermentation, was found by Latour and Schwann, in 1837, to be the yeast plant (*saccharomyces cerevisiæ*)—the study of the causal relation of micro-organisms to disease was again taken up with renewed vigor. So far the bacterial source of infectious diseases was founded only on hypothesis, and although belief in this theory was much strengthened by the foregoing experiments, it had not yet been proved. It was not long, however, before the necessary proof was forthcoming at least for one disease, for in the same year as Schwann's discovery of the yeast plant, Bassi discovered that a fatal infectious malady of silkworms was due to a parasitic micro-organism; and later a similar origin was found for various infectious diseases in grains, potatoes, etc. Just about this time, too (1840), Henle published his "Pathological Investigations," in which he described the relation of bacteria to disease with remarkable clearness and precision, the weight of the opinion of this great authority contributing much to arouse interest in the doctrine of infection. Although Henle failed to find organisms in the tissues in various infectious diseases, this did not lead him to change his opinion, for he contended rightly that there were no means at that time of distinguishing between tissue cells and bacteria. Nor did he consider the presence of micro-organisms alone sufficient proof of their etiological relation, but postulated the conditions later confirmed to the letter by Koch, which must be fulfilled to demonstrate that a disease is due to a specific micro-organism. These conditions were constant presence in the disease, isolation, and evidence of the infectious nature of the isolated germ by inoculation. Similar conclusions were also reached by Mitchell, independently, reasoning by deduction.

Very soon after this it was shown experimentally that micro-organisms were the cause of various skin diseases in man, as favus and ringworm. About this time also, Pollender (1849) observed certain rod-shaped bacteria in the blood of animals dying from anthrax or splenic fever, and he was followed by Davaine (1850); but these observers attached no special significance to their discovery until Pasteur made public his researches in regard to

fermentation and the rôle played by bacteria in the economy of nature. Then Davaine resumed his studies, and in 1863 established by inoculation experiments the bacterial origin of anthrax,—which was later confirmed by Pasteur, Koch, and others.

Schwann had already shown the connection between certain organisms and alcoholic fermentation, but Pasteur, in 1857, deserves the credit of finally establishing the fact that the various kinds of fermentation,—lactic acid, butyric acid, acetic acid fermentation, etc.—are all caused by micro-organisms, which not only differ in physiological action, but are characterized by morphological and biological peculiarities. In this connection Pasteur also made the discovery of certain bacteria which were incapable of growth in free oxygen, assigning to them the name of *anaërobes* to distinguish them from the *aërobes*, or those requiring the presence of free oxygen. Others, again, he found were capable of growth, either with or without free oxygen, and these he called *facultative anaërobes*. Pasteur's investigations demonstrated the fact that since bacteria are the cause of fermentation and putrefaction, they are necessary for the life of plants and animals, for without their agency the higher plants, incapable of feeding upon the complex substances of dead animals and plants, would die if these substances did not undergo decomposition into their elements through the instrumentality of bacteria; and thus the earth would be uninhabitable.

The next important discoveries related to the cause of infection in wounds. Lemaire, following up the experiments of Pasteur, had observed that when carbolic acid was added to putrescible substances fermentation was prevented, and he came to the conclusion that the carbolic acid destroyed the germs which produced fermentation. The processes of fermentation and suppuration he believed to be analogous. If the addition of carbolic acid solution inhibited fermentation, why should it not be applicable to the prevention of suppuration in wounds?

Upon these suggestions Lister now (1863–70) instituted his famous antiseptic treatment of wounds, which has led to such brilliant results in modern operative surgery. The publication of Lister's work exerted a powerful influence upon the general recognition of the germ theory of infectious diseases, and had much to do in lessening the number of its opponents. Then Rindfleisch, in 1866, and Waldeyer and von Recklinghausen, in 1871, drew attention to the constant occurrence of micro-organisms in pyæmic processes resulting from wound infection,—observations which have since been amply corroborated by others for all suppurative processes under whatever condition produced.

