a fundamental part of the training of the mining engineer.

Smyth was followed in the chair by Clement le Neve Foster, Herbert Cox, William Frecheville and S. J. Truscott, all men of great eminence in the mining industry before they accepted the professorship. They were able to present to their students first-hand information concerning the mining problems of their day and the improvements they visualized in the future, thus to inspire their hearers to keep abreast of their subject and to retain the international reputation of their forerunners. The standard of athletic prowess set by the first head of the Mining Department—a Rowing Blue—has been maintained by the present head, Prof. J. A. S. Ritson, a former English International Rugby player.

Progress in mining is achieved in the mines, not in college laboratories. Some practical improvement in the art of mining is of almost daily occurrence; and although this is the fruit of research, it is not of the kind that results in the publishing of scientific papers. Thus it is that the strength of the Department lies in its training to bring about these useful practical improvements in the mines rather than in research work carried out within its doors.

In fulfilling this, its most important function, it has been very successful. The excellence of its training has attracted students from all parts of the British Empire. The Department is unique in the number of awards granted to its past students by professional mining institutions, and in the positions of highest responsibility in the mining world occupied by its *alumni*. The A.R.S.M., the diploma awarded to its students, has an unsurpassed reputation in the Dominions and the Colonies, where almost all its students go on leaving the School; and the demand by the Colonial Governments and mining companies for those trained in the Department has always been greater than the supply. Particularly is this so during the past few years, when only a small fraction of the posts offered could be fulfilled.

Metallurgy

The first English text-book on metallurgy was written by Dr. John Percy, the first professor of metallurgy at the Government School of Mines and of Science applied to the Arts, later to be known as the Royal School of Mines. Percy has been truly described as the 'father of English metallurgy', and it could well be stated that for the first decade of his professorship, his department was the cradle in which British metallurgy was nurtured. Among the results of his many successful researches was the adoption for the Patara process in 1858 using sodium thio-sulphate for the leaching of silver ores.

In those early days, phosphoric iron deposits remained useless as a source of iron, for no method was known by which the deleterious phosphorus could be removed. Percy Carlyle Gilchrist, in association with his cousin Sidney Gilchrist Thomas, and inspired by John Percy, carried out experiments which ultimately established the basic Bessemer process for converting phosphoric pig iron into good-grade steel. The first patent was taken out in 1877 and from it was developed the modern basic steel industry.

Percy was professor during 1851–80, and was followed by Sir William Chandler Roberts-Austen (1880–1902), an exceptionally able and inspiring teacher, who fostered the growth of physical metallurgy—then in its babyhood—to such a degree that his team of researchers, which included D. G.

Bengough, O. F. Hudson, W. H. Merrett and A. Stansfield, made notable advances in the study of metallography.

William Gowland, then a well-known authority on the metallurgy of copper, followed Roberts-Austen and was professor during 1902–9. He completed the Fifth Alloys Research report, the first four having been published by his predecessor.

For the five following years, 1909–13, the chair was occupied by William A. Carlyle, who had been manager of Rio Tinto Mines and smelter. His wide experience in industry enabled him to impress on his students the importance of understanding practical operations on a large scale.

Sir Henry Cort Harold Carpenter was professor from 1913 until his tragic death in 1940. Under his direction, considerable advances were made in the study of corrosion of metals and, in collaboration with Miss Elam (Mrs. Tipper), the first single crystals of aluminium were produced, thereby providing data which have proved of fundamental importance. As chairman of a large number of Government commissions and research institutions, he was able to exercise great influence in promoting the advancement of knowledge in a wide variety of metallurgical operations.

In the course of the century, the Department has produced many metallurgists of outstanding eminence, and professors who, in their turn, have grafted on their universities the courses initiated at their *Alma Mater*. Among its brilliant students were C. O. Bannister, C. V. Boys, A. J. Brett, A. C. Claudet, Sir Lewis Fermor, P. C. Gilchrist, F. W. Harbord, O. F. Hudson, W. F. Hume, Henry Louis, A. McCance, B. McNeill, T. A. Rickard, E. Riley, Sir Thomas Rose, S. W. Smith, A. Stansfield, T. Turner, and E. A. Wraight.

The Royal School of Mines, proud of its achievements, is beginning its second century in a spirit of high endeavour, fully confident that it will continue to produce the highly trained geologists, mining engineers and metallurgists who during peace and war have served Britain and the British Empire with conspicuous success.

THE ALLIED PLAN FOR EDUCATION

By DR. E. F. ARMSTRONG, F.R.S.

THE United Nations Educational, Scientific and Cultural Organisation (U.N.E.S.C.O.) commenced its deliberations in London on November 1 and was able to have its constitution agreed and signed by the representatives of forty-four nations on November 16. The principal object of this Conference was to draw up the constitution of the new body; the delegates attended primarily, therefore, in a diplomatic rather than an educational capacity.

Perhaps the outstanding achievement to many of us is the inclusion of the word 'Scientific' in the title as well as in all pertinent places in the text. Science has now world recognition as an equal partner in the great task of world educational reconstruction.

