tion throughout the country, it must be recognised that a great deal of work is at present being done, some of which, we may hope, is of very high practical utility, and all of which is of the highest experimental value. That work is being carried on by local and representative authorities, and it cannot but be an advantage that those who are engaged in it should avail themselves of the opportunity now afforded to them of conference and consultation with each other, and thus finding some of the guidance which, under a more completely and thoroughly organised system, they might possibly look for from some central authority.

On Friday last, the Duke of Devonshire opened the new buildings of the Municipal Technical School at Birmingham, and, in the evening of the same day, he distributed the prizes to students in the school, and delivered an address. The following is a condensed report of his remarks :—

The first question which perhaps may occur to some of you is, "Why am I here at all; why am I selected to address this great meeting?" I have been told before to-day, and I have been told again to-night by the Mayor, that it is as President of the Council and head of the Education Department that I am here. I need scarcely tell you that in the somewhat remarkable arrangements which control appointment to the great political offices it does not follow at all that because a politician is appointed to be the head of the Education Department he should know anything whatever about education. The fact that I hold that office and that others have held that office before me who know as little about education as I do, must convince you that the mere fact of my holding that office does not confer upon me any special qualification for the part I am expected to take to-night, and I am afraid before the conclusion of my address some of you may be reminded of the lines of the poet Pope, who, in speaking of the presence of flies in amber, said :—

"The things, we know, are neither rich nor rare,
But wonder how the—something—they got there."

I know no more of science or of art than could be put into the capacity of a couple of nutshells, but every member of Parliament is supposed to know something about education. Unfortunately for my own peace of mind, upon one occasion, some years ago now, I happened to be called upon to distribute prizes at a polytechnic institute in London, where I made some observations upon what I thought was an urgent and growing necessity for a greater amount of attention being paid to the scientific and technical education of our people, which appeared to attract some considerable attention. On the strength, I believe, of that speech, I was asked to assume the post of president of a national association for the promotion of technical and secondary education, and since that unhappy moment my life has been more or less a burden to me, and I have been called upon on more occasions than I care to remember to deliver some observations upon subjects of a scientific and an educational character.

It does not require a scientific or educational expert to show that the work which has been done and is being done and is going to be done here is part of a work which is going on all over the country, and which it is for the working population of this country to take or to leave as they please, but it is a work which it is necessary should be done if we intend to maintain not only the industrial supremacy which we have hitherto enjoyed, but even our existence as a great industrial nation. Even upon such a subject as this I can pretend to speak with no authority. All that I have done upon former occasions and all that I can do now is to refer to what has been said by those who can speak upon such a subject with greater authority than I can. Prof. Huxley was one of those who have taken a lead in this movement for the extension of scientific and technical training. These words of his have been quoted before in this hall, but I shall make no excuse to you for quoting them again. He said :—"We are at present in the swim of one of those vast movements in which, with a population far in excess of that which we can feed, we are saved from a catastrophe through the impossibility of feeding them solely by our possession of a fair share of the markets of the world, and in order that that fair share may be retained it is absolutely necessary that we should be able to produce commodities which we can exchange with food-growing people, and which they will take rather than those of our rivals, on the ground of their greater cheapness or their greater excellence. That is the whole story. Our course, let me say, is not actuated by mere motives of ambition or by mere motives of greed. Those, doubtless, are visible enough on the surface of these great movements, but the movements themselves have far deeper sources. Our sole chance of succeeding in the competition which must constantly become more and more severe is that our people shall not only have the knowledge and the skill which are required, but that they shall have the will and the energy and the honesty without which neither knowledge nor skill can be of any permanent avail."

I should like to add a commentary on those words which was supplied, also, I think, on an occasion similar to this, by Sir Henry Roscoe, who has taken a distinguished and a leading part in this movement. Having quoted those words of Prof. Huxley which I have read, Sir Henry Roscoe said : "This great endeavour to place our population in a position to obtain the industrial supremacy which it has long held and to ensure that supremacy is surely of more fundamental importance than any passing political question of the day. Upon the successful solution of this problem depends our very national existence. Pressed on all sides by the superior scientific education of Germany, by the boundless physical resources and indomitable energy of America, we in this country should have enough to do to hold our own in the coming struggle for existence. Hitherto we have rested content with that pre-eminence which our coal and our iron, our insular position, the energy and capability of our race, have given us ; such a state of contentment is at the present time a delusion and a snare. We can afford no longer to live in a false paradise. Our competitors have adopted our industrial methods ; they have bought our machinery, and are now not only treading on our heels but are surpassing us. Our competitors have adopted our own discoveries and inventions, and are, as it were, working out our own designs. Watt, Stephenson, Arkwright and Crumpton, Whitworth and Bessemer, have made the world akin in more senses than one. Rapid and cheap transit has revolutionised commerce and industry, and raw materials flow in and finished products flow out, and it is to the nation as well as to the men which furnishes that finished article most cheaply and best that victory comes. This, then, is the meaning of technical and industrial training—to fit our people from top to bottom, from the future leader of industry to the lowest handworker, with the means, so far as education can do so successfully, to carry out his life's work. This is the great task we have set ourselves to accomplish." I ask you whether in your opinion this language is exaggerated. I do not think that any man of business who is present here this evening will deny the increasing strain of the competition to which we are exposed. He may not accept the remedies which we suggest, but he will not deny the existence of a danger which we fear.