From this time on followed, in comparatively rapid succession, the discoveries of a number of micro-organisms as the cause of various infectious diseases. In 1873, Obermeier announced having found in the blood of patients suffering from relapsing fever a minute spiral, motile organism—the *spirochaëte Obermeieri*—which is now recognized as the specific infective agent in this disease. In 1878, Koch published his important work on traumatic diseases. In 1879, Hansen reported the discovery of bacilli in the cells of leprous tubercles, which, from subsequent investigations, are believed to be the cause of leprosy. Neisser, in the same year (1879), discovered the "gonococcus" in gonorrhœal pus. In 1880, Eberth and Koch, independently, observed the typhoid bacillus, which Gaffky, in 1884, proved to be the cause of typhoid fever. In the same year Pasteur published his discovery of the bacillus of fowl cholera and his investigations upon protective inoculation against this disease and anthrax. Sternberg and Pasteur, also in the same year, independently observed a pathogenic micro-organism in human saliva, which was subsequently (1885) proved by Fraenkel and others to be the organisms most commonly associated with acute lobar pneumonia and now recognized as the usual cause of that disease—the *diplococcus pneumoniæ*. In 1881, Koch made his fundamental researches upon pathogenic bacteria, which form the basis of our modern bacteriology. He introduced solid culture media and the "plate method" for obtaining pure cultures, and showed how different organisms could be isolated, cultivated artificially, and by inoculation of pure cultures into susceptible animals made, in many cases, to reproduce the specific disease of which they were the cause—thus carrying out Henle's suggestions. It was also in the course of this work that the Abbé system of substage condensing apparatus on the microscope, and the Ehrlich-Weigert method of staining bacteria for microscopical preparations were first generally used. In 1882, Koch published the discovery of the tubercle bacillus. The same year Pasteur made his investigations upon hog erysipelas; in this year also his communication upon rabies appeared. In 1882 also Loeffler and Schütz discovered the bacillus of glanders. In 1884 Koch discovered the spirillum of Asiatic cholera or "comma bacillus." This year, too, Klebs and Loeffler discovered the diphtheria bacillus. Rosenbach also, by the application of Koch's methods, fixed definitely the characters of the various pus-producing organisms. And the same year Nicolaier discovered the tetanus bacillus which Carl and Rattone afterward showed to be the true cause of the disease, and Kitasato obtained in pure culture. In 1892, Pfeiffer discovered the bacillus of influenza; and finally, in 1894, Kitasato discovered the bacillus of bubonic plague.

This closes our brief historical sketch of the development of bacteriology, including all the more important facts which are of special interest to physicians. But no review of the progress which has been made in this branch of science would be complete without reference to the recent discoveries of antitoxins in the treatment of diphtheria and tetanus, the protective inoculations against rabies, cholera, the plague, etc., and the peculiar reactions of the blood serum of persons ill with infectious diseases. These discoveries, in which the names of Pasteur, Koch, Behring, Kitasato, Roux, Pfeiffer, Gruber, and Widal are the most prominent, not only mark an epoch in the history of bacteriology in relation to medicine, but they have served to establish beyond all doubt the microbic origin of many diseases, the cause of which was until then in dispute. Attention has, moreover, been directed of late to the smaller group of animal parasites, the protozoa—to which class belong the plasmodium malariæ and the amœba coli, the cause of malaria and epidemic dysentery, respectively—which may prove to be the source of infection in many affections the origin of which is still unknown, as the exanthemata. And quite recently interest has been awakened in the possible pathogenic properties of certain of the fungi, among which it is suggested may be found the cause of other unexplainable diseases, as cancer and rabies. Several bacteria also not mentioned in this list have created considerable discussion of late, as the "bacillus icteroides" in yellow fever, and a small bacillus found in whooping-cough; but these organisms have not yet been positively shown to be the specific cause of the diseases with which they are found associated, and hence have been omitted.

General Characteristics of Bacteria.—*Classification and Definition.*—Under the general term "micro-organism" may be included all the minute lower forms of life which are of biological or hygienic interest, and which are the cause of fermentation, putrefaction, and disease. They are both of the vegetable and the animal kingdom; among the latter of these are the *protozoa*, and among the former the *fungi* and *bacteria*. Bacteria are classed among plants from the fact that they are able to derive their nourishment both from organic and inorganic materials. They are of the class of *cryptogamous plants*, that is, plants which, having no seeds or flowers, are reproduced by means of spores, such as the fungi, lichens, and algæ. Of these they are most nearly allied to the algæ, but differ from them in that they are without *chlorophyll*, the green coloring matter by means of which the higher plants, under the influence of sunlight, decompose carbon dioxide, ammonia, and sulphuretted hydrogen into their elementary constituents. In many respects bacteria resemble the mycetes or fungi, which are also without