EUROMECH
European Mechanics Society

Newsletter 17
October 2000

415

President's Introduction

This Newsletter contains information about the Elections to the Council for 2001, under the auspices of the Advisory Board of EUROMECH. This Board offers the membership a choice of candidates for five seats on the Council, four of the seats for a 6-year tenure, and one for a 3-year tenure. The choice of candidates reflects both the need for some continuity with the present Council and an opportunity to involve new members. All candidates have written a short curriculum vitae to present themselves. I should say that it is most gratifying to find that there is a panel of such distinguished scientists prepared to give time and effort to the work of the EUROMECH *Council for six years.*

May I now ask members to use their voting rights and send back the ballot sheet by return of mail.

Members should know that the Council is keen not simply to preserve our programme of well-known and widely imitated Colloquia, but to extend it across all areas of mechanics and all parts of Europe. This cannot be a process driven entirely by the Council. We need ***proposals*** *for Colloquia in new scientific areas from the* ***membership*** *of EUROMECH. The Council will consider, in April 2001, proposals for Colloquia to be held in 2002* ***and****, for those who need more planning time, in 2003. A* PROPOSAL FORM *and instructions accompany this Newsletter. Please consider how you could help mechanics in Europe by putting in a proposal and organising a Colloquium in 2002 or 2003. It is not an overly onerous or time-consuming task, and the results are often extremely rewarding on both the personal and scientific levels, as the organisers of more than 420* EUROMECH *Colloquia can tell you!*

Hans-Hermann Fernholz
President, EUROMECH

EUROMECH

European Mechanics Society

Young Scientist Prizes 2000

awarded for presentations at the 4th EUROMECH Solid Mechanics Conference

Metz, June 26–30, 2000

Dr. M. BISCHOFF

for the best oral presentation, entitled:

On the conditioning of stiffness matrices of 3D shell elements

and

Dr. R. RIZZONI

For the best poster presentation, entitled:

Shape memory thin films subject to hydrostatic pressure

Contents

Printed by Merkanta s.r.o., Prague

elastic energy and its release at different locations. Finally, the high lift capability of Gurney flaps and divergent trailing edges on airfoils was demonstrated to be further enhanced by an appropriate three-dimensional design of the trailing edge. This results in the elimination of the absolute instability in their wake and a subsequent drag reduction of the device.

The setting of the conference site and the informal atmosphere were conducive to much interesting discussion and fruitful exchanges between participants. The scientific talks were continued during an "open house" at the Hermann-Föttinger-Institut where participants had a chance to visit the laboratories. The objectives set out for the Colloquium have been met and it is suggested that another meeting on the same topic be held in a few years to assess the progress made in this research area.

A volume of abstracts has been prepared.

Addresses for EUROMECH Officers

President: Professor Dr.-Ing. Hans H. Fernholz,
Hermann-Föttinger-Institut, Technische Universität Berlin,
Straße des 17. Juni 135, D - 10623 Berlin, Germany.
e-mail: fernholz@hobo.pi.tu-berlin.de
Tel: + 49 30 3142 3359. Fax: + 49 30 3142 1101.

Secretary-General: Doc. Ing. Miloslav Okrouhlik, CSc.,
Head of Mechanics & Solids Department, Institute of Thermomechanics,
Academy of Sciences of the Czech Republic, Dolejskova 5, 182 00 Prague 8, CZ.
e-mail: ok@bivoj.it.cas.cz,miok@teknikum.uu.se
Tel.: + 42 2 688 5158. Fax: + 42 2 858 4695

Treasurer: Professor Emil.J. Hopfinger,
LEGI/IMG, B.P. 53, 38041 Grenoble Cedex 09, France.
e-mail: emil.hopfinger@hmg.inpg.fr
Tel.: + 33 476 82 50 43. Fax: +33 476 82 52 71.

Journal Editor: Dr. John Finley
Department of Aeronautics,
Imperial College of Science, Technology and Medicine,
Prince Consort Road, London SW7 2BY, UK.
e-mail: aero.time@ae.ic.ac.uk
Tel.: + 44 020 7594 5063. Fax: + 44 020 7584 8120

Mechanics today, how far is it from the tower of Babel?

