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

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

Zam. 2166/78 — 800

LIST OF THE MEMBER-SOCIETIES OF FASE

	Sekretariats:
1. Acoustical Commission of the Czechoslovak Academy of Science	151 24 Prague 5 Plzenská 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 Yougoslavia	Faculty of Electrotechnique 11000 Beograd Bul.Revolucija 73 Yougoslavia
5. Association Belge des Acousticiens A.B.A.V.	Faculté de Polytechnique 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'Académie 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	Londcn 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 Ammanplein 8 Netherlands
14. Optical, Acoustical and Filmtechnical Society - OPAKFI	1061 Budapest Anker köz 1 Hungary
15. Österreichische Arbeitsgemeinschaft für Volksgesundheit-ÖAV, Österreichischer Arbeitsring für Lärmbekämpfung-ÖAL	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 /Yougoslavia/
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 secretary, Z. Engel, J. Etienne, J. Kacprowski, E.Kotarbińska, R. Kucharski - poster session, R. Makarewicz, J. Mazurek, J. Ranachowski, M. Sankiewicz, M. Teichert, M. Vogt - exhibition, M. Wojciechowska, J. K. Zieniuk - proceedings' editor

Foreword

The Second Congress FASE is the first outstanding international evant 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

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

Ultrasonic waves. Generation and propagation in solids

Interaction of acoustic waves with material structure

Nondestructive testing and flow recognition

Materials characterisation

Contents of Volume II

Wave Propagation