

EUROMECH CONFERENCE

ENOC-3

3rd. Euromech Nonlinear Oscillations Conference
September 1999, Paris, France.
Professor R. Ohayon, Chaire de Mécanique, CNAM,
Rue Conte, F-75003 Paris, France.
e-mail: ohayon@cnam.cnam.fr

Unfortunately no exact date could be obtained for this conference.

Miscellaneous Announcements

Russian Academy of Science

International Conference: Fluxes and Structures in Fluids
June 10th. to June 12th. 1999, St Petersburg, Russia.
Professor Yu.D. Chashechkin,
Institute for problems in Mechanics,
101(1), prospect Vernadskogo, Moscow 117526, Russia.
e-mail: chakin@ipmnet.ru

Third European Summer School on Modelling and Control of Mechanical Systems.

June 14th. to June 18th., 1999, Aussois, Savoie, France.
Dr B. Brogliati, LAG-INPG, Grenoble Cedex 09, France.
e-mail: Bernard.Brogliati@lag.ensieg.inpg.fr

ASME PVPC

Second International Symposium on Computational Technologies for Fluid/
Thermal/Chemical Systems with Industrial Applications.
August 1st. to August 5th. 1999, Boston, Massachusetts, USA.
Dr C.R.Kleijn, Delft University of Technology,
Kramers Laboratorium voor Fysische Technologie,
Prins Bernhardlaan, 262 BW Delft, The Netherlands.
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Editor's Piece

I must apologise for the late appearance of this issue, due jointly to my inability to obtain complete information for the 1999 EUROMECH meetings (see above), and to my printer going out of business.

The next issue will appear as early in 1999 as I can obtain the Chairpersons' reports for the 1998 meetings.

EUROMECH

European Mechanics Society

Newsletter 12

September 1998

President's Introduction

I am glad to say that at the meeting of the EUROMECH Council held in Udine, Italy on April 16th. – 18th., 1998, the decision was taken – unanimously – to appoint our first Honorary Members. They have both been immensely influential in the formation and in developing the spirit of EUROMECH from the earliest days, and have both contributed an incalculable amount of effort to the administration of the meetings, and later, the Society. Their academic records are virtually unmatched. It is therefore my great pleasure to be able to announce, as Honorary Members of the European Mechanics Society:

Professor G.K. Batchelor as a token of the esteem in which he and his work in mechanics are held in Europe and in recognition of his tireless leadership of EUROMECH, as Chairman of the Committee from the very start in 1964 up to 1988.

Professor W. Fiszdon to recognise his invaluable support of the work of EUROMECH and mechanics in Europe generally. He also played an essential role in maintaining, under great difficulties, an open window between scientists working in the West and in the Eastern bloc.

I hope the members as a whole will join the Council in welcoming them.

Hans-Hermann Fernholz
President, EUROMECH

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EUROMECH Council Meeting, April 1998

The annual meeting of the EUROMECH Council was held at CISM, Udine, Italy from April 16th. – 18th. The principal business was:

- The election of Honorary Members (see the President's Introduction).
- Confirmation of the present Officers for 1999.
- Approval of the budget for 1998.
- Approval or appointment of members and Chairpersons for the five EUROMECH Conference Committees.

EUROMECH Solid Mechanics Conference Committee (ESMCC)
Chairperson: N.Jones (Liverpool)

EUROMECH Fluid Mechanics Conference Committee (EFMCC)
Chairperson: L.van Wijngaarden (Enschede)

EUROMECH Turbulence Conference Committee (ETCC)
Chairperson: D.Henningsson (Stockholm)

EUROMECH Nonlinear Oscillations Conference Committee (EN OCC)
Chairperson: F.Pfeiffer (Munich)

EUROMECH Mechanics of Materials Conference Committee (EMMCC)
Chairperson: R.Billardon (Cachan)

- Approval of the EUROMECH Colloquia for 1999. There are 10 devoted to solids, 6 to fluids and 1 on solids/fluids. The distribution by country is: Austria (2), Czech Republic (1), France (3), Germany (2), The Netherlands (1), Poland (1), Portugal (1) and UK (4).

As of April 17th, there were 1249 members and 2 honorary members of the EUROMECH society, together with 6 Affiliated Organisations.

The next meeting of the EUROMECH Council will be held in Cambridge, UK, on April 9th. – 10th, 1999. Members are encouraged to contact Council members with comments or matters of concern.

