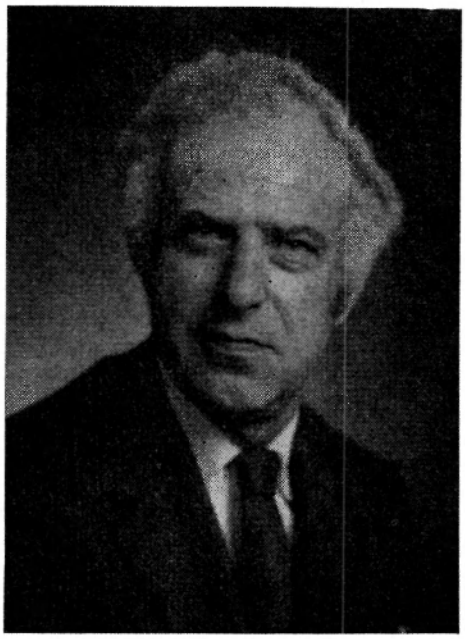
The International Institute of Welding —Its Growth, Activities and Influence



[Text of an address to the Bombay branch of The Indian Institute of Welding by Mr. P. D. Boyd, Secretary General, IIW.]

It is a pleasure and an honour for me to have the opportunity of addressing you here to-day. It must indeed be a pleasure for anyone to visit for the first time this great country which is unique in so many respects ; especially is this so for a citizen of the United Kingdom who inevitably finds here the source of many influences on his own country and much with which he is already half familiar.

At the same time it is an honour for me to be, I believe, the first official of the IIW to have the occasion to speak at a meeting of your Institute and I naturally hope that my visit may help to focus attention on the advantages to be derived from taking part in the work of the International Institute.

Nevertheless, it must be recognized that, because most of the countries which were initially active in the IIW were countries with an old-established industry, much of the effort has been concentrated on problems relevant to those countries ; inevitably this means that comparatively few people have the experience and technical facilities to participate actively in the co-operative work which is being undertaken or to apply the results on an industrial scale. On the other hand, a country such as this which is undergoing rapid industrialisation must have many problems, particularly in the field of education and training, whose solutions depend more on financial resources than on the international collaboration which it is the aim of the IIW to foster.

Membership

I would like to start by saying something about the Institute's membership the growth of which is, in itself, an illustration of the increasing importance which one country after another has attached to international collaboration in the field of welding. Although national welding societies had existed in certain countries from about the time of the first world war, it was only after 1945, when the need was felt, as never previously, for international cooperation which could at once hasten reconstruction and reduce the risks of further conflict, that the idea was mooted of forming an international organisation devoted to welding. Within a year, the IIW's constitution was drawn up, the Institute being officially founded in June 1948 by the representatives of thirteen countries, eleven of which were situated in Western Europe, the others being the United States and South Africa.

No sooner had the IIW been founded than interest in it was aroused in non-member countries, and there was a steady expansion in membership during the first ten years. In this period, societies in West Germany and the countries of Eastern Europe, Australia, Japan and New Zealand in the Pacific, and Canada, Uruguay and the Argentine in America all joined.

Consequently, by the end of 1958, most of the countries which were highly developed industrially

were already members and in the last thirteen years membership has increased slowly in terms of countries. In terms of potential influence the same cannot be said, since during this period the most populous countries in the world, China and India, have joined and it is hoped that, in the near future, another of the world's largest and most rapidly developing countries, Brazil, will also become a member. Thus, nearly all the countries of the world with a well-developed engineering industry are now represented in the Institute.

Having outlined the geographical scope of the IIW, I would like to explain what membership means on a national level. Membership is restricted to non-profit-making bodies which are wholly or mainly concerned with the scientific and technical aspects of welding. The members of the IIW are therefore societies, not individuals, and these societies are, for the most part, national welding institutes or associations, such as The Indian Institute of Welding, though university departments and learned societies which include a section on welding are, in a few cases, also in membership, particularly where a national welding society does not exist.

