

## International Activities of the Czech Society for Mechanics in the Field of Experimental Mechanics

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**Abstract:** A brief report about history of international contacts of Group for experimental Stress Analysis of the Czech Society for Mechanics in the field of experimental mechanics.

**Keywords:** Experimental Stress Analysis; Czech Society for Mechanics; Danubia-Adria Society for Experimental Mechanics; EURASEM; GAMM; AIAS; EAN

Starting presentation of international contacts of the Professional Group for Experimental Stress Analysis (EAN) of the Czech Society for Mechanics (CzSM) it is necessary to turn back to time before the World War II. At that time simple, from the point of today, experiments were done practically on civil structures and on aircraft structures to prove their resistance against loading. Model investigation was focused on photoelasticity and brittle coatings. In this field Czech contribution was joint with name Prof. Tesař and his activities in France. When the German troops had occupied Czechoslovakia he came back to his mother country and started to build up laboratory for experimental stress analysis in ŠKODA Works in Pilsen. There he educated and trained many experts in some branches of experimental mechanics (e.g. Dr. Milbauer) and thus he gave foundation of next generation of experts in experimental mechanics in all industrial branches. In 1945 he turned his attention back to civil engineering at the Faculty of Civil Engineering CTU in Prague and founded Czech school in experimental mechanics. At the same time during war times some new experimental methods were used for testing aeronautical structures in Research and Testing Aeronautical Institute in Prague and after the war end they were developed. Simultaneously new knowledge came from USA and England. And thus I have opportunity to “meet” Phillips strain gages during my university study when some instruments for medical purposes were developed at our faculty. In fifties expansion of industrial manufactures needed also development of research and testing base, what conveyed constitution of specially focused research institutes in the framework either of the Czechoslovak Academy of Sciences (CAS) or big plants and the Ministry of industry and Trade (e.g. Klokner Institute of Faculty for Civil Engineering CTU, Institute of Thermodynamics CAS, Institute of Theoretical and Applied Mechanics CAS, Institute for Mining CAS, State Research Institute for Machinery (SVÚSS) and Institute of Applied Mechanics (ÚAM) in

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Brno). All up that time known experimental methods were used and further developed in all these institutes as well as in others joint to industrial companies.

As at that time political polarization in Europe existed, information acquire was problematic. Technical literature from abroad was missing or was limited as well as contacts to companies, mostly from the west, dealing with technology and instrumentation.. Thus exchange of information was secured by special monthly seminars devoted to strain gage techniques (Dr. Klaboch (SVÚSS) or photoelasticity (Dr. Perla, Dr. Milbauer and Dr. Černošek), where home specialists and salesmen from companies producing or selling relevant instrumentation were invited, even sometimes from the west.

Two big seminar, one on strain gage techniques and the other on photoelasticity were organized in 1963. The first one is joint with names - dr Klaboch, Ing. Řezníček, Ing. Cais and Dr. Kropáč and the other with Dr. Javornický, Dr. Milbauer, Dr. Perla, Dr. Vísner, Dr. Černošek, Dr. Klíč and Prof. Vadovič. These seminars attracted many participants and started regular annual conferences by their impact to technical praxis. Up to 1967 they were separately organized in different places in the whole Czechoslovakia. In 1968 the first common conference on Experimental Stress Analysis (our EAN is short in Czech language for this conference) was organized by Dr. Hercík at the Technical University in Liberec. This conference was taken as the 6<sup>th</sup> Conference on Experimental Stress Analysis (6<sup>th</sup> EAN) in Czechoslovakia and the starting milestone was put back to 1963. That is why we have the 50<sup>th</sup> annual conference on experimental stress analysis now.

These seminars and later conferences had also some expert from abroad. Experts and scientists from so called socialist countries were taking part in our conferences and our ones abroad, particularly in Soviet Union, East Germany, Poland and Hungary. During these negotiations nearly all participants got a good idea to organize an international conference.. Such idea came true in 1965, when the International Conference on Experimental Methods in Civil Engineering took places in Prague.