Professor Cyril Höschl

Institute of Thermomechanics, Academy of Sciences of the Czech Republic

Mechanics as an exact natural science is very young, having existed for not much more than 350 years. Today, in spite of this, it is considered by many physicists as completed, closed and therefore uninteresting. This undervaluation unfortunately leads to many inaccuracies and mistakes in the modern textbooks treating this subject.

No wonder that a susceptible student may be confused. Such a student once approached his schoolmates for help. "What really is equilibrium?" he asked. After a short consultation he got the answer: "It is a state of a system of forces and couples when the resultant force and the resultant couple of the system are simultaneously zero".[1] Our student found this answer insufficient. As he understands Newton's third law, forces can act only between bodies. An abstract system of forces without bodies does not exist. In the student's opinion, equilibrium is rather *a state of the body,* which is at rest or in a state of uniform rectilinear motion in an inertial space. The answer of his schoolmates cannot be held as a definition. It expresses only the conditions for equilibrium, i.e., the forces and couples acting on a body in equilibrium must have zero resultant force and zero resultant couple, otherwise there would be no equilibrium. Nevertheless, it cannot be said that a body under the action of a system of forces and couples having zero resultants is in equilibrium. For instance, a uniformly rotating disc is not in equilibrium, because its particles are accelerated toward the center of rotation. The equilibrium of a body is stable, neutral or unstable. Without the body, these terms would have no sense.

"What is a force?" asked our student further. This time, the answer was immediate: "This is either the cause of the change of the velocity of motion of a body or the cause of its deformation." Although this definition of force can be found in several textbooks, our student was discontented again. He feels that the conjunction "either" should be omitted, because the deformation and acceleration can occur simultaneously. There exists also the possibility of forces acting statically between two rigid bodies. These cases are not covered by the proposed definition. Finally, the captain of a ship can also cause the change of its velocity; is he therefore a force?

"And what about time? What is the definition of time?" An embarrassed silence was the only answer. Of course, it is a very difficult question. Saint Augustine once wrote: "What is time? I know it, if I am not asked to explain it. Should I be obliged to explain it, I don't know."

---

[1] The same definition can be found in Terminology for the theory of machines and mechanisms. *Mechanism and Machine Theory*, vol. 26, No. 5, p.476.

Our student feels instinctively that the true understanding of mechanics cannot be acquired from a single book or teacher. His discontent may eventually extend to the whole university. He knows that "from a hen-house the eagle cannot fly" and he decides to look for help in the books written by the founders of this outmoded but nevertheless very important and – despite of all that the student has heard in physics lectures– very interesting science. He must however expect disappointment. In the classical works of these great men in the history of mechanics, there is confusion in languages, terminology and ideas. For instance, force (vis) is considered by Newton (1643–1727) firstly as the cause of motion, then as the consequence of motion. If we follow Descartes (1596–1650) it is a quantity of motion (i.e., mass times velocity, also a momentum), whereas for Leibniz (1646–1716) it is equivalent to kinetic energy (mass times the square of velocity). Today force is a physical quantity whose consequences can be compared with those of gravity effects. Nevertheless, many curious definitions can still be found in the literature.[2]

Contrary to expectation, the confusion in terminology persists also in contemporary textbooks. For instance, *the principle of conservation of angular momentum* (or *moment of momentum*) is in French literature known as *principle of conservation of kinetic moment* (principe de la conservation du moment cinétique), in German textbooks it is *a theorem of conservation of rotation impulse* (Drehimpulserhaltungssatz), and in Russian literature, there exists *the principle of conservation of the principal moment of motion quantity* (princip sokhranenyia glavnogo momenta kolichevstva dvizheniya). By the way, should it be a principle or a theorem?

