SCIENCE

FRIDAY, JUNE 29, 1888.

AT A MEETING held at the Mansion House, London, on June 8, in support of a scheme for establishing polytechnic institutes in South London, a speech was delivered by Lord Salisbury, in which he pointed out, that, if the law of "the survival of the fittest" is to hold, there must be a rapid improvement in the human race at no distant day. Lord Salisbury, after passing in review the efforts which have been made in London to meet the demand for technical instruction, concluded as follows: "I have only one more word to say, just to call your attention to another aspect of this case, and to commend it to your efforts. We live in a time when men multiply fast, but apparently the means of supporting them do not multiply as rapidly; when there is vehement competition, and occasionally intervals of deep depression. And if you should look more closely, you will find that one cause, at least, of this phenomenon is that man, as the mere owner of muscle, is being edged out by another and more powerful competitor. Merely as an agent of physical force, as the possessor of the power of labor, the steam-engine is a competitor which drives him easily out of the market. And more and more the mere unskilled labor is being made unnecessary by the development of the forces which mechanical science has discovered. And as the world goes on, you must expect this tendency to increase. You must expect mechanical force to become more varied and more powerful and more cheap, and the competition with human arms and limbs to become more hopeless. But there is one region where the machine can never follow the human being, and that is in the exercise of thought. In skill, in cultivated mind, in the power to adapt the processes of thought to the laws of nature, in all that we call 'skilled labor' of the highest kind, — in that man must always have a monopoly, and need fear no encroachment from the competition of the steam-engine. It is to the development of his powers in that respect that the increase in the means of subsistence, and the opening of new paths of self-support, must be found. On all of us, in whatever position we are, is pressing, as one of the most anxious subjects of public care, the discoveries of methods by which the teeming millons of this country shall be able to maintain themselves in a prosperous, decent, and comfortable condition. We cannot find in their unskilled labor a satisfaction of that want. The difficulties are enhanced by the fact that our neighbors in other countries have been sensible of the superiority which skilled education can confer, and have not been slow to take advantage of it. If we will not be left behind in the race, if we desire to find any satisfactory solution for the deepest and the most inscrutable problem of our time, if we wish our complex community and high civilization to be maintained secure from all the dangers which the presence of unfed, unprosperous, untaught millions must bring upon them, we shall do our utmost to give a healthy and a rapid development to the secondary education of the working-classes."

In commenting on this speech, and on the report of the proceedings as given in the *Times*, *Nature* takes occasion to say, "For many a day, as our readers know, we have been urging the necessity for the establishment of a proper system of technical instruction. The subject is one of such pressing importance that we have returned to it again and again, seeking to present it in many different aspects; and Lord Salisbury's speech and the article in the *Times* may be taken as indications that large classes of the community have at last begun to understand that the nation has no time to lose in setting about a task which ought long ago to have been most seriously undertaken. Even if the question had little direct relation with economic interests, it would be for many reasons desirable to secure for manual training a place among our educational methods. Attention has hitherto been too exclusively devoted in schools to such knowledge as may be derived from books. It is necessary, from the strictly educational point of view, that teachers should aim at a wider, more direct, and more practical development of the mental powers of their scholars. But other and even more fundamental interests are also concerned. The leading nations of the world, our rivals in industry and trade, have already perceived the benefits to be secured from a thorough mastery, on the part both of employers and employed, of the principles of science as applied to agricultural and manufacturing processes. The result is, that in many of the best markets, where our supremacy as a trading people was formerly unquestioned, we find ourselves at a disadvantage; and it is certain, that, unless we place ourselves on a level with our competitors, we shall have to pass through some very bitter national experiences. The question is really one of life and death for England. It is a question whether in the near future there are or are not to be sufficient employment and remuneration for the vast and growing masses of her population."

