failure may lead to unexpected and dangerous movement. Accordingly, extensive studies are being undertaken of the reliability of complex electrical and electronic equipment, and there is every expectation that, in future, fault-finding will be made to some extent automatic, so that the production process may be kept going with a minimum of costly interruption. Fourthly, the problems of safety in the nuclear power stations are briefly reviewed (see p. 1023 of this issue).

There has been steady improvement in all fields of safety, and the Chief Inspector believes that accident prevention is gaining momentum, but that we need to set our sights a good deal higher. In referring to training in safety, he expresses the hope that the technical colleges will take greater interest, and that in the expanded programmes a place will be found for spreading the fundamental principles of safe working. The Clean Air Act, where it reduces the pollution of the atmosphere, has immediate repercussions on standards of cleanliness and lighting, and the Food Hygiene Regulations, 1955, have stimulated both food-products factories and factory canteens to further effort in cleanliness, both general

and personal. Work continued on the surveys initiated by the Industrial Health Advisory Committee into conditions affecting health, and that on the Halifax Survey was practically completed during the year.

At the end of 1956, some 362 factories, including five receiving depleted uranium oxide from the Industrial Group of the Atomic Energy Authority at Risley, were receiving radioisotopes from Harwell and the Radiochemical Centre, Amersham, compared with 300 at the end of 1955, the most extensive use being for γ -radiography of castings, welds, etc., chiefly with iridium-192 and cobalt-60, though caesium-137 continues to gain in favour. A draft code of regulations for the use of radioactive materials (other than for luminizing) was examined by an expert committee, and as a result draft regulations in respect of sealed sources were nearly complete by the end of the year and have since been published. The Radiological Protection Service made a concerted drive, with the Factory Inspectorate, to improve still further the protection of radium luminizers. The use of radioactive material for the elimination of static electrical charges continues to increase slowly.

SCIENTIFIC AND TECHNICAL TRANSLATION

A CONFERENCE on "Scientific and Technical Translation", organized by Aslib, was held at the Connaught Rooms, London, W.C.2, on March 5. Dr. J. E. Holmstrom of Unesco and Mr. E. B. Uvarov were chairmen for the morning and afternoon sessions respectively and about two hundred visitors attended. Mr. L. Wilson (director of Aslib) and Dr. Holmstrom introduced the subject, indicating that it had been examined in a report by Unesco* and was of increasing importance in facilitating scientific communication. Even if the problem were restricted to that experienced by those speaking English, it was found that about half of the world literature was unintelligible without translation. For those with other mother tongues the difficulties were far worse. The Unesco report contains the bulk of the factual information now available on translating methods, services, costs and indexes.

Three papers were presented: "The Organization and Availability of Technical Translation", by Dr. A. L. Mackay (Birkbeck College, London); "The Economics of Translation", by Mr. Felix Liebesny (Mond Nickel Company); and "Training for Translating Work", by Mr. A. G. Readett (National Coal Board, vice-chairman of the Institute of Linguists).

Dr. Mackay surveyed possible and actual methods of organizing the extraction of information from foreign-language literature, translation being regarded as an unproductive activity to be avoided if possible. The inefficiency of making a translation for one person who found only a fraction of it informative could be mitigated by circulating translations widely, regular cover-to-cover translations of major periodicals being the most systematic way of sharing expenses. Indexes of individual translations were thought to be only marginally useful. Persons properly qualified for scientific translation work would be better employed as full members of research and develop-

ment groups working with linguistic and library rather than, say, chemical techniques. Material for translation should be selected for its value, reviews, digests and books being preferred; and an estimate of the premium to be placed on rapid processing could be made by attaching half-lives to various categories of literature. Training students in languages and maintaining scientific representatives abroad could reduce the volume of translation necessary.

Mr. Liebesny examined the actual costs, to an organization using translations, of various methods of preparation. He found that, where a complete text was required, the cost of translating a 1,000-word article from Russian to English was about 50s. to 120s., depending on particular techniques (use of recorder, typist, etc.) and salary rates. If the translator worked through the paper orally with the inquirer, translating only part, the cost could be reduced to 17s. to 28s. Mechanical translation, according to the most optimistic forecasts, might cost 2s. per thousand words. Under various co-operative schemes, such as that run by the Department of Scientific and Industrial Research, where the costs are shared, the charges might vary from 8s. to 30s. For cover-to-cover translations of periodicals the cost would be only 4d. to 6d., so that even assuming that only 2½ per cent of the papers which had to be bought were actually required and worth translating, the cost per thousand words would still be only 13s. to 20s. For such co-operative translations the choice of material is not wholly under the inquirer's control and certain papers would still have to be dealt with individually.

