

Please send this report to the Secretary of the European Mechanics Council, Professor Bengt Lundberg, Dept of Mechanical Engineering, Luleå University of Technology, S-951 87 Luleå, Sweden, within one month after the Colloquium.

General

Euromech Colloquium No: 302

Title: "Spectral Analysis of Complex Structures"

Co-Chairmen: E. SANCHEZ-PALENCIA

Place and country: Paris, France

Dates: 12-14 may 1993

Finance

The conference fee 600 FF included lunches, a dinner and a volume of the proceedings

Funding: CNRS, Ministry of Defence, AUM, ISIMM, EDF

Accommodation (type and cost): Hotel, approx. 400 FF/night

Meals:

Participation

Total number of participants: 37

Distribution of participants by country:

Code	Country	Number Citizenship	Address	Code	Country	Number Citizenship	Address
A	Austria			I	Italy	4	3
B	Belgium			IRL	Ireland		
BG	Bulgaria			N	Norway		
CH	Switzerland	2	2	NL	Netherlands		
CS	Czechoslovakia			P	Portugal		
D	Germany	1		PL	Poland		
DK	Denmark			R	Rumania		
E	Spain	3	3	S	Sweden		
EE	Estonia			SF	Finland		
F	France	19	21	YU	Yugoslavia		
GB	Great Britain	1	3	CIS	CIS	3	
GR	Greece			-	Others	4	5
H	Hungary						

Is there need of another colloquium on the same subject? Which year? _____

Scientific Report

Scientific committee :

Chairman : E. SANCHEZ-PALENCIA (Paris, France),
Members : P.G. CIARLET (Paris, France), G. GEYMONAT (Cachan, France),
F. NIORDSON (Lyngby, Denmark), J. RAPPAZ (Lausanne, Switzerland), J.
SANCHEZ-HUBERT (Caen, France), D.G. VASSILIEV (Brighton, U.K.).

Aims and scientific programme :

The term "complex structures" was understood in the sense of problems in continuum mechanics out of the classical framework of compact selfadjoint operators. The emphasis was on spectral properties, but other topics, such as asymptotic modelling and control were considered too.

Main topics :

- . Thin shells and multi-structures,
- . computing spectra of non-compact operators and spectral pollution,
- . coupling of compact and non-compact systems,
- . vibration control, related topics.

There were 17 lectures of 40 minutes, mainly by invitation of the scientific committee, 6 short communications and informal discussions.

Lectures

P.G. CIARLET (Paris, France) : "Some open problems in the modelling of shells and multi-structures"

J. DESCLOUX (Lausanne, Switzerland) : "Linear stability of the electrolytic cells for the production of aluminium"

D.V. EVANS (Bristol, U.K.) : "Discrete modes in acoustic water wave problems in unbounded domains"

G. GEYMONAT (Cachan, France) : "Problèmes spectraux pour les coques minces et contrôlabilité exacte"

H. LE DRET (Paris, France) : "Convergence of the stresses in a thin elastic rod as the thickness goes to zero".

M. LEVITIN (Edinburgh/Moscow, U.K./Russia) : "The Cosserat problem and meromorphic operator pencils"

J.L. LIONS (Paris, France) : "Quelques questions asymptotiques en théorie du contrôle optimal"

M. LOBO (Santander, Spain) : "Vibration of bodies with many concentrated masses near the boundary"

J. SANCHEZ-HUBERT (Caen, France) : "Pollution spectrale"

E. SANCHEZ-PALENCIA (Paris, France) : "Vibrations locales et globales de coques en approximation membranaire".

C. SCHWAB (Baltimore, USA/Germany) : "Boundary layer resolution and adaptive approaches in the hierarchical modelling of thin structures in elasticity".

D. SHILKRUT (Beer-Sheva, Israël) : "Some new aspects of stability problems of conservative nonlinear structures".

L. TARTAR (Pittsburg, USA/France) : "On the use of microlocal measures for studying the evolution of oscillations".

H. UBERALL (Washington, USA) : "Resonances of elastic cylinders and spheroids interpreted by phase matching".

B. VAINBERG (Charlotte/Moscow, USA/Russia) : "Full low-frequency asymptotic expansion for exterior boundary value problems".

D. VASSILIEV (Brighton/Moscow, U.K./Russia) : "Vibrations of shell contacting liquid"

J.M. VIANO REY (Santiago, Spain) : Asymptotic modelling of thin-walled elastic beams".

General comments

As the publication of the proceedings is foreseen (as a volume of the collection "Travaux en Cours" of the French publisher Hermann), we only give some indications here.

Various examples of fluid flow, bifurcation, stability... leading to non compact operators were presented.

The modelling of rods and shells is in progress, but there are many open problems concerning

- a) boundary layers in shells,
- b) shallow shells, transition between the various models of shells and plates.

Vibration control of systems involving small parameters also leads to open problems. Controlability usually does not pass to the limit. The location of the essential spectrum also influences controlability.

Computing of spectra of non compact operators is a difficult and misleading task. New kinds of spectral pollution were presented.

As a conclusion, a research effort seems to be necessary in the following domains :

- a) numerical computation of spectra of non compact operators,
- b) modelling and control of systems containing small parameters.