

DYMAT News

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Dear colleagues,

I said in the last DYMAT News that a large number of things must be done to improve the image of the Association and to offer new services to the members of the Association. As promised, the members of the Governing Board began quickly to work on this matter. A few months later, several actions have been achieved or are in progress, others require some more time for careful consideration: they will start later.

The Board firstly constituted a small group (5 persons) in charge of the publication of DYMAT News. This "**editorial staff**" is very efficient. As expected, it appears now that we will really be able to publish 3 issues a year. But remember that the aim of this paper is mainly to present the life of the Association: so, every member of DYMAT, from any country, may propose articles and I encourage each of you to send us suggestions at our e-mail address. In the same idea, a **new flyer** for presentation of the DYMAT Association has been printed: this information flyer is placed at your disposal to be distributed in the events you are attending. On all occasions don't hesitate to be a "DYMAT messenger" by giving publicity for our Association.

Obviously, the DYMAT **web site** (<http://www.dymat.org>) needed to be updated. We started its renovation and we hope that the new version will be operating by July.

In April, a **new "Subgroup"** was born, with the objective of working on recommendations and standardization of dynamic tests. Bradley Dodd chairs this international committee which is presented briefly on page 3. Moreover, the **first workshop** on "Industrial Dynamic Processes" will be organized in November by the University of Metz (LPMM) with the support of DYMAT (see page 5). The following meetings would be held in Poland (2008 – Poznan University of Technology) and Spain (2009 – University Carlos III of Madrid).

I would like to conclude with some words on the Technical Meeting organized on September by Stephen Walley at Cambridge University. There is no doubt that this meeting will be successful, but beyond the scientific interest, don't forget that it will also be an opportunity to hold the **General Assembly** of DYMAT. The General Assembly is an important time in the life of our Association. The activities of the Board during the past year will be reported, future actions will be presented, and the financial balance will be drawn up. Lastly, the members of the DYMAT Association will elect half of the members of the Governing Board. Even though everyone may contact the Association through our e-mail address, the General Assembly is a privileged meeting where each member can express directly his own opinions and exchange ideas with the Board. Lastly, we are now looking at a new version of the **statutes of the Association**. Since 1991, the year when DYMAT became a European Association, the statutes have never been changed: on several points, they are not in agreement with the current organization and they have to be updated. If the work is going forward quickly, one can expect to be able to propose the new statutes at the Cambridge Technical Meeting, for discussion and a vote by an Extraordinary General Assembly which must gather minimum 25 % of the DYMAT members to be valid. For these reasons I call all DYMAT members to do their best to attend the General Assembly or, if not possible, to send proxies for voting: you will receive further information by August. Of course, only the members who have paid their annual subscription to DYMAT can vote. Thus, thank you to paying the membership fee for 2007!

Looking forward to meeting you at Cambridge,

Sincerely yours,

Richard Dorneval



■ DYMAT FLYER

A new flyer has recently been printed to present general information on the DYMAT Association.

If you wish to get copies, please contact

enquiries@dymat.org

DYMAT Association

CEA Centre de Valduc – 21120 Is-sur-Tille (France)
<http://www.dymat.org> – e-mail : enquiries@dymat.org



→ LIFE OF THE ASSOCIATION

■ LIGHT WEIGHT ARMOUR GROUP WORKSHOP

The LWA Group is one of the subgroups supported by DYMAT. The present board is constituted as follows:

- President: Erhardt Lach (ISL, France)
- Vice-President: Filipe Teixeira-Dias (Univ. Aveiro, Portugal)
- Secretary: Stephen Walley (Univ. Cambridge, UK)
- Former President: Bradley Dodd (Oxford, UK)



SAINT-GOBAIN CERAMICS

5th LWAG Annual Workshop

October 5, 2007

Saint-Gobain IndustrieKeramik,
Rödental Hall "Ceramicum", Coburg, Germany

Local Organization: Christine Wagner
Klaus Steuer

Contact: christine.wagner@saint-gobain.com

Saint-Gobain IndustrieKeramik Rödental GmbH
Postfach 11 44
D-96466 Rödental - Germany

Please also send your confirmation of attendance to Bradley Dodd at:

bradley.dodd@gmail.com

■ REMEMBER

Registration is open for the

17th DYMAT TECHNICAL MEETING

which will be held at Cavendish Laboratory, Cambridge (UK), on September 6-7, 2007. The topic is:

"The High Rate Mechanical Properties of Energetic Materials, their Binders or Simulants"

For requests concerning this meeting, please contact:

Stephen M. Walley
dymat@phy.cam.ac.uk

We remind you that this technical meeting will offer also the opportunity for holding the annual **General Assembly** of the Association. If you cannot attend this meeting, don't forget to send a proxy.