No one, I think, can doubt the closeness of the connection in the present day between science and industrial pursuits—scientific discovery on the one hand and mechanical invention on the other. These are the factors of industrial progress in this or in any other country. Scientific discovery has made known to us the new properties and qualities of matter ; and mechanical invention, on the other hand, has applied those discoveries to industrial processes. How can we expect that our nation can take full advantage of those discoveries ; how can we expect that we can satisfy the wants of the world which expects to be put in instant possession of all the advantages of these successful discoveries, unless we have trained managers and foremen who are competent to take instant advantage of every one of those discoveries in science or mechanical invention and possess the scientific skill to apply them ; and how can we obtain these managers and foremen unless we place within the reach of the great masses of our people and of our working men facilities for acquiring that scientific knowledge? I may further ask you, can these managers and foremen themselves expect to make the most of their own abilities without the assistance of workmen whose eye and whose hand and whose intelligence have been properly trained to carry out their instructions?

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—For many years the annual reports of the University Extension Delegacy have recorded steady progress in the work committed to its supervision. The report just issued shows that, from September 1894 to May 1895, 1544 lectures were delivered in connection with the Delegacy. The

number of courses organised by Local Committees showed an increase over those of previous years, but the courses given in connection with County Councils showed a decline. This is because the County Councils have appointed lecturers of their own to carry on the work of the Extension lectures; and because fixed colleges or institutes are taking the place of peripatetic teaching. Oxford centres have never shown a preference for courses of lectures on science subjects: in 1894-95, 142 courses were delivered on history, literature, economics, and art, and fifty-seven courses on various branches of science. That the lectures delivered under the auspices of the Delegacy appeal to a large class is shown by the fact that the aggregate of average attendances during the year covered by the report was 20,809.

MR. HENRY A. MIERS, of the Department of Minerals in the British Museum, has been elected Waynflete Professor of Mineralogy, in place of Prof. Story Maskelyne, resigned.

THE following are among recent appointments abroad: Dr. P. Ehrlich to be Professor of Special Pathology and Therapeutics in the Berlin University. Dr. Janny, *privat-docent* in Surgery, at Budapest, to be Professor; Dr. J. Nevinny to be Ordinary Professor of Pharmacology at Innsbruck; Dr. K. A. Bier to be Extraordinary Professor of Surgery at Kiel; Dr. A. Monti to be Professor of General Pathology at Palermo; Dr. Augustin to be Extraordinary Professor of Meteorology in the Bohemian University at Prague.

THE *Times*, in some noteworthy remarks upon the Duke of Devonshire's Birmingham speech, pointed out the importance of technical education, and the necessity for instruction in fundamental principles. "The people perish for lack of knowledge," remarked our contemporary, "but it is primarily general knowledge that they require. Only upon that foundation can technical knowledge be built up with any chance of obtaining its full advantages. . . . Too much stress cannot be laid upon the cardinal importance of equipping our industrial population with the knowledge which at present is far more copiously and systematically provided by other nations than by ourselves. Indeed, we may question whether even among educational reformers full recognition has yet been given to the fact that time and energy are limited quantities. Is it enough to superadd technical education to a stereotyped course of verbal study? Do we not, in that way, not only waste time which might be much better employed, but postpone the acquirement of manual dexterities to too late a period? It is worth serious consideration whether what is wanted for an industrial population at the present day is not an education essentially technical and practical from a very early age, with the verbal training that now passes for education relegated to a secondary place."