In about two thirds of the member countries there is a single member society and in the remainder there are two or more societies which are jointly responsible for the organisation of the country's participation in the activities of the IIW.

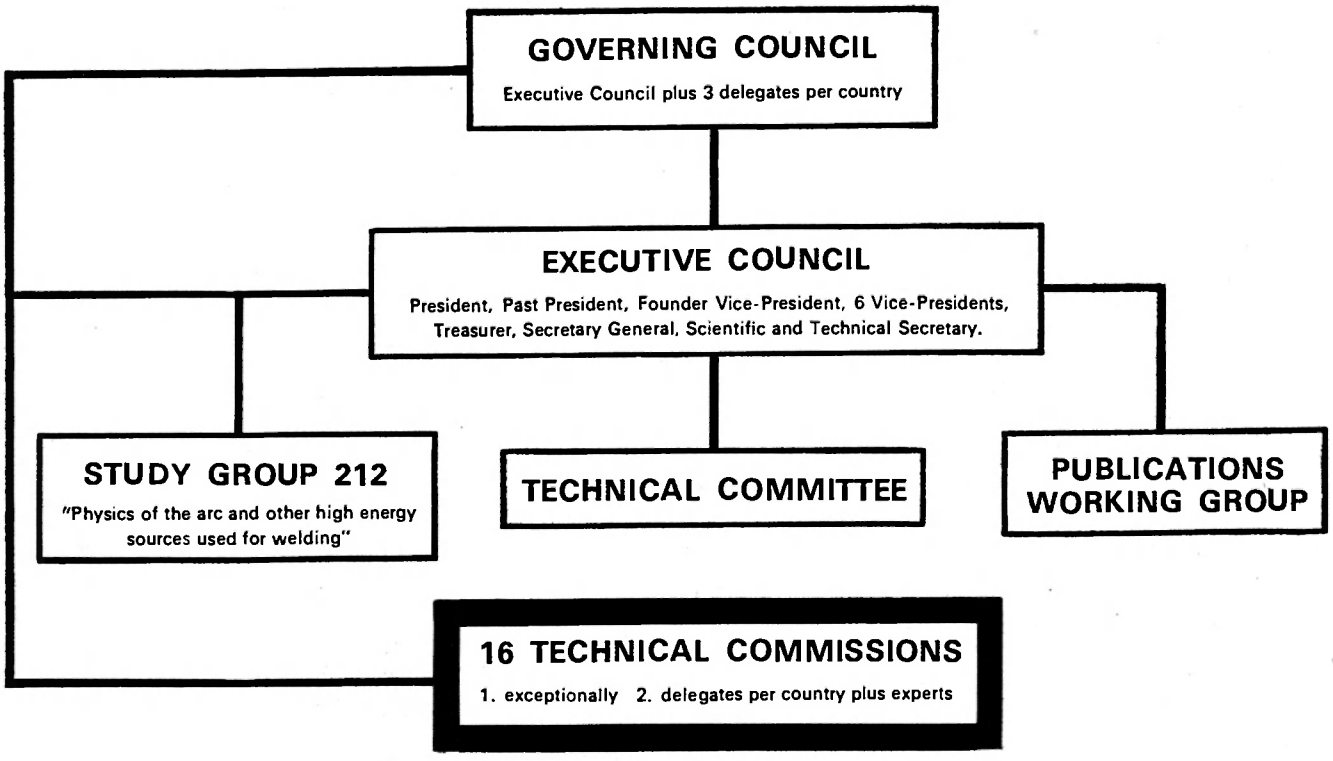
If I may, I will return later to the role of member societies at a national level and to the problem of organising a national delegation to the best advantage.

Before then, I would like to say something of the methods of work of the IIW and of the means by which this work is accomplished.