You will receive further information in August.

■ NEW WORKSHOP

Constitutive Relations and Numerical Simulation of Industrial Dynamic Processes

University of Metz (France) – November 2007



Laboratory of Physics
and Mechanics of Materials

SEE PAGE 5



■ CALL FOR MEMBERSHIP FEES

Did you pay your membership fee to the DYMAT Association for 2007?

Please find below the amounts for the two types of membership fee (one year or three years):

- Membership fee for 2007 only: **40 €**
- Membership fee for the period 2007-2008-2009: **100 €**

Payable

- by cheque to the order of Association DYMAT, sent to :
DYMAT, CEA Valduc – 21120 Is-sur-Tille (France)

- or bank transfer in Euros to:

ASSOCIATION DYMAT
BNP : 91120PALAISEAU (France)
IBAN: FR76 3000 4003 1400 0023 5892 360
BIC: BNPAFRPPMAS

If you have any questions or if you are a new member do not hesitate to contact us at:

al.dymat@wanadoo.fr

→ DYMAT SUBGROUPS

■ COLLOQUIUM « TRANSPORT SECURITY »

to Improve the Performance of Passive Security
System of our Transport Equipment

Safety in transport is a problem which concerns us all:- the ordinary citizen who uses daily some means of transport (car, bus, airplane...), companies who develop systems of transport which are increasingly secure (for cars with complex systems of active or passive safety, complex piloting systems for aircraft...), researchers who propose materials and structures to protect pedestrians and passengers, official organizations who recommend rules to improve flow and safety of the networks of transport....

There is an interaction between Man and Machine in Transport (the Transport Means). It is thus natural that, in the field of transport safety, several themes interact and develop into parallel or joint technologies, processes and methods aimed at improving safety of goods and passengers. In fact, these scientific activities – guided however by the same objective, interact rarely and seldom communicate with each other on what are common problems

In Materials Science, research topics such as the study of the durability of materials and the structures take part implicitly in the improvement of transport safety. In such cases, the problems are numerous: that it is the identification of the material behaviour (composite or metal) under severe tests (impact, shock), the definition of new dampers to absorb the shock energy or the study of the durability of structures under cyclic testing (in fatigue). In another theme, biomechanics, models of a vehicle passenger or a pedestrian (taking into account variations in morphology, geometrical complexity, behaviour of the various bodies, their acceptable kinematics ...) belong to a large amount of developmental work. The development of a numerical model soon will make it possible to understand, anticipate and reduce the body injuries.

However, during an accident, it is precisely the Man-Machine interaction which it is necessary to control and understand. So, the new developments in the knowledge of the behaviour of transport structures and the new physical model of the human body have to be taken into account jointly in any new crash model.

The LAMEFIP - Laboratory (ENSAM, Bordeaux, France) organized on October 11, 12 and 13, 2006 a second colloquium concerning transport safety, in collaboration with the DYMAT Association (to constitute a new subgroup "crash and transport safety" of DYMAT) together with other scientific associations such as SB, AMAC ST2. The objective of the congress was to present the objectives, the results and the advances of the research of the industrial workgroup for the design of more dependable means of transport but also the research efforts in the science of materials and shock biomechanics. These three days were the occasion for scientific exchanges between scientists and researchers from industrial (by posters and a scientific conference), all concerned with this set of themes and in the various branches of industry that it is in car, aeronautics, railway or the naval sciences.

Four invited presentations were presented: Concerning mechanical research, François Moussy – RENAULT S.A. – spoke about the behaviour law for model impacts and André Chabotier – RMA- presented the development of a new pyrotechnic apparatus to simulate bird impacts on aeronautics structures. Concerning biomechanics and shock, Jean-Pierre Verriest – INRETS- developed the research challenge in biomechanics to improve the protection of transport passengers and Hervé Guillemot – LAB- discussed the research work of automotive industries transport security. Thirty presentations were made in mixed industrial aspects and preoccupations (SNPE, Hispano-Suiza, Thales Avionics, Esquad, LAB PSA RENAULT) and research developed in laboratories (LPMM, LAMIH, IMFS, LBMH, LMT, LAMEFIP, LG2M, INRETS). Abstracts of the proceedings were published and articles associated with some of these presentations were submitted to the International Journal Of Crashworthiness.



