EUROMECH

Final Report

Date: 17 June 1991

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, one month after the Colloquium

General

Euromech Colloquium No: 278

Title: MICROSTRUCTURE AND EFFECTIVE PROPERTIES OF RANDOM PARTICULATE SOLIDS

Chairmen: Prof. Konstantin MARKOV (Bulgaria), Prof. John WILLIS (U.K.)

Place and country: Schumen, Bulgaria

Dates: June 4 - 7, 1991

Finance

The conference fee 100 USD included all meals (except breakfast) plus social program and local transportation

Funding: 7000 Bulg.Levs from local sources plus 2000 US D from US Office of Naval Research London (1 US D ≈ 18 Bulg.Levs)

Accomodation (type and cost): hotel (35 USD), hostel (20 USD)

Meals: breakfast included in hotel price

Participation

Total number of participants: 38 Distribution of participants by country:

Code	Country	Number	Code	Country	Number
A	Austria	-	I	Italy	1
B	Belgium	-	IRL	Ireland	-
BG	Bulgaria	17	N	Norway	-
CH	Switzerland	-	NL	Netherlands	1
CS	Czechoslovakia	-	P	Portugal	-
D	Germany	2	PL	Poland	-
DK	Denmark	1	R	Rumania	-
E	Spain	-	S	Sweden	-
F	France	4	SF	Finland	-
GB	Great Britain	1	YU	Yugoslavia	1
GR	Greece	-	SU	Soviet Union	5
H	Hungary	-	-	Others (USA)	5

Is there need of another colloquium on the same subject? Which year? difficult to say in the moment

Please turn

SCIENTIFIC REPORT

The most distinctive aspect of the Colloquium was that it provided an opportunity - not available until very recently - for interaction between roughly equal numbers of scientists from East and West, including a contingent of five from USSR, of whom four had not previously made presentations at any meeting of such international character. This was facilitated largely through locating the Colloquium in Bulgaria. The scope of the Colloquium is indicated by the programme, which is appended. The Colloquium booklet shows the programme, and list of participants, according to information on 15 April 1991. The scale of adjustments that were made can be seen from the final programme, also appended. The total of 23 lectures, over a scheduled time of 12 1/2 hours, allowed a pleasing amount of time for discussions between individuals; attendance of the lectures themselves was also high. The number of participants was 38 - within the Euromech guideline - and this also facilitated free exchange of ideas.

The participants could be classified (roughly) into three groups: physicists (including three or four experimentalists), mathematicians and specialists in applied mechanics. Two of the participants were from industrial laboratories (Exxon and Shell). They had, however, strongly overlapping interests and no tendency to fragment developed.

One of the principal concerns of the Colloquium was the elucidation of macroscopic material behaviour in terms of microstructure. The four main lectures reflect this. Torquato (USA) reviewed a range of physical phenomena and also described progress in the theoretical generation of microstructural parameters, from the standpoint of statistical mechanics. Felderhof (Germany) developed in detail the incorporation of those parameters in macroscopic constitutive models. Kanaun and Levin (USSR) addressed similar problems, but employing their own distinctive methods, and also indicated an approach to dynamical problems. Milton (USA) discussed the range of constitutive behaviour that is attainable from actual microstructures; this topic is of importance in optimal design.

The shorter lectures developed these themes and introduced others. Examples include a novel observation - and theoretical explanation - of two waves, one fast and one slow, in a suspension (Sheng, USA), a new method for bounding the behaviour of nonlinear composites (Willis, UK) and a combined theoretical and experimental study of the development and coalescence of brittle microcracks, explained in terms of fractals (Silberschmidt, USSR). These and other lectures generated lively interest from the "opposite" group - in the case of the fractal approach to fracture, this coming from the most "theoretical" participants, associated with the activity centred at the Courant Institute. Other examples could be listed but perhaps this is unnecessary.

The end result of the meeting was a more complete appreciation of approaches not easily accessible - partly because of the East-West divide. Other valuable interactions occurred, which will continue: one of which we have detailed knowledge is that Iske (Shell, Holland) had implemented a scheme of Willis (UK) for the description of waves in a composite and had made comparisons with experiment. A further discussion, with exchange of data and theoretical ideas, has already been arranged. Further contact, at least by post, is certain between many of the participants from East and West, previously known to each other only through subsets of their work.

We conclude that the meeting fulfilled the objectives of Euromech Colloquia.

On behalf of the Joint Chairmen:

K.Z.Markov