It is generally recognized that the failure to set up an educational body on the same lines as the International Labour Office after the First World War was a serious omission. The remarks of the

Prime Minister, Mr. Attlee, at the first session of the Conference, form the first sentence of the preamble to the constitution "that since wars begin in the minds of men, it is in the minds of men that the defences of peace must be constructed". It is by education alone that men of all classes in all countries can get to know and understand one another. Hence the general view among delegates that they were forging the best possible instrument of peace—a peace based on the intellectual and moral solidarity of mankind.

The first and most immediate object of U.N.E.S.C.O., when it begins its real work, must be to bring help to education in the backward countries. A backward citizen is not necessarily a bad citizen, but his country will be stronger in the measure that he ceases to be illiterate.

People are thinking to-day as perhaps never before. There is universal agreement on a higher standard of life for all, though silence about the fact that it requires education both to attain it and enjoy it. Some advocate a classless society without realizing the impossibility of there being any such thing. The Fascist State, whether of the extreme right or the extreme left, advocates the vice of mass thinking; scientific workers lead in demanding freedom of every kind. Pessimists proclaim that nothing will ever be the same again, while the optimists hope to change human nature by 'order in council'. The truth is that we are unable to decide between what is permanent and what is ephemeral, or as Charles Morgan has so admirably said, "the middle truth appears to be that in all societies and at all times there are both constants and variables, and that what gives to an age its distinguishing character is the relationship, the friction between them".

But this article is primarily to deal with the effect of the new organization on science, national and international. It can be profound, but the future must be shaped by our own efforts; it cannot and must not be left to others while we sit back and criticize.

The U.N.E.S.C.O. originated, as is well known, in part from the Conference of Allied Ministers which began work in London on the initiative of Mr. R. A. Butler, then Minister of Education, in October 1942. In July 1943 it set up a Science Commission. The primary work of the Allied Ministers Conference was to make preparations so as to be ready to aid the essential work of educational and moral reconstruction when their countries were freed; hence the original task given to the Science Commission was to work out the requirements for scientific and laboratory equipment. A general picture of the problem as a whole was obtained and, for the first time, an idea of the magnitude of the scientific equipment of the countries concerned was gained. As a result of their work seventy-six detailed inventories—of many thousands of items—have been compiled. These form a unique catalogue of the necessary equipment of laboratories for a wide range of sciences such as had never before existed. They will form valuable works of reference for many years to come and greatly facilitate both the task of rehabilitation and the setting up of a laboratory in any part of the world.

Apart from this specific achievement, the Science Commission has taken all possible steps in a variety of directions to be able to guide and assist the restoration of science at all levels in the occupied countries, and it can form a basis for the science division of the Preparatory Commission of U.N.E.S.C.O.

Perhaps it is appropriate here to chronicle that the Conference set up a Preparatory Commission to take all necessary steps to bring the new body into physical being and start its work, in particular to get ready the agenda for the first real meeting, which can only take place after a sufficient number of nations have ratified their acceptance of the constitution. When this happens the home of U.N.E.S.C.O. will be Paris. In the meantime Sir Alfred Zimmern is acting as secretary and the business is being conducted from London.

Two different themes were in the minds of all the delegates: one, the legalistic drafting of the constitution; the other, humanitarian, the need to help in rehabilitation of the devastated countries. It required skilled conduct on the part of the chairman of the various meetings to keep the two subjects separate in the discussions. Finally, the rehabilitation aspect was referred to a Technical Committee to be set up by the Preparatory Commission and to come into being at once.

The last session of the Conference was devoted to restoration and closed on a high note of urgent need; the meetings which followed immediately concerned themselves with procedure and oratory and involuntarily brought to mind those words of Macaulay:

"Those behind cried forward,
Those before cried back."

Admittedly, it is difficult to see how best to ensure the provision of aid since this is dependent inevitably upon action by individual nations or existing international relief organizations.

The Conference had before it as the working document a White Paper prepared by the Allied Ministers Conference which substantially was adopted. In this White Paper the word 'Science' was lacking, but its insertion was urged by the United Kingdom delegation largely on the insistence of Miss Ellen Wilkinson, who so efficiently acted as president of the Conference. The proposal met with no serious opposition. Arguments as to whether science is included in 'Culture' are interminable and serve no useful purpose. The nations of the world were concerned, not Britain alone, and to them the inclusion of the specific word 'Science' had a real meaning.

Delegates from the South American countries, from Turkey, China, Egypt and many other, including the Arab countries, all gave the assurance that new status had been given to teachers of science so that their powers would be increased and their prestige enhanced. The same consequence can be made to apply even in Great Britain, where science is still largely an extra, though honourably bracketed with music and dancing!

Charles Morgan writes of "a confluence of ideas flowing from the nations into the stream of civilization". The opportunity now exists to make science supply some of the tributaries of this stream.

Nature, in its issue of November 15, gave full space to the views expressed by some of our leaders regarding the proper future organization of international science, so that there is no point in expressing further views of a detailed character.

The constitution of U.N.E.S.C.O. is permissive, as every well-drafted instrument should be. 'May', for example, in Article 8, enables it to co-operate with outside international bodies presumably of repute, whereas 'shall' is mandatory and forces recognition on any body with headed stationery and a brass plate on the door.