Methods of Work

In general terms, international scientific and technical associations function in one or two ways : either they provide a forum by means of large congresses every few years at which individual contributions can be made known to an international audience or they provide means by which the continuous cooperative study of particular subjects can be carried on at an international level. The IIW has chosen the second of these methods, but it does not entirely disregard the first, since it normally organises, on the occasion of its Annual Assembly, a half-day Public Session for the presentation of papers on a given subject, generally dealing with an application of welding, which enables experts in the host country who do not serve on the Commissions to have technical discussions with their colleagues from abroad.

Fig. 1.



Structure

However, the IIW is primarily a body designed to work continuously on a cooperative basis and this presupposes a certain structure which can be represented diagrammatically (Fig. 1.)

Governing Council and Executive Council

The supreme authority is the Governing Council, to which each country can appoint up to three delegates, though there is only one vote per country. In addition, the officers of the Institute, who constitue the Executive Council, also sit on the Governing Council, the meetings of which are chaired by the President of the Institute.

The Governing Council is responsible for all policy decisions, including the election of members, the appointment and terms of reference of the Commissions, the control of finance, the appointment of the Chairman of Commissions and the election of the Institute's officers. The Council normally meets at the beginning and the end of each Annual Assembly, the first meeting being devoted to the general administration of the Institute and the second to decisions on the resolutions which the various Commissions have adopted during their meetings.

The detailed administration of the Institute is not, of course, carried out by the Governing Council with a potential membership of over 100, but by the Executive Council, composed of the 12 officers of the Institute. They are assisted by two specialist Committees, one of which deals with publications and the other with all matters of technical policy and, in particular, with the orientation of the work of the Commissions.

Commissions

The Technical Commissions are the core of the Institute and it is to sustain them and enable them to carry out their work in the best possible way that the rest of the structure exists. I do not, however, propose to go into details about their current technical programmes here, since this information is readily available in print, but rather to indicate how they operate, the scale of their activities and broadly what subjects they cover.

All the member countries have a right to be represented on each Commission and countries which, for reasons of distance, are not normally able to be represented at meetings in person, can nevertheless participate in the work by correspondence. Most of the Commissions have terms of reference which are too wide to make it possible for all the members to be experts in all aspects of their work. For this reason, at least in the larger delegations, each national delegate is normally assisted by one or more experts in the different matters dealt with by the Commission. For the same reason, most of the Commissions have found it convenient to set up Sub-Commissions or informal Working Groups or to appoint rapporteurs to collect information or make a detailed study of particular subjects. It should be emphasized that this method of work permits of great flexibility since as soon as a task is completed, the corresponding group can be disbanded and others appointed to deal with new topics.

In general, the Sub-Commissions and Working Groups hold separate meetings as often during the year as may be necessary and they report to the parent Commission during its meetings at the Annual Assembly. The Commission then makes any decision which may be called for and recommends action by the Governing Council in certain specified spheres in which the individual Commissions are not empowered to take action on their own.

I think I should perhaps mention to this audience that any national delegation which appoints by name a delegate to a Commission will be placed on the mailing list for that Commission and will consequently receive all Commission documents for onward distribution to those concerned in that country from whom comment, either verbal or in writing, is welcomed. Distance from Europe is thus by no means a complete impediment to participation in the technical work of the IIW, though it is certainly a handicap.

It may be of some interest, before discussing the subjects covered by the Commissions, to have an idea of the extent of their activities in quantitative terms.

The IIW has sixteen Technical Commissions, as well as a Study Group which, for the present purposes, may be counted as a Commission. Before the 1972 Annual Assembly, there existed a total of 40 Sub-Commissions and 46 Working Groups depending from these seventeen Commissions. During each Annual Assembly each Commission holds three or four plenary meetings ; in addition, some 60 separate meetings of Commissions, Sub-Commissions and Working Groups are normally held between Annual Assemblies.

