United States, showing the effect of their training at the institute, in which theory and practice were so happily combined, and in which every thing taught in the lecture-room is at once put to use in experiment and research.

In 1873 a further step in technical education led to the establishing of a laboratory of steam-engineering. An engine of sixteen horse-power was set up, and the necessary apparatus for engine and boiler tests was provided. Out of this humble beginning has grown the largest and best equipped mechanical engineering laboratory to be found, in which not only is the work of instruction carried further than ever before, but original research, conducted jointly by the students and their instructors, is pushed to points often beyond the range of ordinary expert investigation within the profession. In the same year the Lowell Free School of Industrial Design was established at the expense of the Lowell Institute, for the purpose of promoting the industries of the country, and especially the textile manufactures, by cultivating the American taste in respect to form and color.

In 1876 the system of shop-work as a means both of general and professional training was introduced. Half an acre of shops, filled with the best tools, machines, and engines, with over two hundred students pursuing this branch of instruction, represent to-day the poor, mean shed, with its scanty appliances, which was all that the funds at the command of the institute allowed to be erected in 1876.

In 1881 was established a laboratory of applied mechanics, devoted especially to the tests of building-materials in wood, stone, and iron. The equipment of the laboratory has been increased from year to year, until it comprises a great variety of apparatus and machines, designed largely by the instructors in that department, for making almost every kind of test which the purposes of the engineer, the architect, the ship-builder, or the mill-owner may require,—beam tests, column tests, belting tests, rope and wire tests, shafting tests, tests by tension, by transverse strain, by compression, by tensile strain, and continuous, intermittent, or instantaneous tests.

In 1884 the germ of a biological laboratory, which had existed in a corner of the shed used for the workshops of 1876, was developed with the aid of a large amount of physiological apparatus. The resources of the laboratory were turned, first, upon the preparation of its students for subsequent medical studies, and, secondly, upon bacteriological investigations, to which the marvellous discovery of Koch and Pasteur had pointed. It is not too much to say that there is scarcely a place in this country where as much important bacteriological work has been done during the past three years as in this laboratory of the institute.

In 1882 the increased demands upon the department of physics for the higher and more technical instruction of students, looking forward to electrical practice, led to the establishment of a distinct service devoted exclusively to that end, and, in connection with the new building of 1883, to the equipment of an electrical laboratory, with engine, dynamos, electric motors, and a great variety of electric testing apparatus. Notwithstanding this equipment, this course in electrical engineering, as it has been developed at the institute, could not be sustained but for the machinery and ample appliances of the engineering laboratories. The training of the electrical engineer at the Institute of Technology differs from that usually followed, in that the electrical engineer is here regarded as primarily a mechanical engineer, but a mechanical engineer who has specially studied the mechanical requirements of the electrical industries and enterprises, just as the chemical engineer under the course established two years ago is regarded in his relation to the chemical industries. And this introduces us to the last contribution made by the Institute of Technology to the philosophy of scientific and technical education, in the recognition of laboratory work in mechanics as an essential feature of a proper training in any branch of the great engineering profession. In the mechanical laboratories the students in each branch of engineering, civil, mechanical, mining, electrical, chemical, and sanitary, are called to perform the work of experiment, and to deal with the generation of power, and its application to the exigencies of their several contemplated professions.

We have thus roughly traced the history of the Institute of Technology. We have seen within how few years it has grown from a doubtful experiment into one of the most important schools of the country. We have seen how largely it has enjoyed the confidence and liberality of the public, and we feel that we may securely rely upon the same generous support hereafter. We have seen how its methods of instruction have been adapted to the changes and developments of practical science. We have seen that in this mobility, this power of adaptation, lay the grand idea of the whole scheme; and we are sure, that, so long as it continues to be its guiding principle, the Institute of Technology will stand,—a monument to the character, learning, and wisdom of its founder, worthy the community in which its establishment was possible and by which it has been maintained, an honor to the instructors who have devoted their energies to its service, and fortunate, as we trust it may long be, under the direction of so distinguished and able a president as Gen. Francis A. Walker.

HEALTH MATTERS.

The Influenza in Massachusetts.

