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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: 390

Title: Instability, bifurcation and localization in fracture of materials

Dates and location: 10-11-12 May 1999, CACHAN (France)

Chairperson: Gilles ROUSSELIER (EDF, R&D Division)

Co-Chairperson: Ahmed BENALLAL (LMT, ENS Cachan)

Is there need of another Colloquium on the same or a related subject? Which year? 2002?

Full registration fee: 1800 FF

What other funding was obtained? Electricité de France = 30000 FF
CNRS (Centre Nat. Recherche Scient.) = 5000 FF

What were the participants offered?
3 Meals, coffee breaks, conference dinner, buffet meal on sunday evening, conference room, briefcase

Number of members of EUROMECH (reduced registration fee): 9

Number of non-members of EUROMECH (full registration fee): 38

Number of participants from each country:

Austria	1	Germany	2	Romania	
Belgium	1	Great Britain	1	Russia	
Byelorussia		Greece	2	Slovakia	
Bosnia		Hungary		Slovenia	
Bulgaria		Ireland		Spain	
Croatia		Italy	6	Sweden	1
Czech Republic		Latvia		Switzerland	1
Denmark	1	Lithuania		Ukraine	
Estonia		Netherlands	3	Yugoslavia	
Finland		Norway		Turkey	
France	21	Poland	1	Others	5
Georgia		Portugal	1	Total	47

Please turn

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Scientific Report

EUROMECH 390 took place at the Ecole Normale Supérieure de Cachan (France) on May 10th-12th, 1999. It was attended by 47 participants coming from 16 countries, of whom 5 came from outside Europe. There were 31 presentations on the following topics :

- Gradient/nonlocal models, Cosserat theory (7)
- Instabilities and localized plastic deformations in various situations and materials (12)
- Discontinuities and bifurcation (5)
- Fracture mechanics of brittle and ductile materials (3)
- Coupled multi-physics problems: chemical diffusion, fluid flow in solids(3)
- Discrete dislocation plasticity (1)

The scientists that were approached responded positively, among them E. Aifantis, R. de Borst, W.J. Drugan, O. Kolednik, J. Martins, A. Molinari, Q.S. Nguyen, A. Needleman, H. Petryk, G. Pijaudier-Cabot, J.R. Rice, N. Triantafyllidis, V. Tvergaard, E. van der Giessen, I. Vardoulakis, J. Willis... This promoted the high level of the lively debate that was enabled by the limited number of attendants.

It is now widely recognized that non-locality can resolve localisation and avoid associated mesh-dependence in finite element modelling. However some problems arise with the boundary conditions and more physics should be incorporated in the theories, especially on the basis of micromechanics.

A wide range of stability analyses have been presented, from structures (tensile test, metal forming) to various materials (metals, concrete, rocks, rubber) at several scales. The relations between damage, softening, bifurcation and instability have been discussed. Multi-physics and multi-scales problems offer new fields of research as far as localisation is concerned

27 March 2000

G. ROUSSELIER

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