HHF

CISM Programme 1999

Damage Mechanics: Statistical Aspects	May 31 – June 4
Coordinators: D.Krajcinovic (Arizona), J. van Mier (Delft)	
Rolling Contact Phenomena	June 21 – 25
Coordinator: J.J.Kalker (Delft)	
IUTAM-CISM-HYDROMAG Advanced School	June 21 – 25
Liquid Metal Magnetohydrodynamics	
Coordinators: P.Davidson (Cambridge), A.Thess (Dresden)	
Deployable Structures	July 5 – 9
Coordinator: S.Pellegrino (Cambridge)	
Creeping Fatigue	July 12 – 16
Coordinators: J.Dominguez (Sevilla), T.Lindley (London)	
Bone Cell and Tissue Mechanics	July 19 – 23
Coordinator: S.C.Cowin (New York)	
Material Instabilities in Elastic and Plastic Solids	September 13 – 17
Coordinator: H.Petryl (Warsaw)	
Advanced Professional Training:	
Semirigidity in Connections of Structural Steelwork: Theory, Analysis and Design.	September 20 – 24
Coordinators: M.Ivanyi (Budapest), C.C.Baniotopoulos (Thessaloniki)	
Turbulence Modulation and Control	September 20 – 24
Coordinator: A.Soldati (Udine)	
Adaptive Finite Elements in linear and Nonlinear Solid and Structural Mechanics	
Coordinator: E.Stein (Hannover)	October 4 – 8
Environmental Geomechanics	October 11 – 15
Coordinator B.Schrefler (Padua):	
Advanced Professional Training	
Seismic Resistant Steel Structures: Progress and Challenge	October 18 – 22
Coordinators: F.M.Mazzolini (Naples), V.Gioncu (Timisoara)	

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CISM has also organised, or hosted a number of international workshops, seminars, symposia and conferences.

Since its institution, CISM has dedicated much attention to the publication of the texts of its courses and lectures. The more than two hundred and fifty volumes printed at the centre and distributed by Springer Verlag of Wien and New York are known to specialists throughout the world. The international journal "Mechanics Research Communications" was created by CISM and Pergamon Press, Oxford, in 1973.

The CISM Statute provides for the bodies responsible for the operation of the Centre. The Academic and Administrative Councils determine the general programme of the Centre's activities and approve the budget. The Scientific Council, chaired in rotation by one of the three Rectors of different nationalities, and composed of thirty-five representatives of the member institutions together with a restricted number of outstanding scientists invited by the Council, is responsible for the scientific content and quality of CISM's activities. the Council discusses and prepares the Centre's scientific programmes on the basis of the proposals received from member institutions and other sources and in consideration of the evolving interests of scientific and technical sectors. the programmes over the years evidence definite trends which reflect the developments in the fields of classical and contemporary mechanics and related sciences.

CISM is a particularly suitable and attractive venue. Located in the centre of Udine, in the handsome eighteenth century palazzo del Torso, the Centre provides both a charming and practical working environment, with two lecture rooms, seating eighty and fifty persons respectively, together with others suitable for symposia, seminars and workshops. The adjacent Guesthouse offers accommodations for lecturers, while participants can be lodged in the Student House of the University of Udine, or in the many fine hotels in the city. The scientific and organisational work of the Centre is supported by an experienced permanent secretarial, administrative and technical staff.

At nearly thirty years from its institution, we feel that CISM serves as a significant point of encounter and debate for both young and expert researchers working in the field of mechanics, and that it continues to play a vigorous role in the establishment and consolidation of productive scientific links among countries belonging to different areas of the world and to different political and cultural traditions.

Sir James Lighthill FRS 1924 – 1998

James Lighthill was acknowledged throughout the world as one of the great mathematical scientists of this century. He was the prototypical applied mathematician, immersing himself thoroughly in the essence and even the detail of every engineering, physical or biological problem he was seeking to illuminate with mathematical description, formulating a sequence of clear mathematical problems and attacking them with a formidable range of techniques completely mastered, or adapted to the particular need, or newly created for the purpose; and then finally returning to the original problem with understanding, predictions, and advice for action.

His published legacy, of six books and some 150 papers (most of them republished in four volumes in 1997 by Oxford University Press) show at every stage a well-nigh perfect correspondence between a clearly identified physical process or mechanism and its expression and description in mathematical terms. His presentations, in papers or lectures, often emphasized the physical aspects, and gave the mathematics almost as a throw-away for those who like everything formalised; but in fact his style of working was usually the reverse. In one of his most celebrated works, his first paper on "Sound generated aerodynamically", by jet aircraft and the like, he developed the essential mathematical structure completely in two weeks, but felt that the users (aeroengine designers) would not be able to grasp the implications, and so he delayed submission of his manuscript for sixteen months, in which time he worked backwards from the conclusions, isolating the meaning at each stage - and refining and simplifying the mathematics as he did so. He was in no sense simply the employer of existing mathematics against a rich range of practical problems. To be sure, his earliest papers on supersonic flight already showed brilliant mastery and exploitation of classical techniques. But much more powerful techniques were needed for problems such as those of how waves in fluids are generated and propagated, and for this Lighthill made great developments in the theory of Fourier analysis, generalized functions and asymptotics – all set out with elegance and economy, and full rigour, in a delightful 1958 book. Rather different ideas were needed for nonlinear problems, such as the propagation and focusing of sonic booms, and here Lighthill provided equally original and elegant new techniques, permanent and frequently-used additions to the armoury.