These multi-field discussions can improve research in transport safety. During the conference, researchers on these scientific themes met and presented the state of the art in their fields. And even if the vocabulary is sometimes different, these profitable meetings make it possible to have and exchange investigations.

Philippe Viot

philippe.viot@lamef.bordeaux.ensam.fr

■ RECOMMENDATIONS AND STANDARDS

It was agreed at the last Governing Board Meeting in Cambridge (March 2007) to begin a Recommendations and Standards Committee. DYMAT are working jointly with the Chinese Academy of Science and the Japan Society for the Technology of Plasticity on this.

We are going to investigate standardizing dynamic tests (as far as possible), such as those carried out with a SHPB. Also we will eventually be looking at the Plate Impact and the Taylor Test.

The DYMAT group have decided to begin by considering the Hopkinson bar compression test on ductile and brittle metal cylinders because these are amongst the most common tests used. It surprises us that, in a test that has been used for many decades, no international standardisation of, for example cylindrical metal test specimen aspect ratio and lubrication, is used. The quasi-static testing field investigated these variables many years ago and now there are standard tests specified.

There are about four of us in the DYMAT committee. If you should wish to make any comments on this work that you think may be helpful to the overall aim of the Group, please contact me

Bradley Dodd

brad@thinweb.com

→ THESES and BOOKS

■ RECENT THESES

Most of the abstracts of these theses are available on the DYMAT web site.

David Fernández Fernández (dfernand@ing.uc3m.es)

"Development of a new tool based in neural networks for the design of lightweight ceramic/metal armours against high velocity impact",
Universidad Carlos III de Madrid (Spain), 2007

Guadalupe Vadillo Martín (gvadillo@ing.uc3m.es)

"Models of ductile fracture in static and dynamic conditions",
Universidad Carlos III de Madrid (Spain), 2007

Carlos Santiuste Romero (csantius@ing.uc3m.es)

"Analysis and modelisation of composite beams subjected to impulsive loads",
Universidad Carlos III de Madrid (Spain), 2007

M. Apostol (contact: veli-tapani.kuokkala@tut.fi)

"Strain rate and temperature dependence of the compression behaviour of fcc and bcc metals - Development of experimental techniques and their application to materials modelling",
Tampere University of Technology (FIN), 2007

Carys Eleri Lloyd (contact: smw14@cam.ac.uk)

"The dynamic response of piezoelectric sensors",
Cambridge University (UK), 2007

Audrey Dubrulle-Hault

(contact: eric.markiewicz@univ-valenciennes.fr)

"Contribution to the improvement in the knowledge of fluid/structure interaction phenomena inside the skull subjected to dynamic loadings",
University of Valenciennes (F), 2007

Pierre Mahelle

(contact: eric.markiewicz@univ-valenciennes.fr)

"Contribution to the experimental and numerical characterization of welded pieces subjected to dynamic loadings",
University of Valenciennes (F), 2007

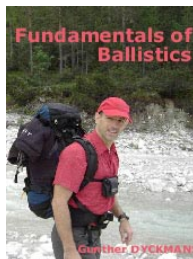
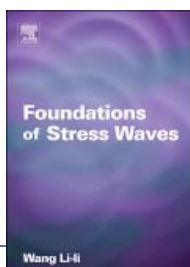
■ BOOK INFORMATION

■ Foundations of Stress Waves

by Lili Wang, Ningbo University, China
Elsevier – www.elsevier.com

The primary objective of this work is to give the reader an understanding of stress wave behaviour while taking into account the dynamic constitutive equations of elastic-plastic solids. The author has combined a 'materials characteristics' approach with a 'singularity surface' approach in this work, which readers will find to be a novel and unique route to solving their problems.

Audience: engineers and researchers studying impact engineering, non-destructive testing and evaluation, earthquake engineering, and other areas related to stress waves.



■ Fundamental of ballistics

by Gunther Dyckmans

<http://users.telenet.be/gd/ballistic.htm>

Welcome to the **e-book on Ballistics**.

Ballistics is a science. It essentially deals with phenomena related to the propulsion of a projectile from a firearm (internal ballistics), the flight of the projectile through the atmosphere (external ballistics) and the arrival of the projectile at its target (terminal ballistics). Each of these phenomena is treated in detail in this e-book steadily updated by the author, Gunther Dyckmans.

Gunther is Lieutenant Colonel within the Belgian Defence Forces and is currently working as a professor in the department of weapon systems and ballistics at the Royal Military Academy of Belgium. He is also vice-President of the DYMAT Association and chairman of the next EURODYMAT International Conference, planned at Brussels in 2009.

