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2. 50 Years of IABSE – Review and Outlook

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In 1979 with the Jubilee of the International Association for Bridge and Structural Engineering the time seems appropriate to make some observations on the Association's past and a few reflections on the direction it will take in the future.

1. Review 1929 – 1979

Following the 1st World War, Professors A. Rohn and M. Ros of the Federal Institute of Technology, Zurich, strove to bring together bridge builders of different lands, including those from the countries which had been enemies. Thus in 1926 the 1st International Congress for Bridge and Structural Engineering was conducted in Zurich, followed in 1929 by a 2nd congress, this time in Vienna. As a result of the Vienna congress a committee made up of Dr. H. Bleich (Austria), Prof. E. Pigeaud (France) and Prof. M. Ros (Switzerland) was formed to work for the continuation of the collaboration. This committee invited the leading representatives from science, industry and government from 14 states to a constitution meeting on 29th October 1929 in Zurich.
The founding of IABSE was decided upon, and Prof. Dr. A. Rohn chosen as first President. The Association would be based in Zurich.
The resolution proceeded from the following ideas and views (appearing in the Schweizerische Bauzeitung, 30th November, 1929):
"The Association aims for the collaboration of structural engineers from the individual states, the exchange of ideas, knowledge both of a theoretical and practical nature, and results of research. The most vital questions and problems occurring at a specific time will be prepared in a special Task Group for scientific and technical study, and stimulus will be given towards a more rational working of all tasks through the best possible coordination of the work in the various countries. Publications and reports will keep members abreast of the results of the experiments and practical experiences made. Side by side with this continued collaboration, congresses will be arranged at regular intervals in order to supplement and further the work of the Permanent Committee through personal contact of the larger circle of members. Of particular importance for the newly created Association is the fact that colleagues engaged in all forms of construction, especially steel and reinforced concrete, are represented with the same interest, and thereby an intensive collaboration for the mutual benefit of bridge and structural engineering in its most general form can be expected."
IABSE was the first, and remains the only, international association dealing with all problems of planning, design and execution in the field of structural engineering. Not until after the Second World War did various organizations specializing in particular sub-fields come into being.

1.1 Political and Economic Situation

The founding of IABSE coincided with the beginning of the Great Depression of the 1930's. At the same time the dictatorial trends which were to lead to World War II were already making themselves felt.
Coming into such a world scene, the newly born IABSE was virtually paralysed in its infancy. However the Association, with its headquarters in Zurich, was able to keep functioning. In various ways, including the forewarding of addresses and letters, the Secretariat was able to help many members in the warring states.
At the end of hostilities contacts were renewed. The expulsion of members from the defeated nations, although difficult for us today to understand, must be viewed in the light of the horrors perpetrated in the war. In March, 1948 an extraordinary convening of the Permanent Committee agreed to the lifting of the expulsion decree. With this gesture IABSE contributed to the understanding and renewed collaboration among all nations.
After a short period of confusion the task of rebuilding the war-devastated countries was swiftly and energetically undertaken. An encouraging growth at all economic levels resulted. At this time bridge and structural engineering were often presented with new and immense tasks. In the developing countries, many of which achieved independence only after World War II, large-scale construction projects were required in the infrastructure as well as in industry and housing.
This unique and long enduring economic expansion came to an abrupt end after a period of more than 25 years. With the first oil crisis in 1973 it became clear that a change was coming in economic development. And the building industry as well had to get ready for new economic conditions.

1.2. Development of Structural Engineering

An idea of the state of building technology at the beginning of the 1930's can be had through some notable constructions:
Steel construction was already an established building method. With the George Washington Bridge (1931) over the Hudson River in New York a free span of more than 1,000 metres was bridged for the first time. The Empire State Building (New York, 1931) reaching 380 m replaced the Eiffel Tower as the world's tallest structure, a record that had been held since the 300 m tower's construction in 1889.
Reinforced concrete had by now outgrown its turbulent adolescence. The 3 x 186 m bridge built at Plougastel, France, in 1930 and the Traneberg-Sund Bridge in Stockholm, Sweden (181 m) three years later set new standards for concrete arch bridges.
The progress of the last 50 years in steel construction was largely brought about by new joining techniques. The welding technique made its breakthrough only after the problem of brittle cracks had been overcome. At the same time friction joinings using high-strength bolts have stood the test as the main joining on construction sites.
Rivet joinings have today virtually disappeared. The introduction of steels of higher strength together with the welding technique, has led to lighter, statically and aesthetically clearer constructions.
Composite structures with steel girders and concrete slabs in shear-resistant union have proven themselves most economic in many cases both in bridge and structural engineering. Recently composite construction has been applied for high rise buildings. Thus for example the periphery