Michael James Lighthill was born in Paris, on 23 January 1924, and excelled across the board at Winchester before going up to Trinity College Cambridge in 1941 for a two-year wartime B.A.. He worked on supersonic flight at the National Physical Laboratory, Teddington, for the rest of the war, publishing his first paper before he was 20. He then went as Senior Lecturer to the University of Manchester at age 22, before taking the Beyer Professorship of Applied Mathematics there at age 26, in succession to Sydney Goldstein. In his thirteen years, 1946-59, at Manchester, Lighthill ran one of the most powerful and inventive fluid dynamics groups ever formed anywhere.

He had many Ph.D. students there, and his students often rose to considerable heights themselves. Indeed, there was a period in which no fewer than 17 of his Manchester students held Chairs in the UK, and that at a time when the number of universities was no more than a third of its present number. Although prepared to share the credit on a paper with a colleague, Lighthill almost never allowed his name to appear as author on any paper written by a student. And he was, then and since, tireless in his support for young scientists of any promise and for scientists working in disadvantaged circumstances.

During these Manchester years, Lighthill worked extensively on gasdynamics, including effects important at very high speed, in his studies of ionization processes, and the diffraction of shock and blast waves. He also launched two major new fields in fluid mechanics. The first of these, "aeroacoustics", or "sound generated aerodynamically", was announced in a remarkable paper published by the Royal Society in 1952. Unusually, but significantly, that paper neither contains nor needs so much as a single reference to any prior work. This work has remained, over nearly fifty years, the progenitor of all subsequent work in the field, and has been cited in many thousands of later papers. It had immediate implication for noise reduction in jet aeroengines, motivating the trend begun later in the 1950s and still continuing, to engines with higher bypass ratio, greater diameter and lower exhaust speed, as mandated by Lighthill's famous eighth power law for jet noise. Remarkably, the Lighthill theory was sufficiently versatile for it to be applied also to problems as diverse as the heating of the sun's corona and the noise heard under water due to breaking surface waves and splashing drops. The second, "nonlinear acoustics", was initiated by a famous 100-page article written in 1956 in honour of the seventieth birthday of another great mechanics scientist, Sir Geoffrey Taylor. This field is again represented now by many thousands of papers, and applications include kidney-stone-crushing lithotripsy machines and, with the same mathematics, flood waves in rivers and traffic flow on highways.

From Manchester, Lighthill went in 1959 to be Director of the Royal Aircraft Establishment Farnborough, where his leadership extended to the critical examination of every report emanating from RAE. The six years to 1964 saw him again in his element ("wouldn't change it for anything!"), working on the aerodynamics of the slender delta wing for Concorde, on spacecraft, and on short-haul aircraft. He also worked with the Post Office in developing commercial use of television and communications satellites, while managing in unusual detail the work of the 8000 RAE staff, of whom 1400 were professional scientists and engineers. Towards the end of his RAE time he became dissatisfied with the support in national societies for applied mathematics, and founded the Institute of Mathematics and its Applications, of which he was the first President 1965-67.

From 1964 to 1969 Lighthill held a Royal Society Research Professorship at Imperial College, and here he began his great development of mathematical biofluidynamics – the quantitative understanding of the flow of blood in mammalian cardiovascular systems, of air in the human airways, and of the flying of birds and insects and the swimming of fish. Mastery of the biology was, he

The International Centre for Mechanical Sciences

Sandor Kaliszky, Rector CISM

The international centre for Mechanical Sciences (CISM) is a non-profit organisation founded in 1968 by European scientists to favour the exchange of the most recent developments in the mechanical sciences and related fields. CISM is rigorously independent and international in structure and scope. To achieve its purpose, it collaborates actively with similar institutions in countries around the world, and has, among others, long-standing relations with UNESCO, IUTAM, IFTOMM, EUROMECH, GAMM and a number of European Universities, Academies and Scientific Institutes.

The principal activity of CISM is the organisation of courses, seminars, workshops, symposia and conferences to present the state-of-the-art to researchers, and to provide advanced training for engineers. Advanced schools are devoted to particular problems drawn from the whole range of classical and contemporary mechanics, present basic and applied topics which are approached theoretically and/or experimentally. Courses have been held in: analytical mechanics; mechanics of solids; hydro- and aerodynamics; acoustics; thermodynamics; heat and mass transfer; theory of continuous, polar and discrete media; elasticity, plasticity and rheology; theory of structures; wave propagation; material science; fracture mechanics; soil and rock mechanics; seismic phenomena and earthquake design; mechanics of machines; numerical methods as well as in the fields of information theory, computer science, mathematical control theory, formal languages, applied mathematics, system theory, operation research. Interdisciplinary courses have included: robotics, mechatronics, biomechanics and environmental mechanics.

Over nine hundred lecturers, from over thirty countries, have contributed their expertise to the success of these courses, while the number of participants, from more than ninety countries, exceeds seven thousand. The number of hours dedicated to a course is roughly equivalent to that of a one-semester university course. Participants pay a registration fee, but scholarships can be offered to young researchers who cannot be supported by their own institutions.

The Centre also offers professionally oriented courses for Italian engineers in broader fields, including geology, geotechnics, bridge design, computer applications in structural design, seismic engineering, quality control, surveying and photogrammetry. These courses have been attended by over two thousand engineers.

