

ACOUSTICAL COMMITTEE OF THE POLISH ACADEMY OF SCIENCES
POLISH ACOUSTICAL SOCIETY
INSTITUTE OF FUNDAMENTAL TECHNOLOGICAL RESEARCH
OF THE POLISH ACADEMY OF SCIENCES

FASE 78
WARSZAWA
18-22 SEPTEMBER 1978
PROCEEDINGS

Warszawa 1978

ACOUSTICAL COMMITTEE OF THE POLISH ACADEMY OF SCIENCES
POLISH ACOUSTICAL SOCIETY
INSTITUTE OF FUNDAMENTAL TECHNOLOGICAL RESEARCH
OF THE POLISH ACADEMY OF SCIENCES

**PROCEEDINGS
OF THE SECOND CONGRESS
OF THE FEDERATION
OF ACOUSTICAL SOCIETES
OF EUROPE**

FASE-78

WARSZAWA 18-22 SEPTEMBER 1978

VOLUME I

EDITORS
Z. PAWŁOWSKI, J. K. ZIENIUK

WARSZAWA 1978

Proceedings of the FASE 78
published in three volumes:
vol. I Z. Pawłowski, J. K. Zieniuk, editors
vol. II L. Filipczyński, J. K. Zieniuk, editors
vol. III H. Ryffert, J. K. Zieniuk, editors
by Polish Academy of Sciences, Warszawa, Poland,
Warszawa 1978.
Printed by Wrocławska Drukarnia Naukowa, Wrocław, Poland

Copyright 1978 by Polish Academy of Sciences,
IPPT-PAN, 00-049 Warszawa, Poland. Świętokrzyska 21
Printed in Poland

Cover photo by B. Zienkiewicz and J. K. Zieniuk

LIST OF THE MEMBER-SOCIETIES OF FASE

Sekretariats:

- | | |
|---|--|
| 1. Acoustical Commission of the Czechoslovak Academy of Science | 151 24 Prague 5
Plezenska 66
Czechoslovakia |
| 2. Acoustical Commission of the Hungarian Academy of Science | H-1502 Budapest
112, P.O.B.132
Hungary |
| 3. Acoustical Society of Netherlands
N.A.G. | Delft
Postbus 162
Netherlands |
| 4. Acoustical Society of Yugoslavia | Faculty of Electro-
technique
11000 Beograd
Bul.Revolucija 73
Yugoslavia |
| 5. Association Belge des Acousticiens
A.B.A.V. | Faculté de Poly-
technique
7000 Mons
Belgique |
| 6. British Society of Audiology | Harvest House
Reading, Berks.
RGL 5AS
62 London Road
U.K. |
| 7. Commission d'Acoustique de l'Aca-
démie Socialist de Roumania | Bucuresti
Calea Victoriei
125 Roumania |
| 8. Comité d'Acoustique de l'Académie
Polonaise des Sciences | Warsaw 00-049
Świętokrzyska 21
Poland |

9. Deutsche Arbeitsgemeinschaft für Akustic - D.A.G.A.
- Deutsche Physikalische Gesellsch.
53 Bonn-Bad Godesberg, Gotenstr.1-3
Fed.Rep.of Germany
10. Groupement des Acousticiens de Langue Francaise - G.A.L.F.
- 22301 Lannion
route de Tregastel
France
11. Institute of Acoustics
- London SW1X 8QX
47 Belgrave Square
U.K.
12. Italian Acoustical Association-AIA
- 00189 Rome
Via Cassia 1216
Italy
13. Netherlands Society for Audiology
- Audiologisch Centrum Rotterdam
3031 BA Rotterdam
Anmanplein 8
Netherlands
14. Optical, Acoustical and Filmtechnical Society - OPAKFI
- 1061 Budapest
Anker köz 1
Hungary
15. Österreichische Arbeitsgemeinschaft für Volksgesundheit-OAV,
Österreichischer Arbeitsring für Lärmbekämpfung-OAL
- 1090 Wien
Währingerstr.59
Austria
16. Société Polonaise d'Acoustique
- 60769 Poznań
ul.Matejki 48/49
Poland
17. Schweizerische Gesellschaft für Akustik
- 3001 Bern
P.O.B. 2334
Switzerland
18. Spanish Acoustical Society
- Madrid 6
Serrano 144
Spain