Mr. Readett described how translators at the London office of the National Coal Board were trained to prepare abstracts, to make full translations and to provide interpreter services. Only professional linguists of honours degree standard were recruited and they were familiarized with the technology of the subject. The close and harmonious relations maintained with the Board's technicians were especially

* "Scientific and Technical Translating and Other Aspects of the Language Problem". Unesco, 1957; second edition, 1958. (H.M. Stationery Office.) 20s.

emphasized. Visits, lectures and films, such as instructional films on new machinery, were used in addition to background reading material to ensure that translators were familiar with the subjects of the papers they had to translate. Only the highest quality of written translation was produced but, for speed, when only one inquirer wished for a translation, the paper could be very satisfactorily examined orally by the translator and the subject specialist. The concept of a 'rough translation' as something cheaper and easier to make than proper translation was based on a misunderstanding of the translation process which was to understand first, and then to re-express in English. Many papers could be clearer in a well-expressed translation, but those papers which were obscure, because they were ill-written and ambiguous even to a specialist, imposed an intolerable burden on the translator.

In discussion, Dr. D. J. Urquhart (Department of Scientific and Industrial Research) supported an organized system of cover-to-cover translation as the only real answer to the situation, together with the widest possible use of English by scientific journals. There was general agreement with this and with the proposition that students should be trained in foreign

languages, particularly Russian, if only to employ translators more effectively. It was recommended that those translating papers should notify the Aslib index when they begin a translation so that duplication might be avoided. Many enthusiasts spoke on various aspects of translation without expressing views which diverged seriously from those of the main speakers, except that many preferred that scientists should be trained in languages rather than that linguists should be taught technology.

It was resolved, on the initiative of Dr. Urquhart, that Aslib should be recommended to convene a further conference "to see what measures can be taken to make Russian scientific and technical literature available in English". The meeting also passed a resolution from Dr. Clason (Philips, Eindhoven) that the whole question of translation required fuller consideration by a three-day conference. Discussion was terminated with a resolution that the Unesco Report proposals, circulated with the conference documents, should be sent out to participants as a questionnaire, so that the opportunity of obtaining the opinions of those attending the conference should not be lost through lack of time. The papers and discussion will be published later in "Aslib Proceedings".

A. L. MACKAY

HIGH POLYMERS

THE Kelvin Lecture, delivered on February 6 to the Institution of Electrical Engineers by Sir Harry Melville, dealt with the chemical structure and physical behaviour of high polymers. After giving an account of the underlying principles, Sir Harry dealt with natural and artificial rubber, polyethylene, synthetic fibres and ion-exchange fibres. The lecture brought out very well the co-ordination of chemistry, physics and engineering in the field of high polymers, and showed to what a large extent materials of this kind are finding all kinds of uses, and how their properties may to some extent be controlled on the basis of theory.

The fundamental property of a high polymeric material is its high molecular weight, which may increase from upwards of 10,000 to values of the order of a million for linear molecules and indefinitely large values for non-linear systems. The molecules should consist of long chains of atoms to which side-chains are attached. The groups in these side-chains may be able to rotate freely or may be joined by cross-links. If the main chain contains double bonds, its members will be hindered from rotation. If the number of molecules in the chain is not very large, the chain may coil into a spherical shape, and rubber is normally in this form. In stretching the rubber, the chains uncoil under moderate tension. Unvulcanized rubber behaves differently and tends to crystallize on extension. Vulcanization puts in cross-links, which are not extensive enough to prevent uncoiling. In synthetic rubbers the aim is to produce chains not long enough to form crystallites, and a recent discovery by the British Rubber Producers Research Association consists in modifying the chemical composition so that the chains cannot form such crystallites.

Silicones have chains of silicon and oxygen atoms in repeating units with various groups attached to

the silicon atoms. They vary from mobile liquids, the viscosity of which is only very little affected by temperature, to rubber-like solids.

Polyethylene is a linear chain of carbon atoms with hydrogen atoms attached when the polymerization is carried out at room temperature. At higher temperatures and high pressures the molecules have many branches attached to the linear chain, and this has an important effect on the properties. By exposure to high-energy radiation such as gamma-radiation, hydrogen atoms are removed from the chains, leaving free radicals, which join to give cross-links, forming a three-dimensional structure which at high enough temperatures decomposes rather than melts.

Synthetic fibres must have a high tensile strength. It is curious that among the strongest natural and synthetic fibres the tensile strength does not vary much. The strength is much less than that calculated for breaking the chemical bonds, and it is less than the calculated value for other plausible structures, so that no explanation is yet known. The modulus of elasticity is close to the calculated value. The lecture dealt with the changes produced by altering the chemical composition. Fibres and rubber are closely related and relatively small changes in chemical structure influence their properties quite markedly.

Ion-exchange fibres are made by mixing high-polymer molecules containing carboxyl or acid groups and hydroxyl or alcohol groups, and heat treatment. They are in effect solid acids. In an acid liquid the fibre swells. If the acid is replaced by an alkali the molecules stretch, but if the fibre is put into acid its original state is restored. Theoretically, mechanical energy could be derived from such a system, but at present the efficiency is very low.