

Please send this report to the Secretary of the European Mechanics Council, Professor Bengt Lundberg, School of Engineering, Uppsala University, Box 534, S-751 21 Uppsala, Sweden, within one month after the Colloquium.

### General

Euromech Colloquium No: 287

Title: DISCRETE MODELS IN FLUID DYNAMICS: THEORY, SIMULATION AND EXPERIMENT

Co-Chairmen: C. CERCIGNANI

Place and country: CAGLIARI, ITALY

Dates: SEPTEMBER 22-25

### Finance

The conference fee / included : NO FEE

Funding: 40 MILLION (IT. £.)

Accommodation (type and cost): HOTEL, SINGLE ROOM (105,000 IT. £. FULL BOARD)

Meals: 3 per day

### Participation

Total number of participants: 46

Distribution of participants by country:

Code	Country	Number
A	Austria	_____
B	Belgium	3
BG	Bulgaria	_____
CH	Switzerland	1
CS	Czechoslovakia	_____
D	Germany	2
DK	Denmark	_____
E	Spain	2
EE	Estonia	_____
F	France	5
GB	Great Britain	1
GR	Greece	_____
H	Hungary	_____
I	Italy	16

Code	Country	Number
IRL	Ireland	_____
LT	Latvia	_____
LV	Lithuania	_____
N	Norway	1
NL	Netherlands	2
P	Portugal	_____
PL	Poland	5
R	Rumania	_____
S	Sweden	_____
SF	Finland	_____
YU	Yugoslavia	_____
CIS	CIS	5
-	Others	3

Is there need of another colloquium on the same subject? Which year? YES, BUT PREFERABLY IN CONJUNCTION WITH SIMILAR MEETINGS (I.E. RAREFIED GAS DYNAMICS); 1996

## Scientific Report

### Report on Euromech 287

The colloquium Euromech 287: *Discrete models in fluid dynamics* has taken place in Cagliari on September 22-25 1992.

The Colloquium has been attended by about 50 scientists, with 38 distinguished speakers from 14 countries including USA and Israel (see attached list).

Most discrete microscopic techniques relevant to the modeling of fluid flows were covered by the official lectures, including

- Basic thermodynamics of Discrete Velocity Models (DVM)
- Exact solutions of DVM
- Lattice Gas Cellular automata
- Lattice Boltzmann methods
- Molecular Dynamics
- Direct Monte Carlo Simulation Method

The meeting developed in a lively and productive atmosphere with intense discussions in and out the time-schedule of formal lectures. Among others, some issues which emerged out of these discussions, are the following;

- The notion of temperature in DVM needs to be handled with care. In particular, a new relation between the entropy rate and the heat released has to be introduced to avoid paradoxical effects related to the discrete nature of velocity space.
- Lattice Gas Cellular Automata not only reproduce the large-scale features of fluid flow, but also provide a quantitatively correct representation of short-scale fluctuations for a wide class of reaction-diffusion systems.
- The Lattice Boltzmann method can be extended in such a way as to achieve higher-order accuracy. In addition, it can now be formulated also in non-uniform lattices.
- Molecular Dynamics and Direct Simulation Monte Carlo (DSMC) can be successfully applied to study shock waves and compute corrections to Navier-Stokes solutions.
- DSMC can be usefully employed to simulate probability distribution functions (p.d.f.) in turbulent reacting flows.
- A new method, called "Hydrostochastics", has been presented and shown to produce remarkably good results for one and two-dimensional homogeneous turbulence.
- A new class of exact DVM solutions has been presented.

It behooves to the organizers to acknowledge the financial support by the three sponsors, CNR (Italian National Research Council), CRS4 (Center for Advanced Studies, Research and Development in Sardinia) and Fondazione IBM Italia, whose generous contribution has permitted to provide practically all Eastern European scientists with full (travel + lodging) financial support and several Western ones with partial support (travel or lodging). Special thanks are due to CRS4, who also provided an outstanding organizational support.

Please use additional pages if needed and sign at the end.

S.ucci