THE secretary of the State Board of Health closes his annual report with the following facts about last winter's epidemic: "1. The first appearance of the influenza in Massachusetts as an epidemic, in the past season, may be stated to have been on Dec. 19 or 20, 1889, and the place of its first appearance was Boston and its immediate neighborhood. 2. It increased rapidly in the number of persons attacked, and reached its crisis generally throughout the State in the week ending Jan. 11, 1890, after which date it gradually declined in severity, and had nearly ceased as an epidemic by Feb. 10, so that the duration of the epidemic was about seven weeks. It reached its crisis earlier by several days in Boston than in the smaller cities and the remoter parts of the State. Its course was still later in Nantucket, Dukes, and Barnstable Counties. 3. The ratio of the population attacked was about forty per cent, or more exactly, as indicated by the returns, thirty-nine per cent, or about eight hundred and fifty thousand persons of all ages. 4. People of all ages were attacked, but the ratio of adults was greatest, of old people next, and of children and infants least. 5. The weight of testimony appears to favor the statement that persons of the male sex were attacked in greater number and with greater severity than females. 6. The average duration of the attack (acute stage) was from three to five days. 7. The predominant symptoms were mainly of three general groups,—nervous, catarrhal, and enteric,—the last being much less common than the others; the special symptoms much observed in the nervous group being extreme depression, pain, and weakness; in the catarrhal group, cough, dyspnœa, and coryza; and in the enteric group, nausea, vomiting, and diarrhœa. 8. The chief diseases which followed in the train of influenza, and were intimately associated with it, were bronchitis and pneumonia. Phthisis, when already existing in the victim of the attack, was undoubtedly aggravated, and in many cases a fatal termination was hastened. 9. The ratio of persons attacked in industrial and other establishments employing large numbers was about thirty-five and a half per cent, or less than that of the population at large. That of the inmates of public institutions was still less,— twenty nine per cent. 10. The ratio of persons who were obliged to leave their work on account of illness from influenza was about twenty-seven per cent of the whole number employed. 11. The average length of their absence from work was five days. 12 Special occupations do not appear to have had a marked effect in modifying the severity of the epidemic upon operatives in such occupations. While the atmosphere may constitute one important medium of its communication, human intercourse also suggests itself as an equally important factor."

Fasting.

In connection with Professor Moleschott of Rome, Professor Luciani of Florence made a careful study of the "Hunger Virtuoso," Signor Succi, during his thirty-days' fast some two years ago. The results of their work are published in a monograph entitled "Fasting: Studies and Experiments upon Man," printed in Italian and German.

According to the *Medical Record*, Signor Succi, when not starved, is a man of strong muscular frame, with little subcutaneous fat, and weighing about one hundred and forty-seven pounds. During his thirty-days' fast in Italy he lost 6,161 grams, or about thirteen pounds During his first thirty days of fasting here he has lost considerably more. He drank at that time an average of 577.5 grams of water daily, which is about the amount he takes now.

Luciani states that he had "firm muscles, a good deposit of subcutaneous fat, a very slow tissue-change, and, above all, an extraordinary force of will." The Italian professor seems to think that by voluntary exertion Succi is able to slow down the metabolic processes, just as some peculiarly endowed persons can slow down the heart. It is upon this interesting point that Luciani particularly dwells; and he finds in Signor Succi a proof of the regulating influence of the nervous system over the functions of heat-production, respiration, hepatic action, etc.

How the Pathogenic Bacteria do their Harm.