Mechanical Engineers were longing for similarly orientated conference. Seven years later, in 1972, the International Conference on Experimental Mechanics ICEM joint with our 10<sup>th</sup> International Conference on Experimental Analysis (EAN) took place at the Faculty of Mechanical Engineering CUT in Prague. Among more than 250 participants from over the world there were tops in experimental mechanics, as Prof. Laermann, Prof. Prigorovskil, Dr. Beer, Prof. Jecič, Dr. Zandmann, Dr. Redner, Prof. Stanley or Prof. Gdoutos. During the gala dinner in a released atmosphere one sentence was to be heard:” If the politicians broke Austria-Hungary to pieces, we technicians should build up an organization, collecting experts, scientists, technicians and students, dealing with experiments in mechanics in the Central Europe. Now it is very hard to find the author among round one table sitting gentlemen (Javornický, Holý, Olšan, Vísner, Klíč, Vadovič and others). This ICEM might be taken as the first in the following rows of ICEM conferences, which are organized every third year by European Association on Experimental Mechanics (EURASEM) now. The last one was in Poitier (France) in 2010.

The attempt to collect national organizations was done in the scope of International Measurement Confederation (IMEKO) in its section 17 several years later, but without considerable success. After our ICEM conference several invitations from USA, Canada and England to research fellowships came, but only two were carried out.

In 1974 the Czechoslovak Scientific Society (ČSVTS) was charged with organizing IMEKO World Congress in Prague. Our professional group for experimental stress analysis took part in organizing Section 17 – Experimental Mechanics.

Further milestone in international cooperation was put by organizing Bilateral Czech-German Negotiation on Experimental Mechanics organized by Prof. Laermann and Prof. Jíra in Bechyně in 1986. These symposia are bilateral and are taking their places in two years term in Germany and Czech Republic up to now.

Next year there was organized by Dr. Vísner and Dr. Štěpánek – ŠKODA Testing Institute - 4<sup>th</sup> Danubia-Adria Symposium on Experimental Methods in Solid Mechanics together with 25<sup>th</sup> International Conference on Measurement of Static and Dynamic Parameters of Structures and Materials in Pilsen. At this conference the Czechoslovak Society for Mechanics (CzSM) received official invitation to Danubia-Adria Committee for Experimental Methods in Mechanics (DAS), which had been founded by three national organizations from Austria, Hungary and at that time Yugoslavia in 1983. In September 1989 CzSM received permission from our authorities to become one of DAS members and several days later at the 6<sup>th</sup> Danubia-Adria Symposium in Austria we became the fifth DAS member after the fourth AIAS from Italy. But for regular activities we were obliged to wait up to time after November 17, 1989.

Only several days before this twist at the world Congress on Experimental Mechanics in Moscow the Czech group of participants were taken as DAS members. In 1993 after splitting of Czechoslovakia the membership in DA Committee was also divided.

Danubia-Adria (DA) Society was founded in 1983 and during the following years was enlarged. Presently, eleven National Societies are members of the DA Society (listed alphabetically):

**Austrian** Society of Experimental Strain Analysis (ASESA)

**Croatian** Society of Mechanics (HDM)

**Czech** Society of Mechanics (CSM)

**German** Society of Experimental Structural Analysis (GESA)

**Hungarian** Scientific Society of Mechanical Engineering (GTE)

**Italian** Association for Stress Analysis (AIAS)

**Polish** Committee for Mechanics of the Polish Academy of Sciences (KMPAN)

**Romanian** Association for Stress Analysis (ARTENS)

**Serbian** Society of Mechanics (SSM)

**Slovak** Society of Mechanics (SSM)

**Slovenian** Society of Experimental Mechanics (SSEM)

DA Society has the objective to promote experimental mechanics, covering all aspects from development to applications of the methods for quality

improvement of processes and products and also for developing new model of education in experimental mechanics. To achieve this purpose the Society intends to encourage exchanges of teachers and researchers between Universities and other technical and scientific societies acting in this field, develop areas of technological cooperation between researchers and technicians from the different countries on bilateral and multilateral basis to contribute to the mutual scientific benefit. But the main task of the DA Society is to organize the symposia on “Development of Methods and Applications of Experimental Mechanics”, in traditional autumn date every year. Three days conference, focused on development and applications and joint with technical excursion, is distinguished by its quality in so far, that it attracts scientists and experts not only from above mentioned countries, but from all over the world. National societies dealing with mechanics are obliged to organize the conference every year with cooperating universities and industrial companies and factories.