Figures are not available for the number of documents considered at the meetings of Sub-Commissions and Working Groups, but the number of documents which were circulated to all the members of the parent Commissions during 1970 to 1971 amounted to 464. In considering this total and the time and energy devoted to the preparation of the documents it should not be forgotten that each document would have been prepared in about 100 copies and that each one would have been circulated in countries all over the world.

It is impossible to state in precise and concrete terms the value of the activities of the IIW to industry in the member countries. I believe, however, that these statistics of meetings held and documents prepared indicate the conviction of the very large number of people who either carry out this work or approve the expenditure entailed, that international cooperative work on welding is an advantage either to themselves or their employers or to the economy of their countries.

If we now turn to the actual subjects studied by the Commissions, it is interesting to note the changes which have taken place since the foundation of the Institute nearly 25 years ago. As originally created, the Commissions did not deal with the problems associated with particular products such as ships and structures, but rather with the welding processes, the engineering and metallurgical problems arising from the use of welding, the testing of welds, the incidence of welding on industrial health and safety and various other problems (see fig. 2).

The test of experience has modified to some degree the purity of this original scheme, notably through the creation of the present Commission XI "Pressure vessels, boilers and pipelines" and that of Commission XVI "Welding of plastics". Commission XI is exceptional in that it deals with the applications of welding in a particular industry. It was set up as a separate Commission in 1954, largely because it was found that the experts who at the time were studying the design details of welds in pressure vessels, boilers and pipelines with a view to forwarding recommendations to the ISO, were in fact so specialised in this particular subject that they could not readily be accommodated in another Commission dealing with a more general topic. The same is, broadly speaking, true of Commission XVI, which is exceptional in that it deals with the welding of a specific material, namely plastics. Here again, because of the specialised character of experts in this field, it was found to be impossible to deal with the welding of plastics either in the Commissions devoted to processes or in those dealing with materials and design.

As a natural reflection of the great development in the number and complexity of welding processes over the period 1948—1967 the number of Commissions dealing specifically with processes has been increased from three to five. This increase is partly represented by Commission XII which was originally set up in 1954 with the title "Special arc welding processes", since it had already become apparent that the experts in what were es entially the flux—and gas-

Fig. 2

1948	*Commission*	1972
Gas welding and allied processes	I	Gas welding. Brazing and cutting
Arc welding	II	Arc welding
Resistance welding	III	Resistance welding
Documentation	IV	Special welding processes
Testing, measurement and control of welds	V	Testing, measurement and control of welds
Terminology	VI	Terminology
Standardisation	VII	Documentation and standardisation
Hygiene and safety	VIII	Hygiene and safety
Weldability	IX	Behaviour of metals subjected to welding
Effect of residual stresses on service behaviour	X	Residual stresses and stress relieving. Brittle fracture
Methods of stress relieving	XI	Pressure vessels, boilers and pipelines
Brittle fractures	XII	Flux-and gas-shielded electrical welding processes
	XIII	Fatigue testing
	XIV	Welding instruction
	XV	Fundamentals of design and fabrication for welding
	XVI	Welding of plastics
	Study Group 212	Physics of the welding arc and other high energy sources used for welding

shielded processes were not the same as the experts in welding with covered electrodes, which was the essential subject of Commission II. During the years from 1954 to 1967 there was of course a further increase in the number of welding processes available which required study and this had the effect of continually enlarging the scope of Commission XII then entitled "Special arc welding processes". It was therefore decided in 1967 to restrict the field of activity of this Commission to flux—and gas-shielded processes and to set up a further Commission on special welding processes to deal largely with the most recent processes, such as electron beam, laser and explosion welding, etc. On the other hand, the terms of reference of the original Commissions I and III, though widened, have not undergone any drastic revision.