Keeping in mind that Newton's famous three laws are perhaps the most important topics in the whole of mechanics, our susceptible student decides to begin his excursion into the classical literature by Newton. The study of his work is in general not easy. His book *Philosophiae naturalis principia mathematica* is written unfortunately in Latin. There are very few scholars today who can master this dead language. And this is not the only unpleasant surprise. The well-known equation $F = ma$ (force equals mass times acceleration) cannot be found there at all. There is neither *mass* nor *acceleration,* there is not any formula at all. We find there only a sentence which begins as follows: "*Mutationem motus proportionalem esse vi motrici impressae ....*" This means: "*The change of motion*" (strictly it should have read "*quantitas motus*"), i.e., quantity of motion, that is the product of mass and velocity, also a momentum) *is proportional to the force acting* (vis motrix) *and is set in the direction of the straight line along which the force acts.* This sentence can be formulated mathematically in the following way. *Mutationem motus* denotes the change of momentum, i.e., it means the difference of momentum for two positions of the body. Supposing a rectilinear translation of a body possessing the inertial mass m, whose motion begins at time $t = 0$ with zero velocity v, then under the action of a constant force F we have

[2] Following the book of R. LAEMEL: Isaac Newton. *Büchergilde Gutenberg.* Zürich 1957. Newton's second law should be considered as a definition of force. If this would be true, then mechanics would be only a tautology and not a science.

Active control of reverse flow regions (session 4)

The session included eight presentations on the control of a variety of flows exhibiting reverse flow. Experimental and numerical studies of the flow over a fence or a backward-facing step illustrated the distinct sensitivities of these two configurations to periodic forcing. Progress in characterising a turbulent separation bubble embedded in stationary flow was reported, with the ultimate goal of controlling its unsteady behaviour. The numerical evaluation of different flow manipulation schemes demonstrated the effectiveness of body forces in delaying separation of a turbulent boundary layer. The oscillations naturally induced by a Helmholtz resonator were investigated experimentally and used with success passively to control flow separation over a wing. A comparative analysis of different control variables in the flow over a fence indicated that the pressure difference at the fence is the most effective in providing a measure of the separation bubble. Finally, flow control in an axial diffusor was achieved by periodic blowing and suction, in the context of Large-Eddy Simulations. Overall, very significant progress was reported in the active control of separated flows.

Control of entrainment and mixing (session 5)

The three papers of the session focussed on the control of various free shear flows. Expansion wave interactions were shown to provide an effective means of controlling entrainment and mixing in supersonic turbulent shear flows through the excitation of large scale structures. The excitation of helical modes in a swirling water jet revealed it to be capable of controlling the evolution of instability waves further downstream, the ultimate goal being the control of vortex breakdown. The global instability arising in jet-edge flow was conclusively quenched, at least for moderate separation distances, by resorting to a feedback control scheme.

Drag reduction by active control (session 6)

Six papers were devoted to this topic. The application of an oscillatory rotational motion to a circular cylinder was shown significantly to reduce the mean drag via the modification of the wake in the mean flow. Spanwise wall oscillations provide an effective means of skin friction drag reduction in turbulent boundary layers: the mechanisms underlying this phenomenon were presented in detail at the conference. The effect of local time-periodic blowing on the turbulence activity in the wall region was further documented. A novel class of electrokinetic fluid microactuators that are radically different from other MEMS technologies was described. These devices which can be used for sublayer control of turbulent boundary layers, work by simply pumping an electrolyte with an applied field and they involve no moving parts. The introduction of a small quantity of long-chain polymers is known to alter dramatically the regeneration cycle of streamwise vortices and high and low speed streaks responsible for drag increase in turbulent boundary layers. Direct numerical simulations have been performed which shed light on the respective roles of the extra dissipation and of the local accumulation of

EUROMECH Colloquium 415

Shear-Flow Control

Chairpersons: H.H. Fernholz (Berlin), P. Huerre (Paris)

The colloquium took place at the Technical University of Berlin from July 24 to July 26, 2000. The colloquium was the third in a series of colloquia on the control of turbulent shear flows (EUROMECH Colloquia 328, 1994 and 361, 1997).

The meeting was attended by 49 scientists from 8 different countries. There were 32 oral presentations covering current research in the field of shear flow control. The time allotted to oral presentations was 20 minutes plus 5 minutes for discussion. After each session there was additional time for discussion. The content of each of the six sessions is outlined below:

Concepts of optimal and suboptimal control (session 1)

The three papers gathered in this session focussed on theoretical and numerical investigations of optimal and suboptimal control schemes, with applications to turbulent flow over a backward-facing step and to cross-flow vortices in three-dimensional boundary layers. The talks nicely reflected the current state of the art in the development of the most promising control strategies.