The following part of the presentation posses the overview of Danubia-Adria Symposia (bolt print – symposium in Czechien):

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|---|---------------------------------------|
| 1 <sup>st</sup> Danubia-Adria Symposium on Experimental Methods in Solid Mechanics        |                                       |
| Stubičke Toplice - Croatia  | October 15 – 17, 1984                 |
| 2 <sup>nd</sup> Danubia-Adria Symposium on Experimental Methods in Solid Mechanics        |                                       |
| Graz – Austria  | October 17 - 19, 1985                 |
| 3 <sup>rd</sup> Danubia-Adria Symposium on Experimental Methods in Solid Mechanics        |                                       |
| 9th Congress of Material Testing  |                                       |
| Budapest – Hungary  | September 29 – October 3, 1986        |
| <b>4<sup>th</sup> Danubia-Adria Symposium on Experimental Methods in Solid Mechanics</b>  |                                       |
| <b>International Conference on Measurement of Static and Dynamic</b>                      |                                       |
| <b>Parameters of Structures and Materials</b>   |                                       |
| <b>Plzeň – Czech Republic</b>   | <b>May 26 – 28, 1987</b>              |
| 5 <sup>th</sup> Danubia-Adria Symposium on Experimental Methods in Solid Mechanics        |                                       |
| Udine – Italy   | October 13 -15, 1988                  |
| 6 <sup>th</sup> Danubia-Adria Symposium on Experimental Methods in Solid Mechanics        |                                       |
| Mösern/Seefeld – Austria  | October 5 - 7, 1989                   |
| 7 <sup>th</sup> Danubia-Adria Symposium on Experimental Methods in Solid Mechanics        |                                       |
| Pula – Croatia  | October 4 -6, 1990                    |
| 8 <sup>th</sup> Danubia-Adria Symposium on Experimental Methods in Solid Mechanics        |                                       |
| Gödöllö – Hungary   | October 11 - 12, 1991                 |
| 9 <sup>th</sup> Danubia-Adria Symposium on Experimental Methods in Solid Mechanics        |                                       |
| Trieste – Italy   | October 1 - 3, 1992                   |
| <b>10<sup>th</sup> Danubia-Adria Symposium on Experimental Methods in Solid Mechanics</b> |                                       |
| <b>Měříň/Prague – Czech Republic</b>  | <b>September 30 – October 2, 1993</b> |
| 11 <sup>th</sup> Danubia-Adria Symposium on Experimental Methods in Solid Mechanics       |                                       |
| Baden –Austria  | September 29 – October 1, 1994        |
| 12 <sup>th</sup> Danubia-Adria Symposium on Experimental Methods in Solid Mechanics       |                                       |
| Sopron –Hungary   | October 5 - 7, 1995                   |
| 13 <sup>th</sup> Danubia-Adria Symposium on Experimental Methods in Solid Mechanics       |                                       |
| Rajecké Teplice – Slovakia  | September 26 – 28, 1996               |