The Third EUROMECH Fluid Mechanics Conference (EFMC3) Göttingen, September 15th. – 18th., 1997

Göttingen succeeded Cambridge and Warsaw as host to the third triennial Fluid Mechanics Conference. The series was initiated after the end of the cold war to provide a forum for the complete spectrum of fluid dynamics research in Europe, with the particular hope that it would encourage the development of new personal relationships across the whole continent. The Göttingen meeting has followed in this tradition, 136 of the 495 participants coming from countries of the former Eastern bloc¹. In all, about 400 contributions were presented in 59 sessions and 3 minisymposia. Invited lecturers gave ten 45-minute survey lectures and one 60-minute set piece.

Twenty-four sessions were devoted to turbulence and related topics (broken down as: turbulence 6, stability 7, vortex dynamics 5 and boundary layers 6) supplemented by a minisymposium on *turbulent mixing* convened by H. Fiedler (Berlin). U. Frisch (Nice) gave the EUROMECH Fluid Mechanics Lecture, on *the intermittency of turbulent activity at small length scales*. H. Alfredsson (Stockholm), M. Germano (Torino) and A. Maslov (Novosibirsk) gave survey lectures addressed to general problems of turbulence.

The problems of multi-phase flows occupied 13 sessions (multiphase flow 9, bubble dynamics 3 and condensation 1). The four invited lectures which were related to this topic were given by: P. Clavin (Marseille) – *combustion dynamics*, W. G. M. Agertof (Vlaardingen/Unilever) – *fluid dynamic problems in the food industry*, L. van Wijngaarden (Enschede) – *the collective behaviour of air bubbles in water* and W. Lauterborn (Göttingen) – *new experimental findings in cavitation dynamics*. Minisymposia discussed *forced flows with solidification* W. Schneider (Vienna) and *dispersed multiphase flows* M. Sommerfeld (Halle).

Other topics took up a further 22 sessions: five on geophysical problems (buoyant flows 3, rotating flows 2), one on biological flows, four on gas dynamics, six on waves, one on measurement techniques, one on aeroelastic problems and one on aerodynamics. Three further invited lectures were given by T. Maxworthy (Los Angeles) – *the exchange of flows in the Red Sea*, T. Pedley (Cambridge) – *fluid dynamics in biomechanics* and R. Hillier (London) – *hypersonic flows*.

I. Rehberg (Magdeburg) gave a public lecture with more than 40 small experiments related to the *statical and dynamical behaviour of granular materials*.

The large number of participants and the interesting content of the contributions suggest that the EFMC series serves a useful purpose.

C. Voigt, Conference Secretary.

¹ Broken down by country: Russia 71; Poland 26; Ukraine 13; Czech Republic 11; Romania 7; Belorussia 3; Bulgaria, Georgia, Slovakia, Uzbekistan and Yugoslavia, 1. From Western Europe: Germany 167; United Kingdom 44; France 43; The Netherlands 23; Italy 15; Switzerland 8. There were 59 Participants from further afield.

insisted, the *sine qua non* for entry into this field. He revelled, in lectures, not only in the articulation of all the Latin names, but in his ability to perform the appropriate gymnastics to illustrate certain flying characteristics – in particular the “clap and fling” mechanism employed by the tiny encarsia formosa to endow it with a lift coefficient far above that obtainable from the ordinary aerodynamics in which the component parts of the body do not break apart.

In 1969 he succeeded Paul Dirac, founder of much of quantum mechanics, in the Lucasian Professorship of Mathematics at Cambridge – though when he referred to “his predecessor in the Chair” one sensed he was thinking primarily of Newton. Here he taught indefatigably, and with enormous gusto, six days of the week at nine in the morning. He widened his range yet further with work on control systems; on active control of sound, or anti-sound; more and more on waves; on oceanography and atmospheric dynamics, including monsoon prediction and propagation; and on biological mechanics at the microscopic level. He sat on many national and international committees, in academic, industrial and governmental circles, and took a serious interest in issues of mathematical education in schools.

From 1979 to 1989 Lighthill was Provost of University College London, much engaged in fundraising, in new developments in the College, particularly in the biology and biotechnology sides, and in dramatically improving the representation of women in senior posts. He still maintained his scientific work, with studies on the unpredictability of large systems, on wave energy extraction devices, and on features of the human auditory system. After retirement he took up Chairmanship of the Special Committee on the International Decade for Natural Disaster Reduction, and travelled and lectured world-wide.

His achievements have been widely recognized – through election to FRs at age 29, through award of 24 Honorary Doctorates, through Foreign Membership of the most prestigious academies, through receipt of many medals and prizes, and through knighthood in 1971.

Stories about Lighthill are legion, as would be expected with such a larger-than-life figure, and no amount of discounting for exaggeration makes them less amusing or less essentially accurate. It is well known that he was fined £1 for jumping from a train as it passed to his dismay without stopping through Crewe; and that on more than one occasion he successfully defended himself on charges of speedy driving, turning the full spotlight of his presence, charm and authority on the magistrates as he explained how, as Lucasian Professor, he was fully seized both of the laws of mechanics and of his duty to society not to waste energy, the latter compelling him to desist from applying the brake on any downhill section of road.