THE MODERN TENDENCY of population to drift from the country to towns and cities is well illustrated by some figures published in a recent number of the *Melbourne Argus*. These figures have attracted considerable attention in Australia, where the tendency is particularly marked in the case of Melbourne, Sydney, and Adelaide. In Melbourne the yearly increase in population has been the greatest, the gain during the past three years varying from nineteen thousand to twenty-two thousand; and this increase is apparently still growing. The population of Melbourne and its suburbs is estimated at 400,000, against 250,000 in 1878. During the same time there has also been an increase in Sydney; and it is believed that this city must now be nearly as large as Melbourne, although with due pride the *Melbourne Argus* expresses its belief that the latter city is destined to be the real capital of Australia. This increase in city population has been at the expense of the country districts. The desertion of work at the gold-fields has tended to depopulate some sections, which population has gravitated toward the large cities. In 1861 Melbourne contained one-fourth of the population of the colony of Victoria; in 1881 this proportion had increased to one-third, and it is now two-fifths; and apparently we may soon see the phenomenon of one-half the people of the colony living in the city, and one-half outside of it. Similar conditions practically are true of Sydney and Adelaide. Melbourne at present contains one-seventh of the entire population of Australia. Whether this drifting from country to city will have any effect on the prosperity of the colony remains yet to be seen.

THE THREE AMERICAS PERMANENT EXHIBITION.

THE heartiness with which both Houses of Congress have dealt with the projectors of the 'Three Americas Permanent Exhibition' that it is proposed to establish in Washington in 1892 as a part of the celebration of the discovery of America by Columbus, insures its success. While the subject was under consideration by the House Committee on Commerce, Major J. W. Powell, director of the United States Geological Survey, was invited to address the

committee on the archæological importance of such an exhibition His remarks set forth more forcibly than has been done elsewhere the advancement to this branch of science that is likely to result from such an exhibition, and the importance of securing the material for it at once. The copious extracts given below will be found interesting: —

"The value of great national fairs or expositions has been abundantly shown by the history of such enterprises, alike in America and in Europe. A great national fair is a stupendous object-lesson in industrial civilization.

"The discovery of America is the event which it is designed to celebrate, and its importance is unparalleled in the history of human progress. At that time a continent was found peopled by savages and barbarians, who did not occupy the land, but who were scattered along the water-courses and shores in little tribes far distant from one another. In their ignorance the beautiful earth, with all its potential gifts for civilized man, was but a hunting-ground, a berry-patch, a tobacco-garden, and a battle-field. But the discovery of this new world gave North and South America to the plough, the mine, the workshop, the highway, and the market. A new world was delivered to civilized man as a theatre for new and highly developed industries, and, better than all, as a theatre for new and highly developed institutions, founded upon principles that recognize a wider liberty and more just equality, and a fraternity that embraces a greater scope of imperative duties, than had previously been recognized in the history of man. This great gift to mankind was not the result of accident through the drifting of tempest-tossed sailors from far-off Asia to the golden strands of the West; it was not the gift of chance through the wandering of barbaric Norsemen to the bleak lands of the north-east coast. Civilization discovered America by the light of science. Columbus, a great scholar, a scientific investigator, a man whose insight penetrated to the great secrets of nature in the light of the science of his time, — which was indeed but dim, — by means of one of the grandest scientific inductions in history, accepted the conclusion that the earth is a sphere, and with a sublime faith in scientific inductions he sailed into an unknown sea, inhabited by the monsters of mythology, and beset with the dangers of superstitious credulity, and through this ignorance he sailed away until he discovered the new land; and the inductions of science were verified by the appearance of continents and islands, from which great mountains reared their tops into the heavens. There, too, great lakes were found whose billows were destined to rock the commerce of many peoples, and there great rivers were revealed upon whose turbulent currents the navies of industry now ride. To celebrate the discovery of America by Columbus is to celebrate the greatest event of human history.

