

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: 305

DYNAMICS

Title: AND GEOMETRY OF VORTICAL STRUCTURES

Co-Chairmen: Prof. PAOLO ORLANDI (Dip. Meccanica e Aeronautica, Rome) and Prof. EMIL H. HOPFINGER (Inst. de Mecanique, Grenoble)

Place and country: CORTONA (ITALY)

Dates: June 28-July 2 1993

Finance

The conference fee 150,000 included book of abstracts + coffee breaks
ITL

Funding: UNIV. DI ROMA, C.N.R. (National Council of Research), U.S. ARMY, COMETT

Accommodation (type and cost): Hotel and dorms ranging from 50,000 ITL and 90,000 ITL

Meals: Lunch (15,000 ITL), dinner (30,000 ITL)

Participation

Total number of participants: 73

Distribution of participants by country:

<u>Code</u>	<u>Country</u>	<u>Number</u>	<u>Code</u>	<u>Country</u>	<u>Number</u>
	Austria	_____	I	Italy	17
B	Belgium	_____	IRL	Ireland	_____
BG	Bulgaria	_____	N	Norway	_____
CH	Switzerland	1	NL	Netherlands	5
CS	Czechoslovakia	2	P	Portugal	_____
D	Germany	8	PL	Poland	1
DK	Denmark	4	R	Rumania	_____
E	Spain	1	S	Sweden	_____
F	France	19	SF	Finland	_____
GB	Great Britain	4	YU	Yugoslavia	_____
GR	Greece	1	SU	Soviet Union	3
H	Hungary	_____	-	Others	7

Is there need of another colloquium on the same subject? Which year? 1996

REPORT ON THE EUROMECH 305

DYNAMICS AND GEOMETRY OF VORTICAL STRUCTURES

This Euromech colloquium on vorticity dynamics was held in Cortona a very nice town in the Toscana. This region of Italy, being the region where Leonardo da Vinci was born and where he performed the first visualizations of vortical structures in the Arno river, was the most appropriate place to host this colloquium. Leonardo can be considered the first fluid dynamicist, who by flow visualizations, understood the intricate interactions of vortical structures and of motion at large and small scales in a turbulent flow. In fact, he wrote the following, translated from the original by U. Piomelli in his Ph.D thesis "Observe the motion of the surface of water, which resembles that of hair, which has two motions, one of which is caused by the weight of the hair, the other by the orientation of the curls; thus water has eddying motions, one part of which is due to the principal current, the other due to the random and reverse motion". Even if during the colloquium Leonardo's spirit was not specifically mentioned it was present among the participants.

The colloquium was held in the Palazzone belonging to the Scuola Normale di Pisa and its peaceful environment permitted a continuous interchange of ideas in the magnificent conference room. Almost 70 participants from 13 countries attended the colloquium, with a relatively large number of scholars from the U.S.A. and from Eastern European countries.

The following topics were addressed:

- a) Vortex dynamics
- b) Topology of vortical structures
- c) Aeroacoustics and vortex dynamics
- d) Vortical structures in 2D turbulence
- e) Vortical structures in Geophysical applications
- f) Vortical structures in 3D turbulence
- g) Numerical methods in vortex dynamics

there were six invited lectures given by Pumar, Hussain, Crighton, Benzi, Van Heijst and Jimenez followed by regular contribution.

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A large part of the contributions addressed fundamental aspects of vortical structures by using experimental, theoretical and computational tools. In most of the contributions the idea was always present that progress in the understanding of the physics of turbulent flows is linked with a deeper understanding of vortical structures. In our opinion the meeting demonstrated once more that numerical simulations play a dominant and essential role in the study of the vortex dynamics. In fact, this approach was more or less addressed in each invited lecture. A reasonable number of talks were concerned with the experimental and numerical study of jets and mixing layers showing that such studies are very important in aeroacoustics and combustion, two topics which still require a large amount of research.

The general atmosphere of the meeting was scientifically very stimulating and at the end of practically each lecture the chairman had to limit the number of questions to respect more or less the time table of the program.

The Euromech colloquium was followed by an Ercoftac workshop focused on the following four topics:

- a) Vortex rings
- b) Two-dimensional turbulence
- c) Vortex breakdown
- d) Flow past bluff bodies

Also in the Ercoftac workshop there were invited lectures on the four topics respectively given by Lugt, Dritschel, Sorensen and Braza.

At the end of the meeting it has been decided to select 15 to 20 papers among the 57 presented for publication in a special issue of *Meccanica* to be printed by Kluwer during the 1994.

The financial support by the Università di Roma, the Consiglio Nazionale delle Ricerche, Comett, U.S.Army and the registration fee of 150.000 were necessary to support the expenses of the participants from the Eastern European countries, the invited speakers and to have a very nice Toscana dinner on a terrace overlooking the valley in front of Cortona.

Considering that the week was very succesful, we hope that Vortex Dynamics will be chosen again in the future as a topic for a colloquium, to allow the study and discussion of vortical structures in a nice environment similar to Cortona. We are in the process of organizing a day devoted to vortex dynamics just after the 5th European Turbulence Conference in Siena next summer.