The primary and indeed essential need is for science to be represented from the very beginning on the Secretariat of U.N.E.S.C.O. The secondary action may well be for us, first nationally and then internationally, to make the existing or new scientific organizations of various types both representative and efficient so that they can claim recognition from U.N.E.S.C.O. at an early stage. The proposals put forward by the Association of Scientific Workers, as representing the work which the scientific division of U.N.E.S.C.O. should do, are admirable but they would take several years to bring to fruition, and demand a large and highly qualified administrative staff at a moment when there is a great dearth of scientific workers for productive work. Moreover, the question arises whether all these matters should be handed over to bureaucrats, for that is what they will become, even though they started as men of science. The docile are not always the virtuous. Is it not wiser to maintain the freedom which we cherish, which some think we are in danger of losing, and organize these things for ourselves while becoming closely affiliated to the world organization?

There is so much to do to-day that we are accustomed to priorities in every sphere of activity. U.N.E.S.C.O. must have priorities, some undoubtedly far higher than the claims of advanced science: this is the main reason why we must do some things for ourselves if they are to be done soon.

Happenings the world over rightly interpreted may be taken as evidence of strength in our civilization. The responsibility for the recreation of the moral life of the world will fall heavily on us; in this we dare not fail. As R. A. Butler wrote the other day, the Conference "must ensure that the world of Education, like that of Science, does not become the plaything of purely Governmental machinery, either in any one country or in any international organisation".

In the next few months U.N.E.S.C.O. will have to establish its organization. It has a precedent in the International Labour Office. The Executive Board is representative of eighteen governments and elected by the Conference; there is to be a director-general and a permanent secretariat. Perhaps it should at once break down its work into sections, of which science will undoubtedly be one. Men of science should proceed without delay to set out in clear and, above all, practical terms, avoiding too great a length, the work and problems which this Science Section should envisage as its first tasks. It must be remembered that the non-scientific workers have still to be educated regarding the nature and the value of the help which the scientific attitude of mind can give them; at present they are sceptical, even suspicious of the motives of men of science and confused by the scientific habit of speaking with so many contrary voices on any subject.

The Conference was well attended, several countries sending large and influential delegations. As always on these occasions, perhaps most was effected by private conversations or smaller meetings, among which were several for the scientific delegates.

Many delegates were closely connected as teachers with education in their own countries, including some of the more backward in the educational sense. They were outspoken in the benefits which U.N.E.S.C.O. could give them: money spent on education instead of armies, a life in which cultural interests, the drama, art, science and literature could play a part instead of power politics and the fear of future war;

a life in which mutual understanding and knowledge instead of ignorance of each other's ways and lives could be developed; a life of travel and interchange of visits (extending over weeks and months) of children, students, teachers, professors, research workers, all men and women of sympathy and goodwill promoting peace and an international outlook instead of narrow nationalism and suspicion; a life in which technical progress was for the service of man and not for his destruction.

INSTITUTION OF METALLURGISTS

INAUGURAL MEETING

AS a craft, the metallurgical art is of the greatest antiquity: in the speculative development of natural science, the metals have played an important part. During the Middle Ages, the Guilds and Livery Companies exercised a beneficial influence in demanding proofs of competence from the craftsmen working with metals; but as the importance of these bodies decreased, this control diminished, and since then, until the last few weeks, there was no organization, in Great Britain at least, which was responsible for certifying metallurgists as being professionally competent. University qualifications are clear proof of this; but there are many who, for reasons outside their own control, have never had the opportunity of obtaining such training or 'hall-mark'.

In the Iron and Steel Institute and the Institute of Metals, Britain possesses two bodies which have done great service to the metallurgical industries, and to the community in general, as the avenues through which metallurgical research and developments have been made known; but membership of neither is recognized as proof of more than interest in the ferrous or non-ferrous metals.

For some years, there has been a growing feeling that a strictly professional body, somewhat similar to those which exist for chemists and engineers, was needed, and the two Institutes have had the matter under consideration. It was ultimately decided that the demand would be best met by the establishment of a new organization, admitting only qualified workers in the field of metallurgy, and having functions supplementary to, and independent of, the two existing metallurgical institutes.

On September 15, 1945, the new Institution of Metallurgists was incorporated and licensed by the Board of Trade, and on November 28 the inaugural meeting was held, under the presidency of Dr. H. Moore, at 4 Grosvenor Gardens, London, S.W.1, the offices of all three bodies. Attended by metallurgists of repute in all branches of the art and science—the presence of Prof. T. Turner, the *doyen* of English academic metallurgists, gave, perhaps, the greatest pleasure—and with the support of representatives of very many similar scientific and professional societies, the support and collaboration of which will be most welcome, the Institution was launched under conditions of the most complete harmony.

After outlining the reasons for the formation of still another society, Dr. Moore expressed his and the Institution's satisfaction at the presence of so many distinguished guests, and pointed out that the Institution was still under the control of a 'caretaker government' until the first general election of officers to be held in the earlier part of next year. He then introduced the Hon. R. G. Lyttelton, treasurer