- 14<sup>th</sup> Danubia-Adria Symposium on Experimental Methods in Solid Mechanics  
Poreč – Croatia October 2 - 4, 1997
- 15<sup>th</sup> Danubia-Adria Symposium on Experimental Methods in Solid Mechanics  
Bertinoro – Italy September 30 – October 2, 1998
- 16<sup>th</sup> Danubia-Adria Symposium on Experimental Methods in Solid Mechanics  
Cluj-Napoca – Romania September 29 – October 2, 1999
- 17<sup>th</sup> Danubia-Adria Symposium on Experimental Methods in Solid Mechanics**  
**Prague – Czech Republic October 11 - 14, 2000**
- 18<sup>th</sup> Danubia-Adria Symposium on Experimental Methods in Solid Mechanics  
Styer –Austria September 26 - 29, 2001
- 19<sup>th</sup> Danubia-Adria Symposium on Experimental Methods in Solid Mechanics  
Polanica Zdroj/ Klodzko – Poland September 25 - 28, 2002
- 20<sup>th</sup> Danubia-Adria Symposium on Experimental Methods in Solid Mechanics  
Győr – Hungary September 24 – 27, 2003
- 21<sup>th</sup> Danubia-Adria Symposium on Experimental Methods in Solid Mechanics  
Brijuni/Pula, Croatia September 29 – October 2, 2004
- 22<sup>th</sup> Danubia-Adria Symposium on Experimental Methods in Solid Mechanics  
Monticelli Terme/Parma, Italy September 28 – October 1, 2005
- 23<sup>th</sup> Danubia-Adria Symposium on Experimental Methods in Solid Mechanics  
Podbanské/Žilina, Slovakia September 26 – 29, 2006
- 24<sup>th</sup> Danubia-Adria Symposium on Developments in Experimental Mechanics  
Sibiu, Romania September 19 – 22, 2007
- 25<sup>th</sup> Danubia-Adria Symposium on Advances in Experimental Mechanics**  
**České Budějovice/Český Krumlov September 24 – 27, 2008**
- 26<sup>th</sup> Danubia-Adria Symposium on Advances in Experimental Mechanics  
Leoben, Austria September 23 – 26, 2009
- 27<sup>th</sup> Danubia-Adria Symposium on Advances in Experimental Mechanics  
Wroclaw, Poland September 22 – 25, 2010
- 28<sup>th</sup> Danubia-Adria Symposium on Advances in Experimental Mechanics  
Siofok, Hungary September 29 – October 1, 2011
- 29<sup>th</sup> Danubia-Adria Symposium on Advances in Experimental Mechanics  
Belgrade, Serbia September 24 – 27, 2012

Since 2002 „Youth Symposium on Experiments in Solid Mechanics” has been organized in spring every year. These Symposia are intended for young people – magister and doctoral students as well as for young scientists and researchers. Some younger colleagues call the autumn symposia as “Danubia for elderly gentlemen” opposite to spring YSESM symposia as “Danubia for younger boys”.

- 1<sup>st</sup> YSESM – Bologna, Italy, 2002
- 2<sup>nd</sup> YSESM – Bologna, Italy, 2003
- 3<sup>th</sup> YSESM – Bertinoro, Italy, 2004
- 4<sup>th</sup> YSESM – Castrocaro Terme, Italy, 2005
- 5<sup>th</sup> YSESM – Púchov, Slovakia, 2006
- 6<sup>th</sup> YSESM – Vrnjacka Banja, Serbia, 2007
- 7<sup>th</sup> YSESM – Szklarska Poreba, Poland, 2008
- 8<sup>th</sup> YSESM – Győr, Hungary, 2009

9<sup>th</sup> YSESM – Trieste, Italy, 2010

10<sup>th</sup> YSESM - Chemnitz, Germany, 2011

11<sup>th</sup> YSESM - Brasov, Romania, 2012

Presented contributions from both conferences are evaluated and according to the quality are later recommended for publication in non-reduced form in technical journals, as e.g. Ingenier Archiv in Austria or Acta Mecanica Slovaka in Slovakia.

The interest for both types of DA Symposia proves that no change is necessary to do in one sentence of the preface to the Extended Summaries of 17th DA Symposium twelve years ago - „The interest in DA Symposia proves the continuing importance and indispensability of experimental methods and denies pessimistic prediction having forecasted the end of experiments” as it is consequent from the attached diagram showing number of participants and presented papers and having elevating nature. Similar situation is valid for our EAN conferences.