A third change which has occurred since the foundation of the IIW has been a change in emphasis in respect of the Commissions dealing with design and materials problems. While Commission IX continues to deal with problems of weldability, though under a different title, the ground covered by the original Commissions X, XI and XII is now, in effect, covered by the present Commission X, much progress having been made in assessing the value of different methods of stress relieving, while the study of the effects of residual stresses has largely been centred on their influence on brittle fracture. In recent years, the study of fracture mechanics has assumed increasing importance in this context, and being of interest to both Commission X and Commission IX, it is primarily considered at joint meetings of these two Commissions.

Almost immediately after the establishment of the IIW, there was a demand for the international study of fatigue failure in welded construction, so after some hesitation as to how this work could best be organised, a separate Commission was set up in 1952.

Similarly, it early became apparent that there was a need for international study in the field of welding design and the calculation of welded constructions and, as a result, Commission XV was established in 1951.

With regard to the Commissions dealing with the different aspects of what it is now fashionable to call "Communications", it was decided early in the life of the IIW to set up a Commission on welding instruction, which is concerned with the teaching of welding technologists and technicians and with the qualification of welders. On the other hand, it has not proved necessary to have separate Commissions devoted full-time to problems of documentation in welding and to handling liaison between the IIW and the ISO, which is the essential task of the standardisation Commission, and so these two Commissions have been combined. The foresight of the founders has, however, been entirely vindicated in the case of the Commissions on testing and inspection, terminology and health and safety, which have all produced a succession of important results within the framework of their original terms of reference.

A final change by comparison with the original pattern has been the establishment of Study Group 212 "Physics of the arc and other high energy sources used for welding". This Group is largely composed of physicists working in this specialised field, and it functions independently under the aegis of the Executive Council. It is possible that, in the near future, a similar group may be set up to study another subject on which very little work has been done, namely, the economics of welding.

Influence of the IIW

1. *Standards*

In discussing the effect of the IIW's work, reference should first be made to its influence on international standards in view of the importance of these standards to industry and commerce in all countries. While it is not the purpose of the IIW to prepare standards as such, one of its stated objectives is to assist in the formation of international standards for welding in collaboration with the International Organisation for Standardisation. The Institute has done this since its inception, in some cases offering documents to ISO which it considered could be used as a basis for international standardisation, in other cases responding to appeals from ISO for information required in the elaboration of an international standard. Some idea of the contribution which the IIW has made to the establishment of international standards dealing with different aspects of the welding processes and their applications can be formed from the fact that, over the last ten years, the IIW has forwarded some 40 documents to the ISO and the International Electrotechnical Commission, while, on the other side of the scales, it is fair to say that some 20 ISO and IEC recommendations for international standards are wholly or partly based on work originally done within the IIW Commissions. It will thus be apparent that the IIW has exercised a very considerable influence over the contents of international specifications and, in many cases, over their very existence since, without the IIW's work, it is probable that the facts on which

many standards rest would simply not be available. In this context, it need hardly be underlined how advantageous it has been to the industry of the different member countries to have a voice in the preparation of international standards from, in many cases, the very first drafts, and also what a very strong position is enjoyed by national delegations which ensure that there is good coordination and agreement between their representatives on IIW Commissions and the corresponding Committees of ISO.

2. *Publications*

A second way in which the IIW exercises an influence is through its publications. Since 1958, when the present system of numbering was devised, the IIW has issued nearly 400 documents suitable for printing as articles in journals, together with a number of books and booklets, a film, Image Quality Indicators and two collections of reference radiographs of welds.

To mention first the documents, these may have been submitted to a Commission by an individual and have been considered sufficiently important to be issued by the IIW, or they may result from cooperative work carried out by members of the Commission. In either case, if the Commission's recommendation for publication is approved by the Executive Council, the document, in practically every case, is freely available for publication by any or all of the member societies of the IIW. In addition, since 1963, very many of these documents have been published in the Institute's bi-monthly journal "Welding in the World". Preprints of each issue are sent in advance to member societies to enable them to arrange for the printing of these documents in their own press simultaneously with the publication of the IIW journal.