Brieger and Fränkel have studied this question. Of course, the first condition for successful inquiry was to employ pure cultivations of the organism experimented upon. Basic bodies, denominated "toxine," had already been found in several pathogenic micro organisms, such as the bacillus of typhoid, tetanus, cholera, etc.; yet it was found that this toxine did not invariably call forth all the phenomena of the infectious diseases due to the bacilli, from pure cultivations of which it had been obtained: the supposition, therefore, seemed fair, that, besides the already found chemical bodies, there were other substances which played a momentous part (*The Edinburgh Medical Journal*). Brieger and Fränkel considered that Löffler's bacillus of diphtheria was well adapted for their purpose, because it is now beyond doubt that this organism is the genuine cause of diphtheria. Löffler had already called attention to the fact that this bacillus, when inoculated on animals,— guinea-pigs and pigeons,— colonized only the immediate neighborhood of the infected spot; yet grave alterations of texture and organs, and speedy death, of the animals experimented on, followed. This connection of events could only be explained in this way,— that the bacilli produced, by their local multiplication, a substance of exceedingly poisonous properties, which spread over the whole organism, and, independently of the bacteria did its deadly work. Brieger and Fränkel consider that they have proved that Löffler's diphtheria bacillus engenders in its pure cultivation a poisonous, soluble substance separable from the bacteria, which, when injected into susceptible animals, calls forth the same phenomena as the injection of the living micro-organism. The authors also have settled that this substance is destroyed by a heat of 140° F.; that it can stand a heat of 122° F., even in presence of excess of muriatic acid. This last fact of itself speaks against the supposition that the poison of the diphtheria bacillus is a ferment or an enzym. Further examination of this substance showed it was not a ptomaïne or toxine. No crystallizable substance, save kreatinin and cholin, was obtained. Shortly summing up their investigations, the authors seem to have discovered in the diphtheria bacillus a substance belonging to the albumen series of bodies, which has poisonous properties, and causes the phenomena of diphtheria when injected. They propose to give it the name of "toxalbumine." In the living body they consider that the bacteria build up and separate their toxalbumine from the albumen of the tissues. Brieger and Fränkel also examined typhoid, tetanus, and cholera bacteria, and staphylococcus aureus and watery extracts of the internal organs of animals killed by anthrax, in the same way as they had examined the diphtheria bacillus, and found in all of them bodies which, according to their chemical behavior, were albuminoids, were poisonous, and could therefore be aptly called toxalbumines. The road from normal constituents of the body to substances of the most dangerous kind seems a very short one, and our organism itself may be looked upon as the proximate cause of morbid conditions let loose by the life-activity of bacteria.

NOTES AND NEWS.

THE trustees of Johns Hopkins Unversity have decided to re-open the Marine Laboratory of the university in the coming spring. Further announcements will be made later.

— We learn from the London *Journal of Education*, that, according to returns compiled by the Civic Statistical Bureau of the schools of Munich, there were in 1889 in those schools 2,327 children suffering from defective sight; to wit, 996 boys and 1,331 girls. The gradual increase in the figures, which proceeds according to the distribution of the pupils into several classes, is highly significant. Of every 1,000 boys in the first or elementary class, 36 are short-sighted; in the second, 49; in the third, 70; in the fourth, 94; in the fifth, 108; in the sixth, 104; and in the seventh and last, 108. The number of short-sighted boys, therefore, from the first class to the seventh, increases about threefold. In the case of the girls the increase is from 37 to 119.

— Dr. Schmidt-Rimpler, the well-known Göttingen oculist, has been asked by the Cultusminister von Gossler to draw up a list of requirements for diminishing the shortsightedness so prevalent in German schools. Dr. Schmidt-Rimpler, according to the London *Journal of Education*, recommends (1) that teachers must acquire some knowledge of school hygiene; (2) that a medical attendant be attached to the school staff, and periodically inspect not only the school, but individual pupils; (3) that printed instructions be sent to the parents to inform them of the best position of the body for their children, especially with reference to writing, while engaged in the preparation of home-lessons; (4) that afternoon school be abolished, as far as is possible, so that the children may have plenty of exercise in fresh air; (5) that the amount of home-work be diminished, especially with regard to written tasks; (6) that the school course be not allowed to extend over too many years.

— The public lecture course of the New York Academy of Sciences for the season of 1890-91 is as follows: Nov. 24 "The Cliff Dwellings of the Mancos Cañons" (illustrated by projections of original photographs), by Mr. Frederick H. Chapin of Hartford, Conn.; Dec. 15, "Life and Scenes in the Hawaiian Islands" (illustrated), by Dr. H. Carrington Bolton of New York; Jan. 19, 1891, "Science and Miracle," by Professor A. J. Du Bois of Yale University, New Haven; Feb. 16, "Instantaneous Photography as an Aid to Science, History, and Art" (illustrated by novel lantern views), by Professor Wallace Goold Levison of Brooklyn, N.Y.; March 16, "The Orkneys and Shetlands" (illustrated), by Professor Charles Sprague Smith of Columbia College, New York; April 20, "Practical Applications of Electricity" (illustrated experimentally), by Francis B Crocker, E.M., of Columbia College; May 18. "What is a Diatom?" (illustrated,) by Charles F. Cox, M.A., of New York.

—W. T. Harris, United States commissioner of education, Washington, D.C., has issued a circular letter, dated Dec. 10, to presidents of colleges and universities in the United States, in which he says that it is assumed that language instruction in colleges and universities, so far as it relates to living tongues, is based on