ACOUSTICAL COMMITTEE OF THE POLISH ACADEMY OF SCIENCES
POLISH ACOUSTICAL SOCIETY

INSTITUTE OF FUNDAMENTAL TECHNOLOGICAL RESEARCH
OF THE POLISH ACADEMY OF SCIENCES

Scientific Committee of the Congress FASE-78

I. Malecki Poland/ - President
I. Barducci /Italy/
S. Czarnecki /Poland/
H.G. Diestel /FRG/
L. Filipczyński /Poland/
P. Francois /France/
J. Frenkiel /Belgium/
N.A. Grubnik /Soviet-Union/
F. Kolmer /Czechoslovakia/
P. Pravica /Yugoslavia/
A. Lara /Spain/
P. Lorand /France/
Z. Pawłowski /Poland/
H. Ryffert /Poland/
A. Stan /Romania/
R.W.B. Stephens /United Kingdom/
O.J. Pedersen /Denmark/
T. Tarnoczy /Hungary/
D.W. Van Wulfften-Palthe /The Netherlands/

Organizing Committee of the Congress FASE-78

S. Czarnecki - president, L. Filipczyński, Z. Pawłowski and
H. Ryffert - section chairman, J. Deputat - general secretary
G. Budzyński, M. Czechowicz, J.Czerwińska - technical secre-
tary, Z. Engel, J. Etienne, J. Kaoprowski, E.Kotarbińska,
R. Kucharski - poster session, R. Makarewicz, J. Mazurek,
J. Ranachowski, M. Sankiewicz, M. Teichert, M. Vogt - exhi-
bition, M. Wojciechowska, J. K. Zieniuk - proceedings' editor

Foreword

The Second Congress FASE is the first outstanding international event in the field of acoustics held in Poland. Polish acoustical community, amounting to 400 people employed in various branches of acoustics, attaches great importance to this fact.

For the Acoustical Committee of the Polish Academy of Sciences as well as for the Polish Acoustical Society, which are FASE members, it is a great honour that Poland's invitation has been accepted by the FASE president and that we request the pleasure of receiving such prominent acousticians from all over Europe.

Nowadays acoustics embraces such a vast field of sciences and technology that it has been necessary to select some of its problems which, though representing different scientific branches, are connected by common research methods.

Three groups of themes have been distinguished: 1/ Acoustic Waves and Structure of Matter, 2/ Ultrasonic Methods of Location and Recognition, 3/ Objective and Subjective Evaluation of Sound in a Limited Space.

For each of these groups, the focus point is to define acoustic field depending on medium, body or enclosure in which acoustic waves propagate. The acoustic wave is an irreplaceable carrier of information on micro and macrophysical characteristics of media and bodies as well as a carrier of knowledge about sound signals. Therefore it is quite natural to couple objective and subjective aspects of acoustical problems and to investigate jointly various objects which are examined with the help of acoustic waves.

In spite of its all differences acoustics remains a coherent scientific and technological field. I hope that the Second Congress FASE will not only present particular acoustical branches but it will also play an integrative role - becoming a place of creative discussions among acousticians who represent various branches of acoustics using common scientific and technological methods.

Proceedings of this Congress include the papers presented by representatives of 22 European countries and 9 representatives of non European ones. Such a wide geographical representation

VII

is the best evidence of the scientific rank as well as technological, economic and social significance of acoustics. It also proves the great contribution of FASE member societies to the development of acoustics.