The majority of the Institute's publications in book form have been issued on behalf of the Institute by a member society which acts as publisher. In this way, IIW work has been issued by publishers in seven European Countries and the USA. Of these publications, special reference must be made to the Multilingual Collection of Terms of which seven sections, mostly in some seventeen languages, have so far appeared. This collection of terms has been the work of Commission VI over nearly 25 years and it has made an essential contribution to the international exchange of welding knowledge, enabling accurate translations to be made.

A catalogue of publications is issued every second or third year to record what work is available.

3. *Personal contact*

The third way in which the IIW can influence welding circles in its member countries is through the action of individual delegates and experts. In this connection I would like to say something about the organisation of national delegations from the point of view in particular of the advantages to be derived from membership of the IIW.

Clearly, one of the first responsibilities of the member society or societies in each country is to appoint on the Governing Council and the Commissions national delegates who will participate as actively as possible in the work and faithfully represent national opinion in international discussions.

While it is beneficial for many countries to be able, through their delegate, to exercise an influence on the work of the Commissions, it is also most desirable that the results of the work of the Commissions should be disseminated in the member countries. For this reason many delegations have set up national committees corresponding to the Commissions of the IIW; these committees serve the dual purpose of allowing delegates to inform themselves of the opinion in their own country on the problems under discussion in their Commissions and of enabling delegates to disseminate useful information which they have gained at international meetings. As we all know, information is frequently available by word of mouth well in advance of its appearance in print, while at the Annual Assemblies of the IIW, the importance of personal contact between experts from different countries, quite outside the official programme of the Assembly, should not be underestimated.

A further function of such national committees concerns the cooperative programmes of investigation or research which are often undertaken by the Commissions of the IIW. It is important that when such programmes are being planned. delegates should be able to decide, with the backing of informed opinion in their country, whether it is beneficial to the delegation to participate and if so, who will pay for and perform the country's share of the work. In this connection it is worth noting that, for countries with a substantial expenditure on welding research, membership of the IIW can result in important savings through the coordination of research programmes in different countries and in the prevention of duplication of effort.

It is, in general, true that the profit derived from an investment is proportionate to the amount of capital

invested. This applies also to membership of the IIW, in that the more efficacious a delegation is, the more advantages the industry of that country derives from membership.

Shortage of foreign currency makes it impossible at present for India to invest in the IIW on any considerable scale. Unfortunately, that is not a problem with which the IIW can render assistance any more than it can provide help which implies a financial commitment over and above the distribution of documents. But I believe that India will derive greater advantage from its membership when it is realized how much information is available both through "Welding in the World" and other publications and through the Working documents of the Commissions. I would hope therefore that in course of time your Institute will nominate on a permanent basis delegates to all the Commissions whose work is relevant to your industry. This would ensure that the delegates so appointed receive all documents circulated for study. If each delegate were then supported by an appropriate group of experts, this would be a considerable dissemination of knowledge while the views of Indian industry could be contributed in writing to the Commissions. Thus there would exist in India an infrastructure which would be immediately valuable and which would provide a basis for more complete Indian participation as facilities for foreign travel increase. Of course the creation of such an active delegation implies a considerable effort, not only on the part of the delegates but also on that of the Council of your Institute which would have to be responsible for its direction and administration. I believe it is a matter for you to decide whether such an effort is at present justified, but if you think it is, I am certain that both India and the other member countries would benefit from an increased Indian contribution to international collaboration within the IIW.

I am convinced that India and the other member countries of the IIW have reciprocally much to gain from their association in the International Institute and so I believe that your Institute took the right course in applying for membership. Since you have as yet had comparatively little direct contact with the IIW, I thought it might be of interest to give you a brief outline of its structure and activities. In 1973, the IIW will be celebrating the 25th anniversary of its foundation and it is indeed an appropriate moment to take stock of how it has developed and what it is doing after nearly a quarter of a century's activity.