walls are made of concrete with window openings, the pillars in steel and the decks as a composite structure.

The Reinforced Concrete Construction, in 1929 still in its infancy, has developed at full speed. The first beginnings of a concrete technology proper, as well as of the use of reinforced concrete with profiling were already made before the war. The way was also opened at this time for prestressed concrete. The great breakthrough came however in practice only after the war. The construction techniques which were then developed were made possible mainly through the use of new construction machines and equipment. As an example from bridge construction we have the segment construction technique, cantilever, incremental launching process, the mobile scaffold and prefabrication.

Behind this external structural development, a revolutionary change in methods of calculation has taken place. Before the war an elastic calculation with allowed stresses was generally adopted. The engineer's tool was the slide rule or at best a rattling, mechanical calculator. The analysis of a system of three linear equations for the calculation of a fixed arch posed quite a problem in practice. After the war however the scientific assessment of the plastic behaviour enabled the analysis of the static ultimate load taking into consideration the inelastic material behaviour. In order to achieve a more balanced safety of various structural systems, the limit conditions "service load" and "failure" have been introduced in recent years.
The limits established early according to numerical calculation have been markedly extended through the computer. The finite elements method has established itself as a process adapted both to the static variety of the structures and to the possibilities of the computer. This has enabled the analysis of complex space systems under static and dynamic loads.

1.3. IABSE Activity

IABSE has contributed considerably to this development in structural engineering. In this connexion should be mentioned the names of some prominent deceased members whose works have helped in achieving the international standing that IABSE enjoys:

O.H. Ammann (USA), E. Freyssinet (France), R. Maillart (Switzerland), E. Mörsch (Germany), S. Timoshenko (USA), E. Torroja (Spain).
Until 1968 the technical and scientific activity of the Association was confined to the annual publication of a volume of Proceedings and a report, "IABSE Bulletin". Congresses were conducted in 4-yearly cycles, i.e 1932 and 1936, then following an interruption due to the war, from 1948. At the annual meetings of the Permanent Committee delegates met to settle administrative business and to exchange experiences on a personal level.
In 1959 it was decided to form 3 Working Commissions for the better handling of individual fields of study:

1) Basics and General Questions
2) Steel and Light Metal Construction
3) Reinforced- and Prestressed Concrete

Since 1968 these commissions have organized symposia, to take place concurrently with the Annual Meetings, devoted to special subjects. The direct contact of speakers and audience as well as the reports themselves, have brought about the desired intensified exchange of knowledge and opinions.
Before the war IABSE was the sole international association in the field of structural engineering. The rapid development of construction technology following the war led to an increasing specialization. The desire for a more intensive treatment of these new fields as well as differences of opinion as to their significance and a general reluctance to a broadening of IABSE activities, led to the founding of new international associations specializing in particular fields. After a certain initial tension, IABSE and these new associations came to a satisfactory understanding on the division of their spheres of activity and evolved a system of collaboration in questions of common interest. Through the "Liaison Committee" created in 1961, the activities and dates of events are discussed at least once a year with the following international committees:

CEB (Comité Euro-International du Béton)
CIB (International Council for Building Research Studies and Documentation)
ECCS (European Convention for Constructional Steelwork)
FIP (International Federation of Prestressing)
IASS (International Association for Shell and Spatial Structures)
RILEM (International Union of Testing and Research)