He saw everything as a challenge to his brain, or to his physique, or to the coordination of the two. And if no challenge were obviously to hand he would create one – mastering Portuguese in three weeks to the extent that he could give a (long) after-dinner speech in the language, for example. He listed his leisure interests as music and swimming, to which surely literature, poetry (especially Portuguese) and languages (French, German, Russian, Portuguese) should be

added. His swimming exploits were legendary - careful in their homework on tides and local currents, bold in their ignoring of everything else. On countless occasions he came home safely, against the odds. Last Saturday he almost completed a nine-hour swim round Sark (he was the first ever to do this, at age 49) against high winds and huge waves, before dying close to the shore.

A colossus who will be missed everywhere in the scientific world, he is survived by his wife Nancy, whom he married in 1945, and by their five children, a son and four daughters.

D.G. Crighton FRS

This obituary was first published in The Independent on July 22nd, 1998.

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406. *Image processing methods in applied mechanics*

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<http://fluid.ippt.gov.pl/~euro406/>
Prof. W. Kosinski, Warsaw, Dr. J. Kompenhans, Göttingen.
6-8 May 1999, Warsaw, Poland.

Colloquium 406 aims to create a common platform for groups working on the development and application of modern image acquisition and processing methods in fluid and solid mechanics. Recent progress in image recording and analysis techniques has introduced revolutionary changes in experimental methods in mechanics. However, we often observe that the development of image processing techniques in both fields of mechanics proceeds on parallel paths, very often solving similar problems without being conscious of each others' work. EUROMECH 406 should help participants to gain knowledge and allow critical assessment of similarities and differences between image processing methods used in applied mechanics today.

Proposed topics include: pattern recognition, analysis of size, shape and deformation; motion analysis, full field measurements of velocity; thermography (infrared, liquid crystals), scalar field measurements; stress and strain analysis; structure analysis, measurement of species concentration; three-dimensional image analysis, tomography. new image acquisition methods - high speed and high resolution techniques.

Vibro-acoustics and flow-structure interactions

P.J.T. Filippi (Marseille) and A.H.P. Van der Burgh (Delft)
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e-mail: cargese99@lma.cnrs-mrs.fr
<http://alpha.lma.cnrs-mrs.fr>
19 - 23 April, 1999, Cargese, Corsica, France.

A proposal for this Colloquium was not submitted to Council at the proper time, but it is listed here at the suggestion of the Vice-President.

The meeting follows on from EUROMECH 369 (September 1997) and covers broadly the same topics. Thus it is intended to discuss recent state of the art research in the domains where the phenomena of interaction between a fluid and a vibrating structure are significant. It will cover industrial problems of acoustic radiation and fluid loading of structures. Diffraction and scattering of waves by rigid or elastic bodies, and the inverse problem of target identification are of general interest for marine, fishing or underwater acoustic investigations. In addition to these linear problems, nonlinear aspects will be welcome. The scope includes both theoretical and experimental studies.

EUROMECH MEETINGS IN 1999

EUROMECH COLLOQUIA

are informal meetings on specialised research topics. Participation is restricted to a small number of research workers actively engaged in the field of each Colloquium. The organisation of each Colloquium, including the selection of participants for invitation, is entrusted to a Chairperson. Proceedings are not normally published. Those interested in taking part in a meeting should contact the relevant Chairperson at the address given below

389. *Physiological flows and flow-structure interactions*

Prof. K. Perktold, Institute of Mechatronics, Technical University, Graz,
Steyrergasse 30/3, A-8010 Graz, Austria.

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Prof. T. Kenner, Graz.

20-24 April 1999, Graz, Austria.

The meeting will be a continuation of a series of EUROMECH Colloquia dedicated to biofluid mechanics and to fluid mechanic effects in physiology. In previous colloquia, Berlin 1993, London 1996 the modelling of blood flow and of processes related to blood or blood components and interactions with structures were treated. A main aspect was the contribution of fluid mechanic effects to physiological and pathophysiological processes and mechanisms.

In this Colloquium, the spectrum of subjects will be extended to cover new research perspectives. There will be emphasis on fluid dynamic effects in complex physiological processes and mechanisms including different types of fluid-structure interactions.

The particular goal of the meeting is to bring together scientists with different backgrounds from theoretical, experimental, computational and clinical disciplines to discuss recent methods and results and to show new perspectives to promote the understanding of complex physiological processes.

390. *Instability, bifurcation and localisation in fracture of materials*

Dr. G. Rousselier, Electricité de France, Dept.MTC, Site des Renardieres,
F-77818 Moret-sur-Loing Cédex, France.

E-mail: gilles.rousselier@der.edf.gdf.fr

Dr. A. Benallal, Cachan.

10-12 May 1999, Paris, France.