"But it is not my task to speak of the value to civilization of the proposed exposition, nor of the importance of the event which it is designed to celebrate; nor even to show that such a celebration would be signally appropriate to the people who are the chief beneficiaries of that great scientific discovery, but simply to set forth the extent to which the great exposition may be made interesting and instructive to the people by making an exhibit of the archæology of the New World.

"The *débris* of forgotten culture of the world was long held to be refuse, unsightly and loathsome; but the time has arrived when this refuse of uncultured man is esteemed by the enlightened man as the priceless relics of antiquity. The ruins of an ancient city that were worthless a few decades ago, are, by the processes of modern investigation into the history and growth of human culture, transformed into values that nations covet; and civilized men are everywhere throughout the world engaged in exhuming from the ruins of ancient cities the treasures of history. Societies are organized for the collection of the material, and colleges and universities are engaged in its investigation, and the libraries of the world are daily enriched with the volumes of this new learning.

"The events of history that are recorded by contemporaneous writers are colored with prejudice and blurred with ignorance; but the records that are preserved in the imperishable works of man are not tainted with baneful inspiration and false statement, but tell the truth, and nothing but the truth. In the past, history was the theme for literary exploration; in the present, history is the theme of profound investigation; and history has become a science because it is founded upon archæology. It is thus that the ruins of a temple, a tower buried in its own *débris*, an inscription on a rock, a bronze spear, a stone knife, or a potsherd, has a value. A mound or a monument is a volume of history, and a ruined city a great library.

"The people who were found in America, the tribes of savages and barbarians, are rapidly being absorbed among the people of civilization. Their history was written; their artisans, their warriors, their statesmen, and their poets are forgotten; but the vestiges of their history, their archæologic records, are widely scattered. They are found buried in ruined towns and villages; they are covered by innumerable mounds of earth that were built as sites for their council-houses, as places for worship, and as cemeteries for their dead; they are found in countless stone-walled graves; they are found in innumerable refuse-heaps, the *débris* of the kitchens of the savage man; they are found in every ploughed field and on every hillside, and scattered over every mountain; and from these sources they must be taken, if we are to reconstruct the ancient history of America. But every dust-laden breeze buries them deeper, every storm of sand serves to hide them more effectually; the furrowing of every field is an agency for their destruction; the working of every road, the construction of every railway, the erection of every building, makes these relics rarer and more valuable; and ere they are lost I beg they may be secured. The whole civilized world is interested in their collection and preservation, and the people of other lands are gathering and carrying them away by cargoes to enrich the museums and the great universities and splendid capitals of Europe; while in America only a few quiet students have become interested in these materials of American history, and until within a few years we have been almost wholly neglectful of things which by time are becoming more and more valuable.

"The wealth and variety of the materials of American history are but little appreciated. The people who inhabited the American continent before its discovery were not all of one race, but of many. In North America alone there were more than seventy-five distinct stocks, having radically distinct languages and mythologies, having independent and diverse institutions, and having diverse and multifarious arts. At the north we have the igloo-dwellers that live by the shores of the frozen seas; farther to the south we have races occupying dwellings made of forest timber; other races wove their habitations of reeds; others built their towns of the clay of mother-earth; and others erected their buildings of stones quarried from the cliffs; while still others hewed themselves habitations in the solid rock. Some dwelt on towering and almost inaccessible cliffs, while other towns were erected among the crags and cinders of extinct volcanoes. Some races were hunters, other races were fishermen, still other races were agriculturists. Some races worshipped the sun and moon and stars, and the gods of the cardinal points; other races made the mountains and the rivers the object of their principal worship; and all worshipped strange mythologic beasts. All of the tribes were organized into bodies politic as bodies of kindred, but the method of organization was multifarious. Many tongues were spoken: harsh consonantal and guttural languages were found in the cold climate of the extreme north and south, vocalic and musical languages were found in the sunny lands of the middle zones. Everywhere the tribes had learned to use picture-writing, and to record events with pictures of men and beasts and many conventional signs. They made tools and implements of stone and bone and shell and horn and wood. They made canoes and boats of bark and logs, they made rafts and basket-boats of weeds, and they made kayaks of skins; and in such crafts they navigated the rivers, the lakes, and the seas. The relics of all these mythologies, religions, institutions, languages, and arts, must be recovered, if we are to preserve the ancient history of America; and the work must be done soon, or they will be lost.