Ignacy Malecki

Contents of Volume I

Acoustics of fluids

I-1	L.M. Liamshev Laser-Generated Sound in a Liquid/Invited Paper/	3
I-2	E.Soozkiewicz Propagation of Ultrasound and Hole Volumes in the Hole Theory of Liquids	13
I-3	K.Takagi, K.Negishi Study of Vibrational Relaxation in Liquid Pyridine by High- Resolution Bragg Reflection Method	17
I-4	E.Yaronis, A.Voleisis, B.Voleisiene Interferometric Studies of Ultrasound Velocity Dispersion in Aqueous Solutions of Lanthanide Salts	21
I-5	A. Juszkiwicz, J.Kopyłowicz, Z.Kozłowski Measurements of Some Anomalies in the Propagation of Ultra- sonic Waves in Pure Water	25
I-6	O. Georgieva, G.Georgiev, M.Metodiev On the Investigation of the Weighty Spere Movement in the Vibrating Viscous Liquid	29
I-7	R.Płowiec- Viscoelastic Relaxation Region in Some Natural and Synthetic Oils	35
I-59	L.Werblan, L.Skubiszak - Properties of Mixtures of Gamma-Butgrolactone with Selected Ethers and Water Fixed by Ultrasonic Methods	295

Ultrasonic waves. Generation and propagation
in solids

I-8	D.Sette - Sound in Liquid Crystals /Invited Paper/	41
I-9	U.KH.Kopvillem, S.V.Prants Electroacoustic Superradiation Phenomena in Local Piezoelectrics	55

IX

I-10	A.V.Alekseev, U.KH.Kopvillem, Acoustic Superradiation from a system of dislocation	59
I-11	A.Byszewski, A.Drzewiecka,M.Szustakowski Applications of Optical Reflected Method for Surface Acoustic Waves	63
I-12	W.Ciurapinski, K.Goździk,M.Szustakowski, B.Swietlicki Acousto-optic Diffraction of Light in Thin Plates of Lithium Niobate Single Crystals	67
I-13	L. Solarz Diffraction of a Surface Waves on a Waveguide	71
I-14	T.S.Liem Electromagnetic Acoustic Transducer in Non-Destructive Testing of Metals	75
I-15	S. Kolnik, J.Klimko Electromagnetic Generation of Ultrasonic Surface Waves at Perturbed Boundary Gonditions	79
I-16	R.Leć, W. Soluch Piezoelectric properties of Li ₂ JO ₃ , Crystals	83
I-17	P.Loranc, M. Szustakowski Some Remarks on Causes of Damages in Li ₂ JO ₃ , Piezoelectric Transducers	89
I-18	P.Rajchert, A. Leszczyński,J.Markiewicz-Jodko, P.Kaczmarski Preliminary Investigations of the Bulk Acoustic Waves Generated by Interdigital Transducer Li ₂ JO ₃	93
I-19	V.K.Nguyen, W.Pajewski Generation of the Acoustoelectric Wave by Means of the Sheer Vibration Source	97
I-20	E. Danicki Theory of Generation of SAW,Bulk Waves and Plate Modes by ITD	101

I-21	K.Reginski Quasi-Continuous Description of the Acoustic and Optical Vibrations in Ionic Crystals	107
I-22	J.Berger,F.Plique,K.Rousseau,A.Zarembowitch. Ultrasonic and Brillouin Scattering Investi- gation of the Structural Phase Transition of Antiferrodistorsive Crystals	113
 Interaction of acoustic waves with material structure		
I-23	B.Fay Calculation of the Density of Scattering Centres	117
I-24	U.KH.Kopvillem, V.M. Choodnovsky Phonon Avalanche in Glasses	121
I-25	L.Opilska, A.Opilski The Acoustical Method of the Energy Gap Determination in Semiconductors	125
I-26	J.Deputat Temperature Dependance of Dislocation Internal Friction in Sodium Chloride	131
I-27	P.Boch, A.Danger, C. Gault Ultrasonic Investigation of the Formation of Guinier-Preston Zones in Aluminium- Magnesium Alloys	135
I-28	K.M. Swamy, K.L. Narayana Rao's Constant and Grüneisen Parameter in Molten Alkaline Earth Metals	139
I-29	L. Lipiński Modulus Defect Stimulated by Ultrasonic Excitation in Polycrystalline Metal Samples	143
I-30	W.Chomka, D. Somatowicz Influence of Sodium Oxide on Internal Friction of Iron-metaphosphate Glass	147