THOUGH in recent years there has been a development of facilities for science instruction for boys, and methods of instruction are slowly being improved, the same kind of advances have not been made in girls' schools. This deficiency was discussed at a meeting held at the Hugh Myddelton School last week, when a paper on "Science Teaching for Girls," was read by Mr. Heller, and the essential points of sound teaching of science were dwelt upon. It was pointed out that the teaching of scientific method rather than the teaching of science subjects should be made a valuable educating factor in all schools; that all such teaching must follow the lines of an investigation, must be accurate and quantitative, and must have a logical sequence; that the scholars must be taught to help and think for themselves, and that the teacher should act rather as an exhaust pump than as a force pump, in extracting facts from the child's brain rather than supplying them. Mr. Heller then sketched a syllabus and scheme of work he is carrying out both with classes of teachers and children in East London, where all facts are discovered by experiment, and nothing is given on the *ipse dixit* of the teacher. Referring to the pioneer work the London School Board is carrying out in the training of teachers, the lecturer proposed the following resolution: "That in the opinion of this meeting the time has arrived when the teaching of scientific method should be made an educating influence in girls' schools, and that such teaching must be of an experimental and investigating nature." In the discussion that followed, Dr. Gladstone urged that all knowledge should be gained by scientific methods, and that no special subjects should be taught even in the higher standards of elementary schools, but rather fundamental principles. Dr. Armstrong thought the time was ripe for great changes. In every direction educational authorities were adopting such work as they had heard described. There was no necessity to teach science, but to form character by teaching scientific methods. He advocated the teaching of mental drill and mental discipline, and in conclusion seconded the resolution, which was carried unanimously.

SCIENTIFIC SERIALS.

Wiedemann's Annalen der Physik und Chemie, No. 11.—Emissivity of bodies at high temperatures, and the Auer burner, by Ch. E. St. John. The Auer burner only shows very slight fluorescence and phosphorescence. A thin sheet of oxide on electrically-glowed platinum foil does not assume the temperature of the platinum. The emissivities of glowing bodies are best compared by introducing them into a stove whose walls are at a uniform temperature. The oxides composing the Auer incandescent gas-burner show a high emissive power, which, together with its small mass, large surface, and low conductivity, accounts for its efficiency as an illuminant.—The true surface tension of pure water between 0° and 40° C., by P. Volkmann. This was determined by capillary tubes, and controlled by similar observations upon toluol and benzol. Under a pressure of 750 mm. of moist air, the surface tension of pure water was found to be 7·683 mg. per mm. at 0°, 7·543 at 10°, and 7·236 at 30° C. —Condensation of vapours, by Mathias Cantor. The capillary constants of a surface exert a decided influence upon the dew-point of a vapour in contact with it. The author allowed steam to condense on a thin sheet of petroleum spread on mercury. As soon as the thickness of the layer so deposited is equal to the radius of molecular action, the dew-point and the temperature of saturation become the same. This radius was calculated from the results obtained, and was found to be $6{\cdot}5 \times 10^{-6}$ mm., or slightly less than that found by Reinold and Rücker from soap-bubbles.—Relation between the dielectric constant of a gas and its chemical valency, by Robert Lang. This is an important new law connecting the specific inductive capacity of a gas with its chemical valency. Whatever the nature of the gas, its (sp. ind. capacity − 1) increases directly as the total valency of the atoms constituting its molecules. This difference from unity is called by the author the "electrification number," since it indicates the difference of behaviour in the dielectric ether due to the presence of matter. The electrification numbers of H, O, CO, and CO_2 are very nearly as 1 : 2 : 3 : 4.—Dielectric constants of liquefied gases and the Mossotti-Clausius formula, by F. Linde. These constants of liquefied CO_2, Cl, and N_2O were determined by means of the electric oscillation method. On plotting the calculated and observed values different curves were obtained, and it was evident that the spec. ind. capacity depends upon other conditions besides density.—Circular magnetisation of iron wires, by I. Klemencic. When a current traverses an iron wire, the molecules tend to arrange themselves in circular chains round the axis. This gives rise to strong extra currents at break. The magnetic susceptibilities are different along and round the axis. In soft iron the former exceeds the latter, whereas in Bessemer steel the circular susceptibility is the greater.

IN the number of the *Nuovo Giornale Botanico Italiano* for November, Sigr. M. A. Mirabella has an interesting paper in which he describes the extra-floral nectaries of various species of *Ficus* cultivated in the Botanic Garden at Palermo. They occur as well-marked nectariferous areas on the young branches or under-side of the leaves. In the same number, Sigr. E. Baroni describes several new species of *Lilium* from China.

THE *Bulletini* of the Italian Botanical Society for October and November contain, in addition to papers addressed especially to Italian botanists, several of more general interest. Prof. G. Cuboni describes a successful attempt to obtain in Italy the very rare germination of the seed of the double cocoa-nut of the Seychelles, *Loidoicea Sechellarum*.—Prof. P. Baccarini has found albuminoid crystalloids in the petals of a considerable number of plants belonging to the Leguminosæ, and especially in fugacious flowers; from which he draws the conclusion that they cannot, in these instances, be regarded as a reserve food-material.—Prof. A. Aloi confirms his previous statement that both terrestrial and atmospheric electricity exercise a very beneficial influence on the growth of plants, and predicts that this may be an important element in the agriculture and horticulture of the future.