FROM THE EUROPEAN GROUP ON FRACTURE TO THE EUROPEAN STRUCTURAL INTEGRITY SOCIETY.

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The first meeting of the European Group on Fracture took place at Université de Technologie de Compiègne in 1976. It was followed by more and more attended conferences every two years. The successive leaders strengthened the organisation which became the European Structural Integrity Society in 1990. ESIS is responsible for a number of activities, publications, technical committees besides the organisation of conferences. They covered a number of topics which remained active throughout the years. In the future it is recommended that ESIS puts more emphasis on risk analysis and education.

A SMALL NUCLEUS AT COMPIEGNE

In 1976, the French Fracture Group had been active for five years and had organised a meeting in Zurich (Switzerland) at the invitation of Thomas Varga who, at the time, was working with Sülzer. The idea was brought forward that a European Fracture Group should exist. Thus I took the initiative to organise a first meeting at the newly created Technology University of Compiegne. I have kept no record of this gathering which was attended by a small number only of fracture specialists, whose enthusiasm compensated their scarcity. I can remember that the lecture room had a ventilation system which would have been very confortable in a hot summer, except it was winter. Apparently the attendees had a low enough transition temperature. We had a nice dinner to warm up and to decide to meet again two years later at Darmstadt (Germany). This was the beginning of a successful undertaking.

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CONTINUOUS GROWTH

Figure 1, shows the evolution of the total number of contributions (oral and poster presentations) at the successive European Conferences on Fracture. (Gross (1), Radon (2), Maurer and Matzer (3), Faria (4), Van Elst and Bakker (5), Czoboly (6), Firrao (7), Sedmak et al (8), Schwalbe and Berger (9)). A fast growth can be observed until 1990. The following decrease probably does not reflect weakening but partly more severe selection of papers as well as difficulties in financing attendance at conferences.

In the first years countries outside of western Europe were absent. A few began to come at the Leoben conference in 1982. Peaks in their attendance are observed at the Budapest Conference in 1988 and at the Varna conference in 1992 as expected from their location. Since 1986, there are always a few colleagues who come from Asia, from Japan mostly. But the number of participants from America remains almost non existant.

This strengthening of ESIS was not the result of chance. The strategy bolstered by the successive presidents and general secretaries was an important element in the process. René Labbens with the help of Jacques Poirier began to fix the rules for national organisations to become members, thus setting down the foundation. He handed over the stick to Harry Van Elst, who, with Ad. Bakker, went further on the way to the transformation of the European Fracture Group into a Society. This was achieved by Hannes Larsson in 1990. The European Structural Integrity Society was born. Recently our President Ian Milne negotiated with the Federation of European Materials Societies (FEMS) for ESIS to become an associated member. The vision of these men must be recognized together with the wisdom they had not to speed things up, but to go ahead step by step, stone after stone. They understood that the needs of industrial societies advocate more and more for a better prevention of failures, for improving the integrity of structures and thus for a solid organisation fostering truly international cooperations.

A VERY ACTIVE ORGANISATION

We all know international organisations which merely organise conferences and we can even observe with some dismay that they show a tendency to multiply, confusing the scene. It is encouraging that ESIS goes much further and demonstrates its indispensability by a variety of activities.

Technical Committees organise workshops and round robins, produce documents some of which should lead to standards.

TABLE I - The ESIS Technical Committees.

NUMBER	title	CHAIRMEN
TC 1 Subcommittees	Elastic Plastic Fracture Mechanics R-curve and Tear Instability Fracture Mechanics Testing and Standards. Local Approach	D. Firrao, G. Wardle G. Wardle K.H. Schwalbe F. Mudry
TC 2 Subcommittees	Micromechanisms Sretched Zone Round Robin Micro Cleavage Fracture Stress Round Robin	J.F. Knott, D. Taplin V. Achenbach C. Jüde
TC 3 Subcommittees	Fatigue Multiaxial Fatigue Contact Fatigue	J. de Fouquet, J. Petit M.W. Brown T.C. Lindley
TC 4	Polymers and Composites	J.G. Williams, A. Pavan
TC 5 Subcommittees	Fracture Dynamics Crack Arrest Conventional Impact Testing High Rate Impact	J.F. Kalthoff R.K. Gillot M.C. Gillivray G. Pluvinage
TC 6	Ceramics	R. Danzer, M. Steen
TC 7	Fracture Mechanics Nomenclature	D. François
TC 8 Subcommittees	Numerical Methods Elastic-Plastic Fracture and Creep Constitutive Modelling	W. Schmitt H. Grebner W. Brocks
TC 9	Concrete	A. Carpinteri
TC 10	Environmentally Assisted Cracking	W. Dietzel, Giovanna Gabetta
TC 11	High Temperature Mechanical Testing	M.S. Loveday, R.P. Skelton

The official journal of ESIS, Fatigue and Fracture of Engineering Materials and Structures, is extremely successfull: the number of submitted papers keeps increasing and its audience is one of the best. This is due in a large part to the efforts and dedication of Keith Miller.