1.4. The Structure of IASBE Today

The structural framework of IABSE had remained basically unchanged since the Association's founding until the 1974 annual meeting in Quebec (Canada) where new by-laws were proposed and accepted. According to these new by-laws our Association should occupy itself with the whole realm of structural engineering, i.e. planning, conception, design, analysis, building, management and maintenance of bridges and structures. The organizational setup of the technical and scientific activity is set out as follows:

At present there are 5 permanent Working Commissions, responsible to the Technical Committee:

1. General Problems
2. Steel, Metal and Timber Structures
3. Concrete Structures
4. Contractor and Construction
5. Design Concepts

For the study of specially important assignments, Task Groups are formed with a limited period of mandate. The Task Groups at present operating are:

1. Use of Computers in Structural Engineering
2. Probabilistic Methods in Structural and Construction Engineering
3. Building Physics
4. Aesthetics and Structural Engineering

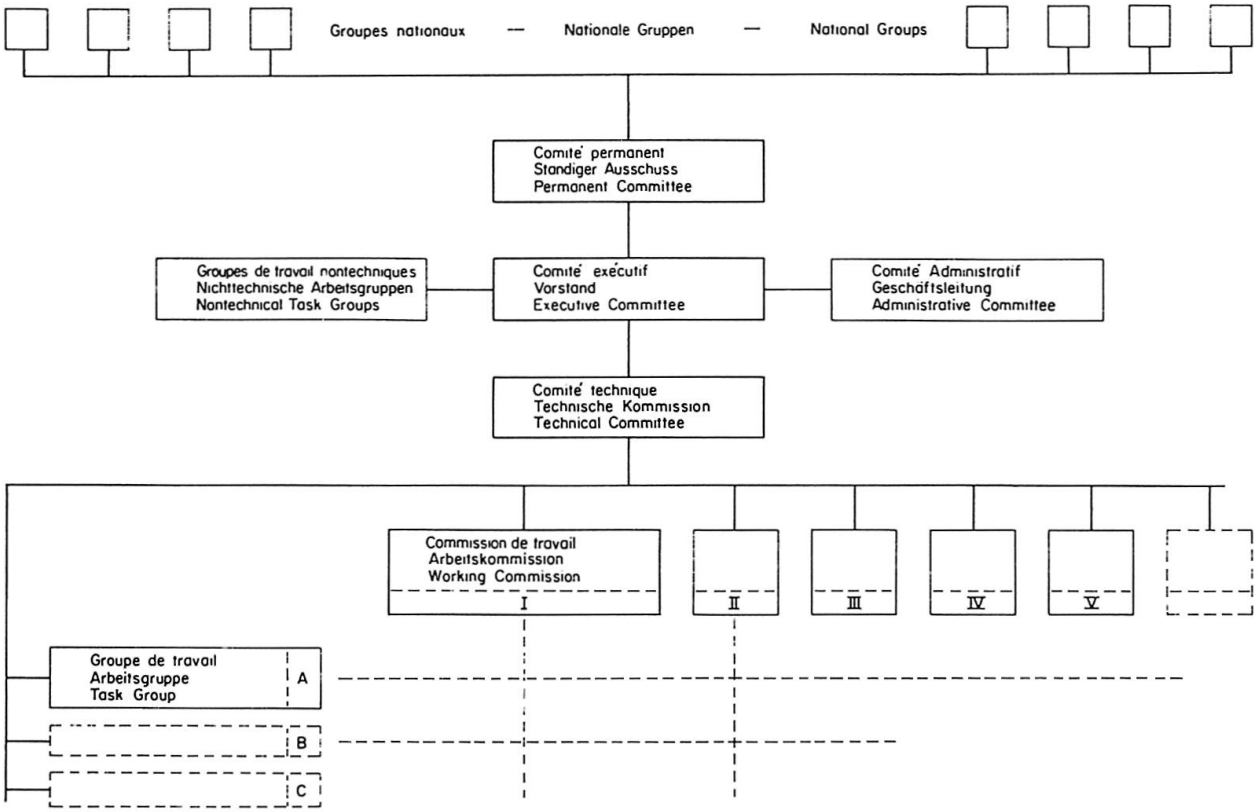
Three different sorts of public events are organized:

1) Congresses in Four-Yearly Cycles:

   These present the development in Bridge and Structural Engineering to as comprehensive an audience as possible of members and the industry in general. Our subject field is here demonstrated to the government authorities, administrations, industry and the general public within a socially recognized framework, thus improving the image of the profession.