Control of laminar/transitional flows (session 2)

The eight papers making up this session were mainly concerned with control of instabilities in transitional boundary layers. Non-normality in both cross-stream and streamwise directions was confirmed to be an essential ingredient in the design of drag-reducing control algorithms based on linear system theory. The secondary instability of streaks was manipulated to effectively delay transition to turbulence. Further progress was reported on the properties of compliant walls and their ability to postpone transition. Finally, active cancellation of Tollmien-Schlichting instabilities was demonstrated to be feasible and the introduction of a strong periodic excitation was shown to lead to the reattachment of a separated shear layer.

Active control of flow over aerofoils (session 3)

The four presentations in this session were concerned with the control of reattachment and separation over airfoils using various devices such as synthetic jets, smart air-jet vortex generators and localised periodic forcing. These investigations clearly demonstrated the effectiveness of active control techniques in enhancing the stall and maximum lift performance of airfoils.

$Ft = m.v$. If we allow the variability in the force F, then we may write $Fdt = d[m(t)v(t)]$. In the case of constant mass, we eventually obtain the well known formula $F = m.dv/dt = m.a$. Nevertheless, Newton does not use differentials and he does not suppose any change of force direction, although in applications he takes this change into account.

We see that the body need not be a " point mass" or "particle", as is found in many elementary textbooks on mechanics. The term "point mass" was severely criticised by G. Hammel.[3] He considered this term to be an intellectual impurity. It applies to an infinite small particle with unlimited mass density. This is neither mathematically nor physically acceptable. Notwithstanding that we are able to apply, quite successfully, the mechanics of a point mass to the system of celestial bodies (which are certainly not infinitely small), the whole mechanics of the point mass is nothing else than an application of a sole theorem of motion of the center of mass. Surely, the mechanics of solids can be built up without this somewhat artificial conception of the point mass.

Similarly, the well-known Bernoulli equation cannot be found immediately in Daniel Bernoulli's Hydrodynamica (1738). It is hidden in the last but one chapter of the book. In his effort to catch his pioneering idea, the author does not trouble himself with the uniqueness of notions, and his sentences seem to be a little feverish. He takes tacitly the value of the gravitational acceleration as unity, as well as the density of fluid. Hence, these values do not appear in the equations, which therefore become dimensionally incorrect. The well-known Bernoulli equation in its contemporary form can be acquired from his book only after a witty intellectual effort, which is similar to the process of solving a riddle.[4] As in fairy-tale from Andersen, all people cry out that their emperor has a splendid suit, but our susceptible student, should he remain sincere, must declare that the emperor is nude.[5]

The problem of confusing, ambiguous terminology can sometimes be very inconvenient, nevertheless it should not be overemphasized. Precision is not the same thing as clearness. Let us mention here the excellent statement of Sir Karl Popper: „One should never try to be more precise than the problem situation demands".[6]

---

[3] HAMMEL, G.: Über die Grundlagen der Mechanik. *Mathematische Annalen, LXVI* (1908).
[4] More details can be found in I. SZABÓ: Die ursprünglichen Fassungen einiger Gesetze der Mechanik. *Die Bautechnik*, vol. 45 (1968), No. 1, pp. 1-8.
[5] DIJKSTERHUIS, E.J..: Die Mechanisierung des Weltbildes. *Springer Verlag*, Berlin 1956.
[6] POPPER, K.: Unended Quest. An intellectual autobiography. *Fontana/Collins*, 5th ed., Glasgow 1980.

Curricula Vitae for Council Candidates

Professor I David Abrahams

Position: Beyer Professor of Applied Mathematics, University of Manchester
email address: **i.d.abrahams@ma.man.ac.uk**
Web page: **www.Wiener-Hopf.com**

I have been interested for over twenty years in mathematical and physical models falling in the general area of wave diffraction and propagation in fluids, solids and in their interaction. After studying for an undergraduate degree in aeronautical engineering, and a PhD in applied mathematics, I have worked on developing a number of theoretical models related to specific engineering and/or phenomenological goals. These include non-destructive evaluation of materials using ultrasonic elastic waves; linear and nonlinear excitation of structures and noise control (for example railway wheel squeal); acoustic, elastic and electromagnetic wave scattering by canonical bodies. My work can be categorised as primarily analytical in nature, although I have always been concerned with the direct application of analytical or semi-analytical formulae to real physical problems, and I have spent much effort on extending the Wiener-Hopf technique and related methods to useful models.