"It is possible to make the four-hundredth anniversary of the discovery of America an occasion to collect and preserve the ancient history of the country, to gather the materials of its archæology, and to put them into one grand international museum at the seat of government of the United States. No other enterprise in

connection with such an American exposition would interest the people more, and no other would be more instructive; and it is proposed or suggested by the Citizens' Committee that a great archæologic exhibit be made, and that each nation in North, Central, and South America be invited to contribute its quota to this great museum. The erection of an appropriate building for this purpose, indestructible by fire, and of sufficient magnitude for the instalment of so great a collection, would cost about five hundred thousand dollars. The archæologic materials to be found within the territory of the United States are in part, but only in small part, collected, and now in the National Museum; and the time is all too short for the completion of this collection, yet by beginning soon it might be well done.

"Such, in brief, is the plan which I was requested to present to you by the Citizens' Committee. It is no less than to collect and put on record for future generations the priceless records that constitute the history of all the native American races. If this can be done, it will be a monument to these native peoples, erected by the invading and conquering and civilizing nations, worthy of Aryan power, and worthy of Aryan culture."

WHEAT-CULTIVATION.

IN the last number of the Journal of the Royal Agricultural Society of England, the most interesting sections are those bearing upon wheat-cultivation. A paper upon the condition of wheat-growing in India, by Dr. George Watt, is followed by an article by Mr. W. E. Bear upon the Indian wheat trade, and in this connection is given an interesting account of modern improvements in corn-milling machinery. These papers throw considerable light upon the difficulties under which the English wheat-grower is struggling, and are commented on by Mr. Wrightington in a recent number of *Nature*.

Dr. Watt and Mr. Bear show the extraordinary extent of the wheat-producing area of the Indian Empire, and the rapidity with which this vast field is being opened up. With reference to the latter point, men in middle life are scarcely likely to realize the fact that in 1853 there were in all only 20½ miles of railway in India, that in 1873 there were 5,695 miles of railway, while in 1887 there were 13,386 miles. Telegraphic communication with India was first opened in 1865, and the opening of the Suez Canal in 1869 was scarcely of less importance in developing her trade, first by shortening the passage, and second by mitigating the risk from wheat-weevil. Another agency has been the development of irrigation-works. We read that "only" 30,000,000 acres have up to date been artificially irrigated; but the appropriateness of the qualifying adverb is rendered evident when it is employed in contrast with the total area of 200,000,000 acres of cultivated ground, and the vast tract of 868,314 square miles which include British India. The normal area under wheat is 26,000,000 acres, and the degree to which this area is likely to be increased depends entirely upon demand and price. Dr. Watt informs us that the Indian cultivator is at all times ready to adapt his courses of cropping to circumstances, and that he will increase or abandon the cultivation of wheat, cotton, or any other crop according to its comparative profitableness.