2) Symposia Held Concurrently with the Annual Meeting, and According to Need:

   These technical-scientific meetings treat one theme of a particular field which should find interest not only among specialists, but appeal also to a wider audience who wish to keep up to date.



3) Colloquia According to Need:

These provide specialists with the opportunity for intensive discussion and/or the working out of a current problem. The number of participants is limited in order to encourage individual contact among participants.

The results of these events are published in reports, divided into Introductory, Preliminary and Final Reports. In addition, the IABSE PERIODICA appears quarterly.
This extensive activity ensures that our members are constantly informed on the international development in the field of bridge and structural engineering. Additionally, members are offered the opportunity to publish their works and to present papers at the events of IABSE. Finally they are welcome to collaborate in Commissions and Task Groups, contributing in this way directly to the forming of IABSE's activities. Naturally the Association wishes that this personal participation include prominent members from as many countries as possible, so that the Association may remain truly internationally represented.

2. Future Outlook

2.1 Economy, Public Opinion

As previously mentioned, the near frenzied economic expansion of the post-war years was followed in 1973 by the first oil crisis bringing with it economic difficulties which put a brake on the general economic growth world-wide. A significant factor is the energy squeeze, which confronts almost every country today. It is certain that in the near future the cost of energy will continue to rise significantly, so that economic use of it has become the cry of the day.
In the Western world at least, so far as can be judged, there has been for some time a growing resistance among the populations to technology and science which at times threatens to develop into an outright hostility. The computer, so harmless and helpless without human operation, has become a symbol of the dehumanization of technology. Nuclear power stations are considered, or at least represented, by many as a direct threat.

The building profession is also reproached en bloc for disfiguring the landscape and making living conditions unbearable through dams, highways, industrial complexes, high rise buildings and appartment houses. It is of little avail to point out that it is not engineers who decide upon and finance the construction of such plants, or that the majority of these structures are for the needs and actual improvement in the standard of living of the people and for the protection of the environment. On the other hand it must however be admitted that a blind belief in progress and the unreined use of technology and science as well as disregard for nature and a lack of understanding for the spiritual and aesthetic values are exactly the causes that have provoked this reaction. The presumptious idea that anything is technically feasible has been in many heads for too long, so that in one way this resistance is to be greeted. This development of public opinion should not be considered lightly or as a temporary symptom of the times. It would seem wiser to support the positive side of this movement in order to replace the unrestrained materialism by spiritual and moral values.

2.2 Further Development of Construction Technology

Our Association must face the question of along what technical-scientific lines its activities should develop until the year 2,000. Perhaps such far-reaching changes as have been brought about in the past 50 years through the technique of welding, the development of prestressed concrete and the availability of new kinds of construction machines and equipment as well as the electronic computer on all levels of the building process cannot hope to be repeated in the next 20 years. Rather can we look forward to a phase of consolidation and of a steady furthering of the development. The traditional building materials concrete, steel, as well as brick and wood, will continue to hold the major share of structural engineering. Naturally a steady quality improvement of these materials can be expected. Synthetic products will in the future, for reasons of cost and technology, (e.g. fire resistance) be used only in special cases.