Many specialised meetings have been organised and they have resulted in a number of publications of excellent quality. (Miller and de Los Rios (10), Blauel and Schwalbe (11), Brown and Miller (12), Larsson (13), Boehler (14), Bensussan and Mascarell (15), Scott and Collis (16), Kussmaul (17), Blauel and Schwalbe (18), Kussmaul (19), Baptiste (20), Larsson (21), Miller and de Los Rios (22), Rossmanith and Miller (23), Ainsworth and Skelton (24), Solin et al. (25), Schwalbe and Kocak (26), Waterhouse and Lindley (27), Williams and Paratt (28)).

The Advanced Courses in Fracture, which were organised by Hannes Larsson when he was at Ispra, were of high standard and they produced excellent materials (Larsson (13)). It is to be hoped that they would take place again, as they would contribute efficiently to the education of young scientists and engineers and to improvement of fracture prevention.

The ESIS Newsletter proved to be on essential tool to disseminate informations and a lively forum for discussions. A. Bakker must be congratulated for his efforts to keep the Newsletter alive.

ESIS has also distributed a number of awards:

Griffith Medal: Professor Bruce Bilby
Wöhler Medal: Professor Jean Petit
Awards of Merit: Dr. Hannes Larsson
Honorary Member: Professor Dominique François
Young Scientist's Award : R.C. Brower and Maatschappij, Della Donne
Poster Awards: S. Hao, A. Cornec, K.H. Schwalbe,
A.T. Moczko, P. Stroeven, H. Frenz,
J. Kinder, P.D. Portella.

Finally it ought to be mentioned that ESIS cooperates with the International Congress on Fracture. It supported ICF 8 which took place in Kiev in 1993. ESIS took also the responsability to organise the 7th International Conference on Mechanical Behaviour of Materials ICM7 in Then Hague in 1995.

SIGNIFICANT PROGRESS

Reading through the proceedings of the successive European Conferences on Fracture provides for interesting considerations about trends in research and engineering activities.

TABLE II - Proportion of papers in ECF conferences according to various subject matters.

Subject	ECF 3	ECF 4	ECF 5	ECF 6	ECF 7	ECF 8	ECF 9	ECF 10	Total
Elastic Plastic Fracture mechanics	**0,39**	0,08	0,10	0,24	0,21	0,13	0,12	0,18	**17%**
Local approach	0	0	0	0,01	0,01	0,01	0,03	0,03	≈
Fracture toughness and mechanisms	0,17	**0,35**	0,05	0,11	0,08	0,11	0,12	0,05	**11%**
Dynamic fracture	0,02	0,01	0,06	0,03	0,05	0,07	0,03	0,01	**4%**
Fatigue	0,11	0,29	**0,33**	0,16	0,16	0,09	0,06	0,013	**14%**
Assessment of components and structures	0,17	0	0,22	0,08	0,05	0,03	0,15	0,05	**8%**
Probabilistic aspects	0	0	0	0,06	0,03	0,02	0,01	0,03	≈
Weldments	0,04	0,01	0,10	0,05	0,06	0,05	0,10	0,09	**7%**
High temperature creep-creep fatigue	0	0,08	0,02	0,04	0,04	0,04	0,03	0,12	**5%**
Environment assisted fatigue and fracture	0	0,08	0,05	0,08	0,05	0,04	0,05	0,09	**6%**
Polymers	0	0	0,04	0,01	0,05	0,03	0,03	0,02	**3%**
Composites	0	0	0,02	0,01	0,05	0,06	0,04	0,05	**4%**
Ceramics	0,07	0,03	0,01	0,01	0,02	0,04	0,03	0,01	**3%**
Concrete and rocks	0	0	0,02	0,01	0,02	**0,16**	0,01	0,01	**5%**