Strain localisation can be a precursor to fracture of materials. A great amount of work has been devoted to the description of this phenomenon. Depending on the constitutive behaviour, bifurcation and/or perturbation approaches can be used. recent advances in the field and the links between the two approaches will be discussed. The effects of damage, thermal conduction, inertia, mesh size and non-local constitutive relations can be discussed, from a theoretical and physical as well as a numerical point of view.

Coupled phenomena will also be considered: diffusion, stress corrosion, chemical reactions, porous solids -- --. Contributions can concern metallic materials, concrete, soils, polymers etc.

and presented in a computer-friendly manner. This requires the use of either modern symbolic manipulators or advanced assembly and solution algorithms interfacing in a modular manner with other types of software in the areas of control, finite elements and optimisation. Related developments and applications in solution methods in the fields of numerical analysis, software, hardware platforms, time integration methods applicable to differential-algebraic systems and problems related to time integration of flexible systems with high frequency content are also of primary importance for this field. Computer graphics and parallel computing methodologies extend the scope of applications and help speed up and post-process the numerical solution of large and complex systems.

The aim of the colloquium is to address the recent developments in the field of multibody systems. Contributions in the following fields would be particularly welcome: theoretical and computational methods; applications and experimental procedures for the validation of theoretical foundations; solution algorithms and numerical issues; flexible multibody systems; advanced control issues of mechanical systems; optimisation and design sensitivity; real-time simulation; applications.

405. *Modelling uncertainties in structural analysis*

Prof. P. Level, Université de Valenciennes et du Hainaut Cambrésis,

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59304 Valenciennes Cedex, France.

E-mail: Pascal.Level@univ-valenciennes.fr

Prof. L. Jezequel, Lyon.

_ September 1999, Valenciennes.

Calculation techniques based on the finite element technique promise to be very robust and of general application. Remaining problems include the processing of imprecise or uncertain parameters. Amongst possible approaches are the non-deterministic process, stochastic methods, statistical approaches and error modelling, while the host institution has had some success with "fuzzy arithmetic" formalisms.

It is hoped to include the following topics: uncertainty modelling in engineering analysis (static, dynamic and buckling behaviour); non-deterministic finite element methods; non-deterministic updating methods; uncertain parameter identification methods; vibroacoustic analysis.

391. *Windtunnel modelling of dispersion in environmental flows*

Dr. Z.Janour, Institute of Thermomechanics, Dolejsovska 5,
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E-mail: janour@bivoj.it.cas.cz

Prof. A.Robins, Surrey; Prof. M.Schatzmann, Hamburg.
13-15 September 1999, Prague, the Czech Republic.

A powerful source of information about the physics of all the phenomena in the atmospheric boundary layer is provided by windtunnel experiments.

Experimental results are then only reliable if both the physical model and the measuring techniques used are adequate. The objective of the Colloquium is to bring together the community active in relevant experimental work and discuss, assess and report on the state-of-the-art in this field, define directions for future research and encourage wider co-operation between institutions. The colloquium will concentrate on the physical modelling of flow and dispersion in the natural environment. The topic includes flow and dispersion around buildings and structures (but excludes wind loading which is well catered for elsewhere), flow over complex terrain etc., techniques used in their simulation, and the means by which such simulations are tested and evaluated.

392. *Mechanics of railway interfaces*

Prof. R.A.Smith, University of Sheffield,
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E-mail: roderick.smith@sheffield.ac.uk

Prof. E.Andersson, Stockholm.

25-27 March 1999, Sheffield and Derby, UK.

The two major railway based topics for this Colloquium will be the mechanics of the contact between current collectors and overhead wires and the wheel/rail contact. In both cases advances in mechanics knowledge now (potentially) allow active control of the forces generated in these critical locations. Both areas are highly non-linear and as train speeds have increased, many problems have emerged including aerodynamics, noise control, wear minimisation, fatigue and vibrations. Offers of contributions in these fields are welcome from researchers in both academic and industrial groups.

393. *Crack initiation after extensive multiaxial plastic flow*

Postponed to 2000, Reading, England.

The objective of the Colloquium is to provide a forum for engineers and scientists working in this field to present their most recent results and to discuss recent developments. Topics are macroscopically ductile or brittle materials such as metals, ceramics, composites and geomaterials etc. Particular emphasis will be placed on issues related to the bridging of length scales from micromechanisms to meso- or macroscopic fracture. Contributions should present experiments, modelling, numerical simulations, damage mechanics and other relevant fields.

403. *Turbulence in high speed compressible flows*

Prof. J.P.Bonnet, Laboratoire d'Etudes Aérodynamique,
CEAT - 43 Route de l'Aérodrome, F-86036, Poitiers, France.

E-mail: bonnet@univ-poitiers.fr

Dr. Otto Leuchter, ONERA.

2-4 November 1999, Poitiers, France.

The scope of the Colloquium is to present and discuss new experimental, theoretical and numerical work on high-speed compressibility effects in turbulent flows relevant to practical applications, such as boundary layers, free shear layers, wakes and jets as well as shock/boundary layer and free turbulence interactions. Shock induced turbulent mixing and laminar/turbulent transition will also be addressed. Applications are related to external aerodynamics (transonic, supersonic and hypersonic regimes), to internal flows (compressors, scramjets and combustion), aero-acoustics, aero-optics, and internal fusion containment etc. Fundamental aspects as well as experimental approaches and numerical simulation (RANS modelling, LES and DNS) will be covered. Specific advanced experimental methods will also be considered.