As the holder of the Beyer Chair, a post occupied in the past by Sir Horace Lamb, Sydney Goldstein and Sir James Lighthill amongst others, I am acutely aware of the continuing importance of theoretical mechanics in modern society and the need to maintain the United Kingdom's interaction with Europe and the rest of the world in this area. To this end I have been a keen conference organiser and participant, co-chairing EUROMECH 316, sitting on the organising committee of EUROMECH 352 and attending several other European Mechanics Society events. I have also helped organise four annual British Applied Mathematics Colloquia, chaired an IUTAM Symposium in July 2000 and for over twenty years attended at least two or three international meetings a year.

I currently sit on the UK Panel of the International Union of Theoretical and Applied Mechanics (IUTAM) and serve in various ways for the London Mathematical Society and the Institute of Mathematics and Its Applications.
I have also been active on many panels for the Engineering and Physical Sciences Research Council, the main funding body for science research in the UK, as well reviewing grants for overseas agencies, including NSF and TFR (Swedish Research Council).

When I find the time I am a keen (but slow) runner and also enjoy walking in the countryside. This year I have managed to run three marathons and numerous other races. Further details of my interests, recent publications etc. can be found at my Web home page.

Scientific Committee EUROMECH Solid Mechanics:

Professor N.Jones, Liverpool, UL, Chairman
Professor I.G.Goryacheva, Moscow, Russia
Professor M.Kleiber, Warsaw, Poland
Professor J.Lemaitre, Cachan, France
Professor M.Okrouhlik, prague, Czech Rebublic
Professor F.Pfeiffer, Munich, Germany
Professor M.Potier-Ferry, Metz, France
Professor F.G.Rammerstorfer, Vienna, Austria,
Professor B.Schrefler, Padova, Italy
Professor B.Storakers, Stockholn, Sweden
Professor L.Toth, Metz, France, Scientific Secretary.

Local Organising Committee

Jean-Marc Cadou
El Mostafa Daya
Denis Entemeyer
Laurent Faure
Catherine Gardin
Mahdia Hattab
Véronique Jeanclaude
Janusz Klepaczko
Marion Martiny
Sébastien Mercier
Etienne Patoor
Guy Pluvinage
Michel Potier-Ferry, Chairman
Jean-Claude Roth
Laszlo S.Toth
Ursula Weber
Hamid Zahrouni

MECAMAT Organising Committee

Co-chairpeople:
Michel Clavel, Université de Technologie de Compiègne
Fionn Dunne, Oxford University
Elisabeth Gautier, École des Mines de Nancy

Pierre Archambault, École des Mines de Nancy
René Billardon, LMT Cachan, Paris
Georges Cailletaud, École des Mines, Paris
Clervie Guillemer-Neel, UTC, Compiègne
José Mendez, ENSMA Poitiers

4th European Solid Mechanics Conference (ESMC4)
June 26th – 30th, 2000, Metz, France

ESMC was organised under the auspices of the European Mechanics Society (EUROMECH) and was chaired by Professor N.Jones.

The Local Organising Committee, chaired by Professor M.Potier-Ferry selected the Campus of the University of Metz for the Conference, which proved to be a good choice.

About 700 papers from 47 countries were accepted for this important event, mostly from Europe (10 papers or more were presented by France, 198; Russia, 60; Germany, 54; Poland, 47; Italy, 26; Ukraine, 26; Romania, 26; Morocco, 17; United Kingdom, 16; USA, 12). The number of participants was somewhat less: 630. However, this number shows an about 50% increase with respect to earlier manifestations of the European Solid Mechanics Community.

The scientific programme consisted of one general lecture by Professor V.V.Bolotin, 8 plenary lectures, 20 general sessions and 13 minisymposia. The latter were introduced for the first time, as were poster presentations (about 200), which were coupled to the oral sessions. The Scientific Secretary, Professor L.S.Toth was in charge of the scientific programme. The minisymposia were organised on the basis of invitations to experts in the given fields who independently composed their sessions. The minisymposia were very homogeneous and at a high scientific level. The poster sessions were full of participants and provided an excellent framework for valuable discussions and contact making. They were introduced by the Session Chairmen during the oral part of the sessions.