Elastic-plastic fracture mechanics was one of the most popular topic. Global criteria, engineering simplified analysis have been widely covered, and local approach is gaining more and more attention. Apparently EPFM continues to raise many questions and it is an area were progress is still needed. The same can be said of fatigue, a subject which has also been much covered in all conferences, with a peak at the Lisbon conference, possibly because of the high implication of the people there for this topic. Environment assisted fatigue, creep and creep fatigue have not been neglected. Fracture toughness and fracture processes have been well covered, but less and less so for the last ten years. Quite a few contributions can also be found about the assessment of components and structures and about weldments. In spite of the liveliness of the Technical Committees concerned with polymers and composites, with ceramics, with concrete, these materials appear to remain at a rather low level in the preoccupations of ESIS. This probably reflects the modest part of ceramic materials in industry and the existence of other active and powerful organisations which gather polymers and composites specialists on the one hand, and concrete on the other. However the conference in Torino attracted quite a large number of papers on this material, owing to the strong implication of the Chairman of the TC on concrete, Professor Carpinteri. Lastly there has always been papers about fracture dynamics.

Going through the ECF proceedings the little attention given to some topics can be surprising. For instance, in the last few years, physics specialists have applied methods of statistical physics to fracture problems, looking at the degradation of networks by random processes, at the fractality of fracture surfaces and paths. Very little of this activity has been brought to the attention of ESIS. Another such left out subject is fretting, in spite of the industrial importance of this phenomenon and of the research which is devoted to its understanding. Little has also transpired concerning irradiation embrittlement, which obviously is not neglected at all by the nuclear industry.

Certainly these subjects are covered by many international conferences, but, if we wish the name of our Society to be meaningful we should try to widen our activities to as many facets of structural integrity as possible.

MUCH LEFT TO DO

This shows that the future of ESIS is not that of routine. That failures still occur might demonstrate that we are altogether lousy or, optimistically, that the subject is a difficult one. It is a reason to pursue the work already underway. But, the analysis of accidents demonstrate that human errors are more than significant. They occur as well at the stage of design, as in fabrication, control, maintenance and in operation. It could be suggested that a closer connection should be established with specialists in human sciences and research ought to be developed by interdisciplinary teams implying engineers and psychosociologists. It is worth to mention that a first approach has been initiated, with the sponsorship of ESIS, by H.P. Rossmanith who organized a conference on "Structural Failure, Product Liability and Technical Insurance" and by L. Faria who organized one on " Economic Cost of Failures. Assessment of Risk and Maintenance". I have felt however that they went only a very little way towards the specialists of risk analysis, who are well aware of these problems. I strongly suggest that, without overlooking what already exists, ESIS should take initiatives in this area.

Interestingly enough, H.P. Rossmanith has also engaged in conferences dealing with teaching "Teaching and Education in Fatigue and Fracture". Here is another activity which we should strongly promote. No doubt that the education not only of engineers, but also of a larger audience, to enlarge knowledge about structural integrity should help in better prevention. Why don't we get interested for that matter in secondary education, in continuous education ? Why don't we get books published for the general public, for teenagers, for undergraduate and graduate students . Why moreover don't we think about modern media, CD-ROM, internet, etc... ? These are but a few suggestions concerning teaching which should be one of our main objectives in the years to come.

In view of putting full emphasis on what I consider as the main issues for the future, I have left aside such important topics as structural integrity of nano-components, enhancement of fracture in crushing, etc... It turns out that insisting on the necessary introduction of human factors in structural integrity, through risk analysis and well as education, allows me to conclude on our European character. Our continuous strengthening has to do with the ease of communications between countries on the same

continent and above all between people who have some common ways of thinking. They are rooted in nations for which history is long and visible and shared, in education systems which, however diversified, are demanding and consider humanities as essential. And thus, should it not be of paramount importance for an European Society to bring human aspects in its preoccupations and demonstrate that Science and Technology devoid of social aspects are meaningless.

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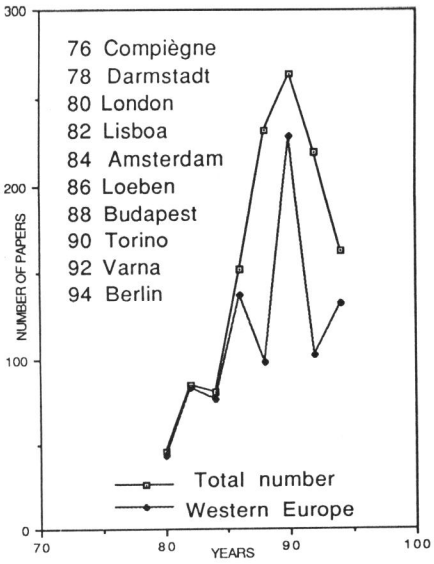

Fig 1. Evolution of the numbers of papers published at ECF conferences

Fig 2. The new ESIS logo appearing in issue n°18 (spring 1992) of the Newsletter