The energy expenditure in the production of building materials, in the actual building stage as well as in the subsequent use of the building will have a much greater economic and also political significance. Analysis of the total energy budget will, especially in the case of heated or fully airconditioned buildings, lead to new forms, which can also entail structural changes.
The new field of study, building physics, which tackles the scientific and technical treatment of heat-, noise- and moisture problems in buildings, will become ever increasingly important for the structural engineer.
The trend towards calculating the ultimate load should be made general on an international scale. The problems of safety and efficiency of buildings will be given more significance. Both recent spectacular collapses of bridges and hall roofs and unexpected wear, corrosion and storm damages to bridges and structures demonstrate the necessity of a reanalysis. In this context a total consideration encompassing all phases of the building process, should be undertaken.
The application of the computer in all spheres of the structural engineer's activities is still in the early stages.
In addition to the large computers, more and more the small computers are finding use in individual firms. This makes a solid basic education in computer use indispensable for the engineer so that he can make a rational choice and can carry out the necessary checking of the results. A goal-oriented use of the computer should free the engineer from calculation and checking drudgery and leave him free for creative and comparative studies.
The construction process in the execution of major building assignments takes on an ever more complex nature today. Thus direction and checking play an ever increasingly vital role from the planning stage right down through each step to the occupation and maintenance of the structure. In future construction specialists will have to occupy themselves more and more with these problems in order to realize structures as economic, pratical and aesthetic as possible.
This leads to the question of structures- people- environment. The lack of interest and indeed in many cases the utter disregard for this problem often shown by engineers in responsible and influential positions is partly the cause of the present malaise.
Builders are creators. Their structures often occupy dominant positions in a city-or landscape. They should therefore aim to erect structures that are not merely economic, solid and efficient, but also beautiful and at the same time adapted to the local conditions and the environment. In the case of structures for the infrastructure, traffic and industry, the engineer bears a large proportion of the responsibility for the fulfillment of these goals.
This short exegesis shows that the coming years will bring in all probability no revolutionary innovations in the field of bridge and structural engineering. In the industrialized countries rather a certain transposition in favour of maintenance and renovation works is to be expected. The majority of structures built since the last world war are successively reaching an age where such repairs fall due. Added to this are the unavoidable energy conservation measures, which from economic and/or political reasons demand that significant building investments as well as new technical installations be made on existing buildings.
In the developing countries large-scale building projects for the infrastructure, the exploitation of raw material sources, the production of energy, as well as for industry and housing will continue to be needed.
With these sketchy remarks it has been attempted to pinpoint the areas of activity envisaged for the International Association for Bridge and Structural Engineering in the coming years as well as to indicate the change which should be taken into account in the general attitude towards technology and scientists.

For the activity of the Association, the following propositions may serve as a resume:

- IABSE encourages international cooperation on all levels of structural engineering encompassing planning, conception, design, construction phase and maintenance;
- the Association strives to win leading international representatives from science, research, administration, engineering offices, contracting firms and industry for this cooperation, in order to achieve a world-wide exchange of technical and scientific knowledge on the highest level;
- the Association preserves its scientific and political independence. In accordance with this policy the Association's activities are financed solely through membership dues and the income from fees for meetings and the sales of publications as well as from unconditional donations;
- the Association seeks cooperation with national organizations covering the same fields, and this through common events, cooperation with national meetings, as well as support from the Commissions' works;
- the Association cooperates with international associations specializing in bridge-and structural engineering. This cooperation is sought through mutual discussion of the activities, and reciprocal help in the staging of events and the formation of ad-hoc commissions for the solving of problems of mutual interest;
- mindful of the eminent significance that the technical scientific improvement of the developing countries has for the economic development of all nations and for the maintenance of world peace, the Association makes her organizational and technical services available to these lands e.g. help in the organization and running of technical meetings, assistance in finding suitable speakers, and the giving of technical-scientific advice. The Association is ready to support the international panels (e.g. UNESCO) in their programmes for developing countries;
- the Association strives to raise and enhance the international image of the profession in accordance with the great significance of constructional engineering for all walks of life and this she tries to achieve by conducting events in an appropriate framework and also by inviting representatives of the authorities and administration to them. Through the accompanying cultural events and lectures by specialists from other branches of science and from the fine arts the Association also hopes to foster in its members interests out of their own field;
- the Association's events encourage, it is hoped, personal contact among members and their families from the various countries. This direct association with other cultures, attitudes and economic systems should promote and deepen mutual understanding and respect. In this way IABSE tries to play its part in furthering peaceful understanding among all peoples.

IABSE is proud of its members and of the achievements of its first 50 years. A challenging goal is set for the future. In order to accomplish it, the kind support of all members will be needed, and especially the mutually stimulating collaboration of those members active on the various panels of the Association.
For this support the Association thanks its members in advance.