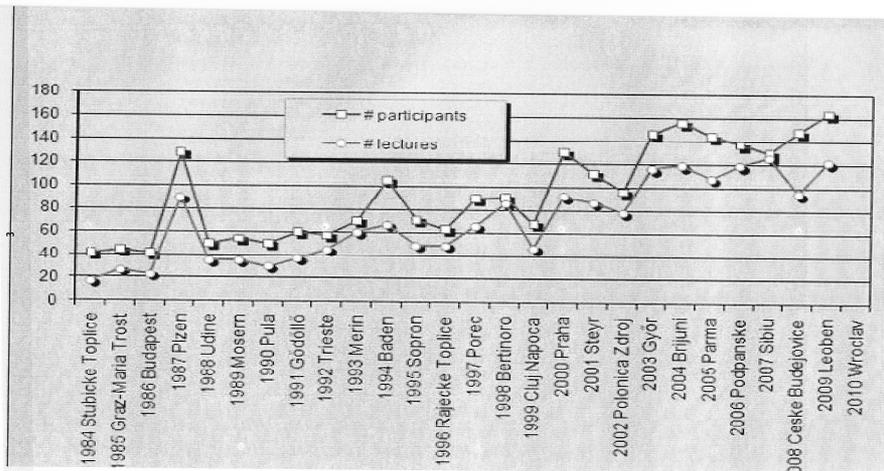


Fig. 1. Number of participants and presented papers on DA Symposia 1984-2010

High activity of the Czech representation have evinced during all DA projects and campaigns, either in DA committee (Dr. Antropius, Dr. Vísner and, Prof. Holý in the past or at present Prof. Plánička and Prof. Růžička) or by number and quality of presented contributions at all DA symposia after 1989. I hope this trend remain in the future.

Another professional and scientific contacts have been leading to European Association for Experimental Mechanics (EURASEM), which organize the above mentioned ICEM world congresses. At these congresses our participation is not rich but Czech presentation are recommended for publishing in journals as e.g. Strain and Experimental Mechanics. In spite of weak linkage between our CSM and EURASEM, quality of the Czech school in experimental mechanics was appreciated by awarding Prof. Holý by Award of Merit for outstanding contributions to the field of experimental mechanics at the 13<sup>th</sup> ICEM Congress in 2007.

During last ten years some members of our Group for experimental stress analysis (EAN) have been participating by organisation or presentation at many special conferences and seminars, organised by universities (e.g. Italian University in Bologna or Slovakian TU Košice and TU Žilina) or by producing or commercial companies and organisations. Their number is high, but one should be mentioned here – International Conferences on Application for Image based Measurements (ICAIM), having been organised by German company by company Dantec Dynamics, Ulm since 1995 every year. In spite of the fact, that the organizer is a commercial company, these seminars, now conferences are carrying all marks of scientific conference.

From this brief overview we can see that our professional Group of Experimental Stress Analysis (OS EAN) and its members are active participants and partners for organizers of conferences, seminars, workshops and courses in homeland as well as in abroad (e.g. Class on experimental mechanics – University in Bologna). Another example of this cooperation might be preparing and chairmanship at the GAMM Congress in Prague 1995 or membership of our members in relevant foreign societies (e.g. VDI, AIAS).

Some words in general to the closing. Several times the question springs up: Do we need actually an experiment in the 21<sup>th</sup> century? Yes, we need it and we use it, because demands for higher material utilising and requirements for higher safety, lifespan and reliability of structures and verification of their quality are and will be increasing, as we can see at aircrafts, automotives, energetic units, particularly nuclear ones. Increasing necessity of application of experimental methods in non-traditional branches of experimental mechanics, as biomechanical and biomedical branches in research and practical applications are has to be mentioned, too.

Emphasizing of experiment importance does not mean to decrease signification and importance of simulating numerical analysis. Both have the same starting point in task assigning. But sometimes the results of experiments do not serve only to verify the numerical calculated results, but it gives input data for numerical analysis.

Characterization of the next development and progress in experimental methods is not a simple task. Today's state of experiment in general is given by the yesterday's theories and analysis and those by needs of the day before yesterday. This process is permanently accelerating. Tomorrow's methods will not be extrapolation of those from today. Many principles and methods, that are not still spotted and discovered, will be used in the new generation of experimental methods and measuring devices. Remember some methods – acoustic emission, magnetic or optical methods. Activities followed from the point of view experiment in mechanics of solid and deformable bodies and systems, have been swelled and extend.

Regarding to demands in experiment and rate of development in experimental methods, the international cooperation is the only possibility how to stand the test of time and how to bear favourable technical comparison.

Our conferences and other activities are a contribution to solving this task. Our colleagues as well as the Group for experimental stress analysis and the whole

Czech Society for Mechanics were, are and will be respectable in the field of experimental methods in mechanics. That is why we can look forward to future developing experimental methods and next EAN Conferences and international cooperation.

### **References**

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