■ History of Shock Waves, Explosions and Impact

A Chronological and Biographical Reference

by Krehl, Peter O.K.

Springer 2007 – www.springer.com

This unique and encyclopedic reference work charts the evolution of the physics of shock waves and detonations from the earliest investigations into percussion right up to the most recent groundbreaking research in the field.

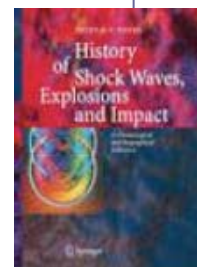
The history of this long and complex process is first reviewed in a general survey that encompasses everything from the earliest observations and interpretations of puzzling high-rate dynamic phenomena associated with natural and man-made explosions to a discussion of the merits of modern numerical computer simulations.

The subject is then treated in more detail and in chronological order in the central section of the book, while also being richly illustrated in form of a picture gallery. The bibliographic index provides 122 short biographies of eminent researchers who have contributed to the field. Further references for biographical sources are given, and both name and subject indices (with over 4400 and 2500 entries, respectively) are provided.

"This book is of tremendous value to all who teach, research or write about the subject or, simply, are inquisitive about the people whose names appear in the text or bibliographies. The whole community is indebted to Peter Krehl for what has clearly been a labour of love and for what must surely become the "bible" of shock waves, explosives and impact" Professor John E. Field, FRS, Cavendish Laboratory, University of Cambridge.

Audience:

Everyone professionally interested in shock wave phenomena.



→ CONFERENCES and WORKSHOPS

■ INTERNATIONAL CONFERENCES*

✓ ICEM 13

"International Conference on Experimental Mechanics"
ALEXANDROUPOLIS (Greece) – July 1-6, 2007
www.icem13.gr

✓ "21st International Colloquium on the Dynamics of Explosions and Reactive Systems"
POITIERS (France) – July 23-27, 2007
www.icders2007-poitiers.org

✓ IMPLAST'07

"9th International Symposium on Plasticity and Impact Mechanics"
BOCHUM (Germany) – August 21-24, 2007
www.tm.bi.rub.de/implast07

✓ PROTECT 2007

"Performance, Protection & Strengthening of Structures under Extreme Loading" (1st International workshop)
WHISTLER (Canada) – August 20-22, 2007
www.civil.ubc.ca/protect2007

✓ IWCM17

"17th International Workshop on Computational Mechanics of Materials"
PARIS (France) – August 22-24, 2007
www.iwcm17.ensmp.fr

✓ DYMAT - 17th Technical Meeting

"The High Rate Mechanical Properties of Energetic Materials, their Binders or Simulants"
CAMBRIDGE (UK) – September 6-7, 2007
www.dymat.org

✓ ATEM' 07

"International Conference on Advanced Technology in Experimental Mechanics 2007"
FUKUOKA (Japan) – September 12-14, 2007
www.congre.co.jp/atem07/

✓ "Sixth Int. Symp. on Impact Engineering"

DAEJON (Korea) – September 16- 19, 2007
www.isie2007.org

✓ HVIS

"Hypervelocity Impact Symposium"
WILLIAMSBURG (USA) – September 23-27, 2007
www.hvis.org

✓ "2007 International Autumn Seminar on Propellants, Explosives and Pyrotechnics"

XI'AN (China) – October 23-25, 2007
www.iaspep.com.cn

✓ ICMEM 2007

"International Conference on Mechanical Engineering and Mechanics"
WUXI (China) – November 5-7, 2007
<http://www.icmem.org>

✓ HSIMP

"High Speed Industrial Manufacturing Processes"
SENLIS (France) – November 13 -15, 2007
www.hsimp.com

✓ Workshop on "Constitutive relations and numerical simulation of industrial dynamic processes"

METZ (France) – November 2007
rusinek@lpmm.sciences.univ-metz.fr

✓ "6th International Conference on Mechanics of Time-Dependent Materials"

MONTEREY (USA) – March 30 - April 1, 2008
www.ae.utexas.edu/MTDM08/

✓ "15th International Conference on Textures of Materials"

PITTSBURGH (USA) – June 1-5, 2008
www.ceramics.org/ICOTOM15

✓ "14th International Symposium on Electromagnetic Launch Technology"

VICTORIA, British Columbia (USA) – June 10-13, 2008
www.emlsymposium.org

✓ "Gordon Research Conference on Energetic Materials"

TILTON, New Hampshire (USA) – June 15-20, 2008
www.grc.org

✓ PHOTOMECHANICS 2008

"International conference on full-field measurement techniques and their applications in experimental solid mechanics"
LOUGHBOROUGH (UK) – July 7-9, 2008
www.lboro.ac.uk/photomechanics

** in red letters are new announcements with respect to the last DYMAT News*

■ WORKSHOP on "Constitutive Relations and Numerical Simulation of Industrial Dynamic Processes" – University of Metz (France) – November 2007

The goal of this Workshop is to present and discuss different modelling approaches in the field of the dynamic behavior of materials. An important objective is to consider original constitutive relations which are suitable for Finite Element codes to simulate dynamic processes related to engineering applications.