A one-day workshop organised under the auspices of ERCOFTAC and COST F1 will follow the Colloquium on November 5th.

404. *Advances in computational multibody dynamics*

Prof. Jorge A.C.Ambrosio, IDMEC - Instituto Superior Tecnico,
Ave.Rovisco Pais 1, 1096 Lisboa, Portugal.

E-mail: jorge@lemac.ist.utl.pl

Prof. W.Schiehlen, Stuttgart.

20-23 September 1999, Lisboa, Portugal

During the last few years, major scientific progress has been made in fields related to computer aided analysis of multi body systems. Recent developments in computer hardware and general purpose software have motivated a demand for efficient analysis and simulation tools, especially by the aerospace and automotive industries. This, in turn, has provoked the need to include in such tools advanced features such as: real-time simulation capabilities, highly non-linear control devices, workspace and path planning, active control of machine flexibility and multidisciplinary features increasing the reliability and accuracy of the analytical results. These factors were responsible not only for the increased activity in the area, but they also set the pace for future research. It is now widely recognised that the classical equations describing multibody system dynamics must be derived

techniques and analytical procedures. A fruitful route to follow begins the design process at the constituent level and progresses by moving from one size level to the next using micro-mechanics or mechanism-based models, which, when combined with mathematical and continuum models, leads to a powerful alternative to empirical design.

The meeting will address progress made in recent years in the modelling (analytical/numerical) of impact damage and damage tolerance of polymeric composite laminates and structures. Damage tolerance is defined as the ability of the composite component to "tolerate" damage, that is to limit further damage propagation under service loading. Papers should focus on the identification and characterisation of the problem from microscale to product; explore ways of tackling and solving the problem by a combination of models, including how to set up the model and its interrogation; and, finally, its display in a useful form that permits successful application by computer implementation.

401. *Inverse methods in structural dynamics*

Prof. J.E. Mottershead, Dept of Engineering, University of Liverpool,
Brownlow Street, Liverpool L69 3GH, UK.
E-mail: jmotters@mechnet.liv.ac.uk
Dr. M.I. Friswell, Swansea.
6-7 September 1999, Liverpool, UK.

The subject of the Colloquium is the "structure" and parameterisation of mathematical models in structural dynamics. It will address the issues of formulating and updating mathematical models by using inverse methods and will include: the formulation of stiffness and mass matrices to minimise prediction errors or discretisation errors; model structure determination including the identification of connectivities; finite element disassembly; parameterisation and model updating; methods for locating and identifying nonlinearities; damping identification; model-based damage detection methods; structural modification; the identification of joints and boundary conditions; optimal inputs and measurements; and selective sensitivity.

402. *Micromechanics of fracture processes*

Prof. D. Gross, Institute of mechanics, TU Darmstadt,
Hochschulstraße 1, D-64289 Darmstadt, Germany.
E-mail: gross@prandtl.mechanik.th-darmstadt.de
Prof. D. Fischer, Prof. E. van der Giessen.
24-27 September 1999, near Darmstadt, Germany.

Micromechanics is of increasing significance in the understanding and description of fracture and damage processes. This field offers a deeper insight into the nature of material failure, makes possible the modelling of complex material behaviour and provides a basis for the improvement of material properties relevant to failure. It covers experimental observations, modelling of physical mechanisms, numerical simulations and has natural links to macroscopic descriptions, damage mechanics, classical failure concepts and material science.

394. *Theory and numerics of anisotropic materials at finite strains*

Dr. K. Hackl, Institute for Strength of Materials, Technical University,
Graz, Kopernikusgasse 24, A-8000, Graz, Austria.
E-mail: hackl@euler.tu-graz.ac.at
Prof. Ch. Miehe, Stuttgart; Prof. Ch. Celigoj, Graz.
29 March - 1 April, 1999, Graz, Austria.

The Colloquium is intended to cover new developments in the constitutive theory and the numerical treatment of anisotropic elasticity and plasticity under special consideration of materials which are capable of sustaining finite strains. Topics are likely to include: general approaches to the formulation of anisotropic constitutive models for solids which undergo large-strain deformation processes; thermodynamics and physics of such materials at both the micro- and macro-mechanical level; the transition between and interrelation of these two scales; parameter-identification within material models from experimental data; numerical algorithms, especially time-dependent schemes; their consistency, stability and accuracy; applications to the solid mechanics of mono- and polycrystalline materials; composite and structured materials; biological materials.

395. *Coastal, estuarine and river forms*

Prof. H.J. de Vriend, University of Twente, P.O. Box 217,
7500 AE, Enschede, NL.
E-mail: h.j.devriend@sms.utwente.nl
Prof. P. Blondeaux, Genoa.
2-4 June 1999, Enschede, NL.