Nondestructive testing and flow recognition

I-31	J. Obraz	
	Some New Achievements in Ultrasonic Nondestructive Testing /Invited Paper/	153
I-32	L. Adler	
	Selected Problems in Quantitive Nondestructive Evaluation	163
I-33	T.R. Licht	
	Developments in Acoustic Emission Instrumentation	167
I-34	T. Morawski	
	The Reliability Assessment of Pipelines Based on Nondestructive Tests of Circumferential Welds	171
I-35	Z. Pawłowski, J. Gorzny, J. Szelążek	
	Experience in Ultrasonic Testing of Pipeline Welds	175
I-36	M. Przybyłowicz, J. Karle	
	Digital Evaluation of the Flaw Size in Ultrasonic Nondestructive Testing	179
I-37	C. Gazanhes	
	Targets Transfer Functions and Impulse Responses	183
I-38	T. Pritz	
	Transfer Function Method for Determining Complex Modulus of Viscoelastic Materials	187
I-39	A. Jungman, F. Cohen-Tenoudji, B.R. Tittmann	
	Characterization of Surface Flaws by Wide Band Spectrum Analysis	191
I-40	A.F. Brown, E. A. Lloyd	
	Broad-Band Ultrasound in Non-Destructive Testing	195
I-41	J. P. Sessarego	
	Bojarski's Identity - Application to the Target Recognition	203

I-42	J. Łoziński The Study of Temperature Variation within the Heat-Seal Zone of the Ultrasonic Heat Sealing of Polycarbonate Film Depending on the Physical Parameters of the Process	207
I-43	J.Łoziński,W.Oliferuk,T.Piotrowski Application of Infrared Radiation of Studying the Ultrasonic Heat-Seal Zone of Polycarbonate Film	213
Materials characterisation		
I-44	L.Frohlich, W. Morgner,Z.Pawlowski Applications of Acoustic Methods to Assess Material Structure	221
I-45	S. Kozakowski Effect of Internal Stresses in Castings on the Changes in Ultrasonic Wave Velocities	225
I-46	A. Brokowski Remarks upon the Lateral Displacement at Rayleigh and Lamb Critical Angle	235
I-47	K. Szabó Nondestructive Testing of the Elastic Properties of Ceramics	241
I-48	J. Lewandowski, J.Ranachowski, E.Ryll-Nardzewska Ultrasonic Methods of Mechanical Properties Estimation of Ceramic Materials	245
I-49	A. Pilarski, Z. Pawłowski Bond Strength Evaluation with Ultrasonic Method	249
I-50	B.Rehško, L. Filipczynski Ultrasonic Method and Apparatus for Fatigue Testing of Steel Wires	253

XIII

I-51	Z. Pawłowski, G. Funke Evaluation of Fracture Risk with Ultrasonic Methods	257
I-52	W. Pompe, W. Kreher, J. Ranachowski Estimation of Fracture Strength by Non-Destructive Testing in Ceramics	261
I-53	Z. T. Kurlandzka Brittle Fracture of Elastic Dielectrics in Presence of Electromagnetic Forces	271
I-54	K. Elek, J. Granat, P. Peliegel Measurement of the Complex Young's Modulus on Samples of Annular Discs /e.g. Grinding Wheels/	275
I-55	A. Kulik, J. Ryll-Nardzewski Applications of Flexural Vibrations of Thick Circular Plates in Physical Examinations of Solids	279
I-56	K.A. Kunert, Z. Kozłowski Ultrasonic Investigation of Cross-Linked Polyethylene	283
I-57	H. Gawda Ultrasonic Investigations of the Mechanical Properties of the Stalks of a Wheat	287
I-58	J. Lewandowski Scattering of Compression Acoustic Waves in Inhomogeneous Media	291
	Authors' Index	301

Contents of Volume II

Wave Propagation

II-1	I. Hrazdira Biophysical Aspects of Ultrasonic Tissue Characterization /Invited Paper/	3
II-2	G. Yaroniene Response of Biological Systems to Low-Intensity Ultrasonic Waves	13