The 4th. EUROMECH-MECAMAT (Mechanics of Materials) Conference was organised in tandem with ESMC4, the chairpersons being Professors E.Gautier (Nancy) and M.Clavel (Compiègne). It comprised 69 oral or poster sessions.

Two prizes of 500 EU were awarded by the Scientific Committee for young scientists under 35, the winners being Dr M.Bischoff (Germany) and Dr R.Rizzoni (Italy). (See page 2.)

The weather was very generous for the whole week. The banquet was also special, hed in the Abbey des Prémontrés in Pont-à-Musson.

Lists of certain organising committees are given below. We thank them all, also those not listed, for their excellent work in the realisation of ESMC4.

Laszlo S.Toth, Michel Potier-Ferry.

Professor Ahmed BENALLAL

Directeur de Recherche au CNRS, Laboratoire de Mécanique et Technologie, Cachan (France). Head of the Material Division, Laboratoire de Mécanique et Technologie (1993-1997).
e-mail address: benallal@lmt.ens-cachan.fr

Professional interests

-Research: Constitutive equations for solids: plasticity, viscoplasticity and damage. (metals, rubbers, composites)
Bifurcation and stability in solids. Material instabilities.
Localization phenomena

-Teaching: Continuum mechanics. Continuum thermodynamics.
Mechanics of materials:Plasticity, viscoplasticity, damage.
Material instabilities.

-Industry: several contracts with French and European companies mainly in the field of mechanics of materials
(SNECMA, EDF, Renault, T&N Technology)

EUROMECH connections:

Organization of EUROMECH 390 on "Instability, bifurcation and Localization in Fracture of Materials", May 10-12, 1999, Cachan (France).

Participation in several EUROMECH Colloquia.

Participation in all the EUROMECH Solid Mechanics Conferences (Munich, Genova, Stockholm and Metz)
Plenary lecture in Metz.

Associate Editor of EUROPEAN JOURNAL of MECHANICS/A-SOLIDS

Ian Peter Castro, M.A., M.Sc., Ph.D., FRAeS., C.Eng.

Ian Castro graduated from Sidney Sussex College, Cambridge (Mechanical Sciences Tripos) and Imperial College, where he was the first Donald Campbell Memorial Fellow in the Department of Aeronautics. After six years as a Research Officer in the Fluid Dynamics Division at Marchwood Research Laboratories, CEGB, he joined the University of Surrey as Academic Advancement Fund Research Fellow in 1978, before becoming Lecturer, Senior Lecturer, Reader and finally professor of Fluid Dynamics from 1990. He was also Director of the Environmental Flow Research Centre (1993 – 1999) and has been a regular Visiting Professor at the Department of Marine, Earth and Atmospheric Sciences, North Carolina State University, funded by the US Environmental Protection Agency. In January 2000 he took up the Chair of Fluid Dynamics in the School of Engineering Sciences, University of Southampton.

Currently he is the UK member of EUROMECH's Turbulence Committee, a member of the UK Wind Engineering Society Research Committee and a member of EPSRC's 'College of Peers' for Mechanical Engineering.

Major research interests are in the general area of turbulent and stratified flows with application to environmental and industrial aerodynamics. Work has included experimental and computational approaches in problems as diverse as the basic physics of separated flows, bluff body aerodynamics, the effects of density stratification on wind flow over hills and turbulent dispersion. One book, over 80 refereed research papers and innumerable conference papers have been published.

Outside interests include work with the Gideons International, local Church activities, and support for Christian activity amongst students and staff on campus.

Associate Editor of: *European Journal of Mechanics B/Fluids*
Advisory Editor of: *Flow, Turbulence and Combustion*
International Journal of Heat and Fluid Flow.

e-mail: i.castro@soton.ac.uk

Professor Sergei V. Sorokin

Full Professor and Head of Department of Engineering Mechanics
State Marine Technical University of St.Petersburg

E-mail: sorokins@mail.ru

Interests and experience

Originally, my research interests were focused on applied problems in structural acoustics. Now they have shifted to analytical methods in the non-linear mechanics of fluid-loaded thin-walled structures. My most recent research interest lies in dynamics of structures composed of smart materials and an active feed-forward control of noise and vibration. In my University I do courses in Elasticity, Non-Linear Vibrations and Fluid-Structure Interaction for M.S. students. I also gave a number of Ph.D. courses at Danish and British Universities in the above subjects. I have had links with some industrial partners in Russia and abroad, e.g., Grundfoss AG and Endress+Hauser Flowtech.