Note: *This date is correct, a provisional date has unfortunately been promulgated in various journals.*

The non-linear interaction of the water and sediment motion with the bed topography in natural waters, such as rivers, estuaries, coastal zones and shelf seas, gives rise to a variety of morphological patterns over a wide range of scales. Many of these can not be related to variations in the forcing of the system, nor can they be historical relicts. Analyses of mathematical models of these interactions have revealed that pattern formation is inherent to these systems and robust to the natural variability of conditions. It turns out that largely the same methodology can be used for the analysis of fluvial, estuarine, littoral and marine forms. The scope of the Colloquium will therefore be the linear and non-linear analysis of morphological patterns in alluvial systems.

396. *Vortical structures in rotating and stratified fluids*

Prof. R. Verzico, Dipartimento di Meccanica e Aeronautica,
Via Eudossiana 18, 00184 Roma, Italy.
E-mail: verzico@orlandisun.ing.uniroma1.it
Prof. G.J.F. van Heist, Eindhoven.
22-25 June 1999, Cortona, Italy.

This Colloquium follows on from EUROMECH 305 also held in Cortona in 1993. The effects of rotation and/or stratification on the dynamics of vortices are of great interest to scientists because of their important role in many practical and geophysical applications. The aim of the Colloquium is to bring together specialists in this subject from Mathematics, Physics and Engineering to promote discussion among people working on this subject and to exchange their ideas.

The colloquium is focused mainly on basic studies rather than applications. The intent is to understand new phenomenological aspects of vortical structures through the comparison of experimental, numerical and theoretical results for the following topics: vortex stability and vortex interactions; geophysical vortices; the effect of rotation and stratification on shear flows and turbulence; wave-vortex interactions; vortices near interfaces (including rigid walls and free surfaces); topographic effects and mixing and dispersion.

397. *Impact in mechanical systems*

Dr. B. Brogliato, Laboratoire d'Automatique de Grenoble,
UMR CNRS-INPG 5528, ENSIEG, BP 46, Domaine Universitaire,
38402 Saint Martin d'Hères, France.
E-mail: Bernard.Brogliato@lag.ensieg.inpg.fr
Prof. W. Stronge, Cambridge.
30 June – 2 July, Grenoble (LAG), France.

The aim of the symposium is to bring together scientists, from both the Mechanical Engineering and the Robotics-Systems-Control fields, in order to exchange new ideas and information on problems relating to modelling and control of impacting systems. Applied mathematicians dealing with well-posedness problems in dynamic systems with unilateral constraints and dry friction are also welcome. Junior people are encouraged to participate in the meeting.

Topics include: modelling of multiple impacts in mechanisms; analysis of constrained collisions; development of friction in a finite contact area; wave theory for distributed colliding elements; analytical tools for feedback control and stability of robotic and manipulation systems with impacts; system theory analysis of systems with unilateral constraints and dry friction; numerical simulation software for rough impacting mechanical systems; experimental verification of impact theories; granular materials.

398. *Fluid-structure interaction in ocean engineering*

Prof. E. Kreuzer, Meeresstechnik II – Mechanik, Technische Universität
Hamburg-Harburg, Eissendorfer Straße 42, 21073 Hamburg, Germany.
E-mail: kreuzer@tu-harburg.de
Prof. O von Estorff.
11-15 October 1999, Hamburg, Germany.

The evolution of gravity driven water waves interacting with fixed or freely floating objects is an important field of research in ocean engineering. In many cases it is sufficient to linearise the free surface conditions and solve the linear problem. In ocean engineering there are often situations, however, where linearisation can not be justified and other techniques must be developed. Moreover, marine structures often have to be modelled as multibody systems rather than as a single body. This causes additional problems due to wave slamming on floating and fixed structures.

Typically, problems such as

- the coupled structural behaviour of submerged or floating systems (e.g. offshore structures, ships, underwater robots and pipelines)
- the excitation of a structure by the water (e.g. due to gravity waves or earthquakes)

have to be considered. The proper design of offshore systems must also take into account the various wind effects involved.

This meeting will concentrate on: coupled structural behaviour; fluid loading on structures; behaviour of floating systems; underwater robotics.

The objective of this Colloquium is to discuss new analytical, numerical and experimental concepts and methodologies which can be applied to this class of problems.

399. Cancelled.

400. *Impact & damage tolerance modelling of composite laminates & structures*

Dr. C. Soutis, Imperial College, London SW7 2BY, UK.
E-Mail: c.soutis@ic.ac.uk
Prof. G.A.O. Davies, Imperial College, Dr. J. Wiggemraad, NLR.
26-29 September 1999, London, UK.

Current design practice, largely based on traditional empirical methods, is not well suited to a cost-conscious economic climate. One way forward is to use the predictive power of modelling to tailor composite properties and behaviour from material conception to component obsolescence. Design that relies on empirical methods is slow. One reason is the general lack of recognition of the role of a "size scale" in the total design process; the absence of transmission of information and knowledge from ply to laminate to component. Understanding behaviour at different levels of size requires different characterisation methods for modelling