EUROMECH Final Report

EUROPEAN MECHANICS SOCIETY

Please send this report to the Secretary-General of EUROMECH, within one month after the Colloquium.

EUROMECH Colloquium No: 368

Title: Biomechanics of Hearing

Dates and location: 10 - 12 September 1997, University of Stuttgart Stuttgart, Germany

Chairman: Prof. Dr.-Ing. Dr.h.c. W. Schiehlen

Co-Chairman: Dr.-Ing. A. Eiber

Is there need of another Colloquium on the same or a related subject? Which year?

Full registration fee: 150,-- DM

What other funding was obtained? Volkswagen-Stiftung, Verein der Freunde Universität Stuttgart

What were the participants offered? File with Program, Booklet of Abstracts
Refreshments during coffee breaks
1 small dinner
partial reimbursement of travelling costs

Number of members of EUROMECH (reduced registration fee): 1

Number of non-members of EUROMECH (full registration fee): 49

Number of participants from each country:

Austria		Germany	31	Romania	
Belgium		Great Britain	1	Russia	
Byelorussia		Greece		Slovakia	
Bosnia		Hungary		Slovenia	
Bulgaria		Ireland	2	Spain	
Croatia		Italy		Sweden	
Czech Republic	2	Latvia		Switzerland	2
Denmark	1	Lithuania		Ukraine	
Estonia		Netherlands	3	Yugoslavia	
Finland	2	Norway		Others USA	2
France	2	Poland		Japan	2
Georgia		Portugal		Total	50

Please turn

Scientific Report

See enclosure.

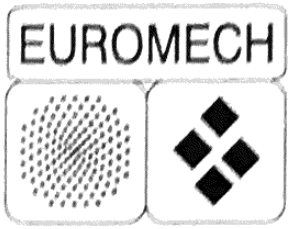
Please use additional pages if needed. Put date and signature at the end.

EUROMECH 368

University of Stuttgart, Stuttgart, Germany

Biomechanics of Hearing

September 10 – 12, 1997



The Colloquium formed a bridge between acoustical and medical scientists coming from surgery, hearing research and audiology on the one hand and mechanical and control engineers on the other. Such interdisciplinary meetings featuring intensive discussions of small groups of experts active in different fields are most helpful to disseminate the developments of ongoing research. The main topics relevant to the meeting were modern measurement techniques, modeling and simulation and microsurgery with its applications to the hearing organ.

Three plenary lectures were delivered.
H.-P. Zenner illustrated the "Mechanical Sound Processing of the Ear", K.-B. Hüttenbrink reported about "Biological and Mechanical Aspects on Middle Ear Reconstruction" and A. Dancer explained the "Intracochlear Acoustic Pressure Measurements, Transfer Functions and Cochlear Mechanics".

In addition 31 contributions were presented and intensively discussed in 12 sessions devoted to the following topics:

- Description of the hearing process with appropriate models using finite elements.
- Multibody system and continuous system modeling for the outer, middle and inner human ear, respectively.
- Parameter identification of the models using physicians' knowledge and clinical observations.
- Audiological measurements concerning specific investigations like impedances, pressure and forces as well as transfer functions.
- Detection of vibrations and imaging of motion patterns by laser or optoelectronic techniques.
- Simulations of the dynamical behavior of the different parts, including the spatial vibrations of the middle ear ossicles.
- Transfer of specific sound events to the nerves of the inner ear.
- Simulations of the dynamical behavior of the entire hearing for normal and pathological situations.
- Reconstructed hearing with passive and active implants.

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Most of the contributions were devoted to the description and the investigation of the dynamical behavior of the middle and the inner ear from an experimental and from a theoretical point of view. The main problems treated were the formulation of appropriate models, the identification of parameters and the validation of models by comparisons with measurements. For the application of the results in the clinical practice the optimal design and the practical use of passive and active prostheses was wideley discussed.
Simulations with the models designed allow also a better understanding and interpretation of clinical observations during surgery and diagnosis via otoacoustic emissions and multifrequency-tympanometry.

A booklet of abstracts was prepared and circulated to all participants. The Karger Publishers, Basel offered a possibility to publish a number of the papers in a special issue of the journal "Audiology & Neuro-Otology" after a peer review.

The colloquium provided a common basis for the modeling and the description of the hearing process embracing the middle and the inner ear. Discussing the interdisciplinary problems, numerous new contacts between scientists dealing with theory, applied research and clinical application have been made. Among the scientists from different disciplines there were vivid and inspiring discussions about the different points of view concerning the hearing process. A very intensive exchange of new research results from theory, experiments and observations from the clinical practice has been started.

The colloquium took place on the Vaihingen campus of the University of Stuttgart. The participants represented the following countries:
Czech Republic (2), Denmark (1), Finland (2), France(2), Germany (31), Great Britain (1), Ireland (2), Japan (2), Netherlands (3), Switzerland (2), USA (2). Total: 50.

A financial support was provided by the "Volkswagen-Stiftung" to cover partly the travel and living costs of most of the participants. From the "Vereinigung der Freunde der Universität Stuttgart" a support was greatfully received to cover the organizational costs.

Albrecht Eiber

Werner Schiehlen