The workshop will cover both theoretical modelling of the mechanical behaviour of materials at high strain rates and numerical simulations of fast processes. There will be four main sessions:

1. Constitutive relations
2. Numerical simulations
 - a - Dynamic cutting
 - b - Crash-box behaviour
 - c - Dynamic forming
 - d - Drilling, grinding, milling
 - e - Special processes
3. Experimental verifications
4. State of art in industry and their needs

with the support
of DYMAT

contact

rusinek@lpmm.sciences.univ-metz.fr



→ LABS

■ THE INSTITUTE OF MATERIALS SCIENCE - TAMPERE UNIVERSITY OF TECHNOLOGY

by Veli-Tapani Kuukkala

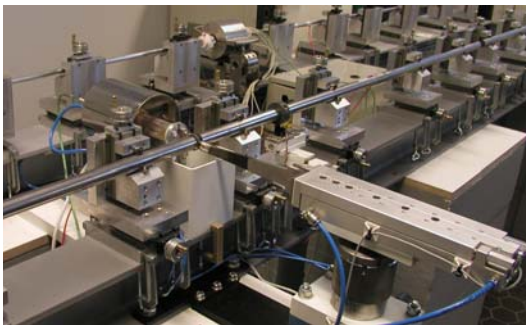
veli-tapani.kuukkala@tut.fi

The Institute of Materials Science (IMS) is one of the biggest research and teaching units at Tampere University of Technology (TUT). The Institute is divided into five laboratories:

- Materials Characterization,
- Metallic Materials,
- Ceramic Materials,
- Coatings,
- Plastic Materials

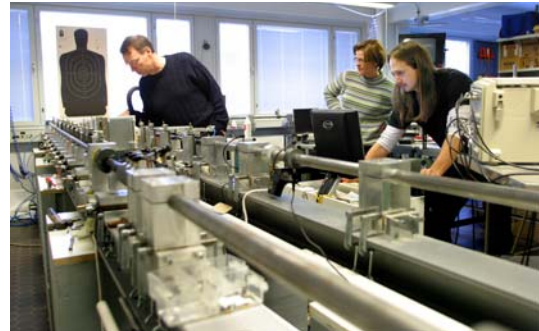
each of which concentrates on their respective materials and research areas. The high strain rate research group, consisting currently of about ten researchers, is part of the Laboratory of Materials Characterization.

Close-up of the high/low temperature compression HSB set-up.



Most of the high strain rate research at IMS/TUT is conducted with Hopkinson Split Bar devices. At IMS, there are currently three HSB systems, two for compression testing and one for tensile testing of sheet metals. Both compression and tensile HSB devices are equipped with high/low temperature systems, allowing experiments in the temperature range of $-160\text{ }^{\circ}\text{C}$ to $1000\text{ }^{\circ}\text{C}$ in compression and $-120\text{ }^{\circ}\text{C}$ to $250\text{ }^{\circ}\text{C}$ in tension.

The compression Hopkinson Split Bar devices at IMS/TUT.

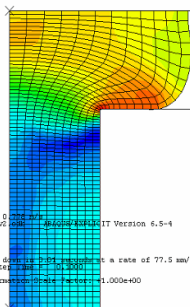
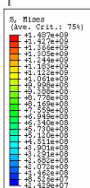


Some of the research projects currently being conducted in the high strain rate research group at IMS/TUT are:

- Development of the composition, microstructure, and properties of ultra-ductile high strength steels
- Time dependent deformation of polymer matrix composites
- Modeling of the plastic deformation in metals and alloys at high strain rates and at elevated temperatures
- Dynamic properties of steels and modeling and simulation of high rate deformation processes
- Mechanical properties and behavior of nanocrystalline metals and alloys
- High strain rate tensile behavior of TRIP and TWIP steels
- Effects of composition and heat treatments on the dynamic behavior of TRIP steels



Tensile HSB for sheet metals at IMS/TUT



Modeling of the cold heading process

Tampere University of Technology - Institute of Materials Science

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<http://www.tut.fi/matchar>