EUROMECH connections

I participated in ESMC-1 (1991, Munich), ESMC-2 (1994, Genova), ENOC-1 (1993, Hamburg) and ENOC-3 (1999, Lyngby).

My papers have been accepted for presentation at ESMC-3 (1997, Stockholm), ESMC-4 (2000, Metz), ENOC-2 (1996, Prague), but I did not attend these Conferences.

I also participated in several Euromech Colloquia during 1990 - 1997.

Other useful connections

I regularly participate at IUTAM Congresses and Symposia.

I also have well-established links at Danish Technical University, Aalborg University, Keele University, Cambridge University.

Professor Patrick Huerre

E-mail: huerre@ladhyx.polytechnique.fr

Patrick Huerre is Director of Research at the CNRS (French National Centre for Scientific Research) and Professor of Mechanics at the École Polytechnique in Paris.

He received his Ph.D. in Aeronautical Sciences from Stanford University in 1976, and was a postdoctoral fellow in the department of Applied Mathematical Studies at the University of Leeds (UK) from 1975 to 1978. He then joined the department of Aerospace Engineering at the University of Southern California where he successively held the positions of Assistant, Associate and Full Professor until his return to France in 1989. He is the director and founder of the Hydrodynamics Laboratory (LadHyX) at the École Polytechnique, a research group actively involved in theoretical, numerical and experimental investigations of instabilities and transition to turbulence.

Patrick Huerre's primary research interests are in the areas of hydrodynamic instabilities, nonlinear dynamical systems and aerodynamic sound generation with particular emphasis on the dynamics of large scale vortices in open shear flows such as mixing layers, jets, wakes and boundary layers.

Patrick Huerre was elected a Fellow of the American Physical Society in 1993. He received the Montyon Prize awarded by the French Academy of Sciences in 1972 and gave the Batchelor Lecture at the University of Cambridge in 1988.

Between 1994 and 1988 he was co-Chief Editor of the *European Journal of Mechanics-B-Fluids*. He is presently Associate Editor of the *Journal of Fluid Mechanics*.

He has been a member of Euromech since its inception and is the co-Chairman of Euromech 415 on Shear Flow Control.

Professor Felix Darve

Institut National Polytechnique de Grenoble, France
Felix.Darve@hmg.inpg.fr

Engineer of Ecole Centrale Paris (1971)
Dr.-Ing. (1974), Dr. es Sciences (1978) Institut de Mecanique de Grenoble
Prof. INPG (1985)

Teaching area: solid mechanics, geomechanics

Research area: constitutive relations, bifurcations and instabilities of geomaterials (concrete, rocks, soils)

Participation and sessions organiser of several EUROMECH Colloquia and Conferences

Chief editor of the Int. J. Mech. Cohes.-Frict. Mater. (Wiley publ.) and of the Rev. Fr. Genie Civil (Hermes publ.)
Member of the advisory board of the Int. J. "Comp. and Geotech.", "Mat. And Struct.", "Granular Matter", "It. Geotech. J.
Editor of 13 books or congress proceedings
More than 100 papers in journals or extended proceedings

Director of the European network of laboratories ALERT Geomaterials

Expert (French Ministry of Research and Technology, Belgian FNRS, Italian Ministry of Universities and Research)

Felix Darve
I.N.P.G. Laboratoire Sols Solides Structures, B.P. 53 - 38041 Grenoble cedex 9
Soils Solids Structures Laboratory; A.L.E.R.T. Geomaterials, Director

tel. 33 (0)4 76 82 52 76
fax. 33 (0)4 76 82 70 00
URL: http://www.3S.hmg.inpg.fr
e-mail to: Felix.Darve@hmg.inpg.fr
mail to: Felix.Darve@inpg.fr
mail to: fdarve@geo.hmg.inpg.fr