II-3	M. de Billy, G. Quentin, B.Tittmann Study of the Structure of Biological Tissues by the Angular Dependence of Ultrasonic Backscattering	17
II-4	K.P. Richter, R. Millner Ultrasonic-Pulse- Spectroscopy and Tissue- Backscattering of Human Liver in Vitro	21
II-5	L. Filipczyński Temperature Effect in Soft Tissue - Estimated and Measured	23
II-6	W.H. Round, R.C. Chivers Ultrasonic Propagation in the Human Eye: Parameter Measurement and Beam Profiles	27
II-7	W.H. Round, R.C. Chivers, J.K. Zieniuk The influence of the Human Eye on an Ultra- sonic Beam: A Ray Tracing Approach	31
II-8	R.C.Chivers, R.J. Parry The Ultrasonic Modelling of Human Tissue- A Prototype Foetal Head	35
II-9	R.J. Parry, R.C. Chivers Sampling of Fast Waveforms in Ultrasonic Materials Science	39
II-10	J.P. Lefebvre An Acoustic Investigation Method of Stratified Media Using the Algorithms of the Inverse Scattering Problem in Quantum Mechanics	43
II-11	R.C. Chivers Amplitude and Phase Fluctuations in the Propagation of Longitudinal Waves in Inhomogeneous Media	47
II-12	K. Harumi, T. Saito, T. Fujimori Motion Picture of the Computer Simulation of Elastic Waves from Transducer	51

II-13	J. Bejda Amplitude Modulation of Nonlinear Harmonic Wave	61
II-14	R.C. Bhattacharya On the Guided Torsional Discontinuity Waves	65
II-15	H.Toda, H. Fukuoka Analysis of Wave Mode in Composite Cylinder	73
II-16	R. Dyba Perturbation and Taylor Series Approach to Finite-Amplitude Problems in the Case of Intermediate Mach Numbers	77
II-17	H.V. Fairbanks Influence of Ultrasound on Liquid Flow through Inhomogeneous Media	81
	Ultrasonic Diagnostic Methods	
II-18	J. Etienne, L. Filipczyński, J. Groniowski J.Kretowicz, A. Nowicki Three Ultrasonic Methods of Placenta Location	89
II-19	A. Cabo, A. Argudo, J. Domene, M. Trigo Prenatal Diagnosis of the Sex by Means of Ultrasonography with Gray Scale	93
II-20	A.Cabo, A.Argudo, J.Domene,M.Trigo, J.Manes Amniocentesis Directed by Ultrasounds with Biopsy Transducer	97
II-21	J. Laskaris, K.Kirkou-Latridou, D. Katsimantis The Value of Ultrasonography in Cytologic Diagnosis of Cancer in Abdominal Organs	101
II-22	J. Gryminski, G. Łypacewicz Use of Ultrasonic Guiding Transducer for Monitoring Thoracentesis	105

II-23	A. M. Hadidi Contribution of the Echography to the Clinical Thyroidology	109
II-24	A. M. Hadidi Pancreatic Sonography	121
II-25	K. Ilmurzyńska, J. Salkowski Heart Visualization in Real Time for Diagnosis of Hyperthropic Cardiomyopathy	129
II-26	A. Szydłowski Developmental Echocardiogram of Healthy Children up to 7 Years of Age	133
II-27	J. Preisova A New Approach to Interpretation of A-Scan Echograms of Orbital Tumours	137
II-28	J. Czajkowski, J. Etienne, Z. Krawozykowa Blood Flow Estimation in Carotid and Ophthalmic Arteries by Means of Doppler Technique	143
II-29	K. Iwaszkiewicz, I. Giżycka, A. Chróscicki, T. Powałowski, J. Gruchalski, Z. Malec - The Role of Transcutaneous Ultrasonic Doppler Method in Diagnosis of Patency of Congenital and Surgical Shunts between Aorta and Pulmonary Artery	149
II-30	G. Lypacewicz, T. Powałowski, K. Łukawska - Ultrasonic Examinations of Breast Tumours with Doppler Method	153
II-31	T. Powałowski Real Time Automatic Transcutaneous Determination of Blood Velocity by Means of C.W. Doppler Method Eliminating Angle Dependence	157
II-32	A. Shiozaki, S. Senda, A. Kitabatake, H. Matsuo Ultrasonic Modulated Doppler Technique by Sharp Cross-Correlation Sequences	161