Dr. Watt comes to the conclusion that the Indian wheat trade up to the present time is a perfectly natural one. "The people are exporting only what they specially cultivate for that purpose. The moment better profits can be realized on another crop, they will turn from wheat, without being in the least degree incommoded." If this is the case, the English farmer may well look with envy upon his Indian brother, as he is in the unfortunate position of being compelled to carry on wheat-growing from sheer inability to find a substitute for it in his agricultural economy. Natural though the course of the ryot may be from his point of view, the actual bounty upon wheat, or what amounts to a bounty, consequent upon the fall in value of the rupee, can scarcely be described as natural. This great advantage to the Indian cultivator is clearly brought out by Mr. Bear by the following considerations: First, the Indian ryot gets as much for a quarter of his wheat now as he obtained in 1872. He gets as many rupees, and his rupees are worth as much to him as they were then. In 1871–72 the average exchange value of the rupee was 1s. 11.12d., whereas recently it has been under 1s. 5d. The price of No. 2 club wheat in Calcutta in 1872 averaged only 2rs. 3a. 1p. per maund, whereas it has for some time past been over 2rs. 10a. Taking 16rs. per quarter (6 maunds) as the price for both periods, then reckoning the exchange value of the rupee for both periods, it is clear that the exchange value of 16rs. in 1872 was equal to 30s. 8d. per quarter, whereas the exchange value of the same sum in 1888 is only 22s. 8d. The fact is that the Indian ryot gets as much for a quarter of wheat now as he did in 1872, in spite of the fall in prices. He gets as many rupees, and his rupees are worth as much to him. This seems to settle the question as to the encouragement given to the ryot as a competitor in wheat-growing with the English farmer. Another point, in all respects discouraging to the cultivation of wheat in England, is found in the complete revolution during the last ten years in corn-milling machinery described by Mr. W. Proctor Baker of Bristol. There has been, in fact, not a mere substitution of one machine for another, or of one series of machines for another, but there has been a change of the principle and mode of procedure. The old system of 'low grinding' by mill-stones, so well calculated for producing flour from soft, tender wheats, such as are produced in England, has been entirely superseded by the Hungarian and American 'gradual reduction' process by 'roller mills.' Not only does this system require the wheat to be dry, hard, and brittle, so as to secure the requisite cracking and gradual reduction, but any thing in the form of a soft or moist wheat is most injurious to the machinery and the products. It rolls into a paste, steam is generated, and the flour works into balls, becomes attached to the rollers, turns sour, and, in fact, throws the entire process out of gear. "It is because of these troubles that owners of mills on a large scale will not employ native wheats in damp seasons. No concession of price is sufficient inducement to them to risk the disorganization of the mill, and probable loss of reputation, by turning out inferior or irregular flour." There are, however, two modes in which these wheats may be used, — first, by submitting them to an artificial drying process; and, second, by mixing them with some description of very brittle wheat, and allowing the mixture to lie for some weeks, until the brittle wheat absorbs some of the moisture of the native wheat, to the mutual advantage of both.

THE MARINE BIOLOGICAL LABORATORY.

THE new laboratory is at Wood's Holl, Mass. A convenient site has been secured close to the shore and to the laboratories of the United States Fish Commission. The laboratory building consists of two stories; the lower story for the use of students receiving instruction, the upper story exclusively for investigators. The laboratory will have boats, dredges, and other collecting apparatus; it will also be supplied with running sea-water, with alcohol and other re-agents, glassware, microtomes, aquaria, etc., a limited number of microscopes for students' use, and a small reference library.

Dr. C. O. Whitman, the distinguished embryologist, has accepted the directorship; and Mr. B. H. Van Vleck, who has had greater experience than any one else in this country in the management of summer seaside biological schools, has been appointed instructor. Under these very competent officers, the laboratory will attract probably more persons than can find accommodation; nevertheless it remains a matter of regret that the announcement of the opening of the laboratory has been so much delayed, owing, we understand, to some unavoidable difficulties in completing the preliminary arrangements.

The laboratory for students will be opened on Tuesday, July 17, at 9 A.M., for a systematic course of six weeks in zoölogy. By permission of the director, students may continue their work until Sept. 20 without additional payment. Microscopes, glass-ware, etc., will be supplied without extra charge except for breakage. Hand lenses, dissecting instruments, drawing materials, etc., may be bought at cost in the laboratory. It is desired that students owning microscopes should bring them.

The fee for this course is twenty-five dollars. The number of students will be limited to twenty-five.

The laboratory for investigators will be opened on July 10, and