# iacm expressions

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# contents

# editorial

In my first message as the newly elected President of IACM I want to start these lines by thanking the former IACM President, Prof. Tom Hughes, by his dedication and successful efforts to increase the number of prestigious activities of IACM worldwide.

Indeed the field of Computational Mechanics seems to be a rare exception in this strange kind of recession we are living in some other sectors. The IACM V World Congress in Computational Mechanics (WCCM V) held in Vienna last July was a landmark, both in the number of near 1500 attendants from 57 countries and in the high quality of the scientific papers. Much of the success was undoubtedly due to the excellent work carried out by the Congress organisers: Profs. H. Mang, F. Rammerstorfer and J. Eberhardsteiner and their team. In any case, I believe that WCCM V confirmed that we are moving in the direction of a growing academic and industrial community in Computational Mechanics.

Other similar signs are the number of activities in the field of computational mechanics in the form of conferences, workshops, etc. to be held in the next twelve months. Some 14 different scientific events organised by IACM affiliated organisations over the world are so far scheduled for 2003. Over 5000 attendants are expected to take part in these meetings; a figure which duplicates the current IACM membership (!).

These facts could be the opportunity to open an interesting debate over the actual size of the computational mechanics community and the excessive or insufficient number of conferences in the field. Both questions are of particular interest in order to design future IACM activities. Indeed the IACM Executive Council has taken a positive view on both issues when it decided last year to change the periodicity of the World Congress of Computational Mechanics to a two years interval. By the way, please put in your Diary that the next WCCM VI will take place in Beijing on  September 5-10, 2004.

My personal view is that the expansion of computational methods in all areas in science and engineering, together with the growing activity of IACM affiliated organisations at national and regional levels is leading to a change of scale in the number and size of academic and industrially oriented events worldwide. This is naturally balanced by the increase in the number of persons actively involved in research, development and application of computational methods. The time has probably come for the statistical analysis of the overall activity in the field of computational mechanics in an effort to quantify the extent of the on-going activities and clarify the potential for new ones.

In the meantime I invite you to take part in at least one of the many events organised by the IACM affiliated organisations in 2003 over the world. The success of these initiatives will be the best proof that we are moving in the right  direction.

Eugenio Oñate
President of IACM

# Combining Machine Power and Expertise -

## Research in Computational Science and Engineering in the
# Institute of High Performance Computing, Singapore

by
**Heow Phew Lee**
*Institute of High
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Computing
Singapore*

The Institute of High Performance Computing (IHPC) is a National Research Institute under the Agency for Science, Technology and Research (A*STAR) in Singapore. It was established in 1998 to enhance Singapore's global competitiveness through the innovative research and manpower development in leading edge computational science and engineering for modelling, simulation and visualisation. The Institute develops and promotes the application of high performance

***IHPC's key technological areas include the following:***

*Computational Chemistry*
*Computational Electromagnetics &
Electronics*
*Computational Fluid Dynamics*
*Computational Mechanics*
*Computational MEMS*
*Defence Systems*
*High-End Computing*



*Figure 1:
Domain
decomposition of
the bubble
surface mesh*

> " *... to enhance ...
> global
> competitiveness
> through the
> innovative research
> and manpower
> development in
> leading edge
> computational
> science and
> engineering for
> modelling,
> simulation and
> visualisation.* "

computing (HPC) technologies, and undertakes research and development work in computational science and engineering (CSE) fields that are of strategic importance and relevance to Singapore's economy.

Currently IHPC has a staff strength of more than 150 researchers and engineers with 61% holding Doctorates and 31% with Master degrees. The IHPC team, together with affiliated academic staff from the National University of Singapore (NUS) and the Nanyang Technological University (NTU), embarks on CSE research across a broad range of disciplines.

## Highlights Research Projects undertaken by IHPC:

### Interfacial Flow Modelling

IHPC has successfully developed a front tracking/finite difference method to simulate a wide range of interfacial flows. The method is based on solving a single set of Navier-Stokes equations for the whole computational domain by treating the different phases as one fluid with non-homogeneous material properties.

In addition, the team has developed an unstructured mesh adaptation/smoothing system for the interfacial front using a Laplacian smoothing algorithm, as well as a domain decomposition technique to parallelise the mesher and solver modules of the code.

### Modelling the Growth of Low-Dimensional Quantum Structures

Some of IHPC's developments in the area of quantum dots include the development of an in-house finite element software to model the growth of quantum dot structures, and analysis of the vertical alignment and stacking schemes of quantum dots. This software has also been used to study the effect of elastic anisotropy of substrates and thin film on quantum dot formation and arrangement.

Currently, the research team is developing a continuum modelling framework to establish the relationship between the properties of semiconductor materials and the fabrication processes, along with a study of the dominant mechanisms affecting the heteroepitaxial growth processes.

### Virtual Engineering System for the Manufacturing Industry

This project, with Molex Singapore, has led to the development of a knowledge-based rapid virtual engineering system, which is capable of capturing engineers' knowledge on the design and development of dies and moulds, and retaining such knowledge in a computer. The invention has resulted in a high degree of design automation, as design activities that previously required human input, can now be automated. The core functions of the system are that it is capable of: representing engineering data and information in different formats in a single, controlled environment; finding a mechanism to organise tooling design knowledge, along with the use of templates to capture different characteristics of various types of design objects; and customising knowledge to meet specific requirements and standards.

*" ... capable of capturing engineers' knowledge on the design and development of dies and moulds, and retaining such knowledge in a computer."*



$t^*=9.39$    (a)

$t^*=12.1$    (b)

$t^*=14.38$    (c)

$t^*=22.13$    (d)
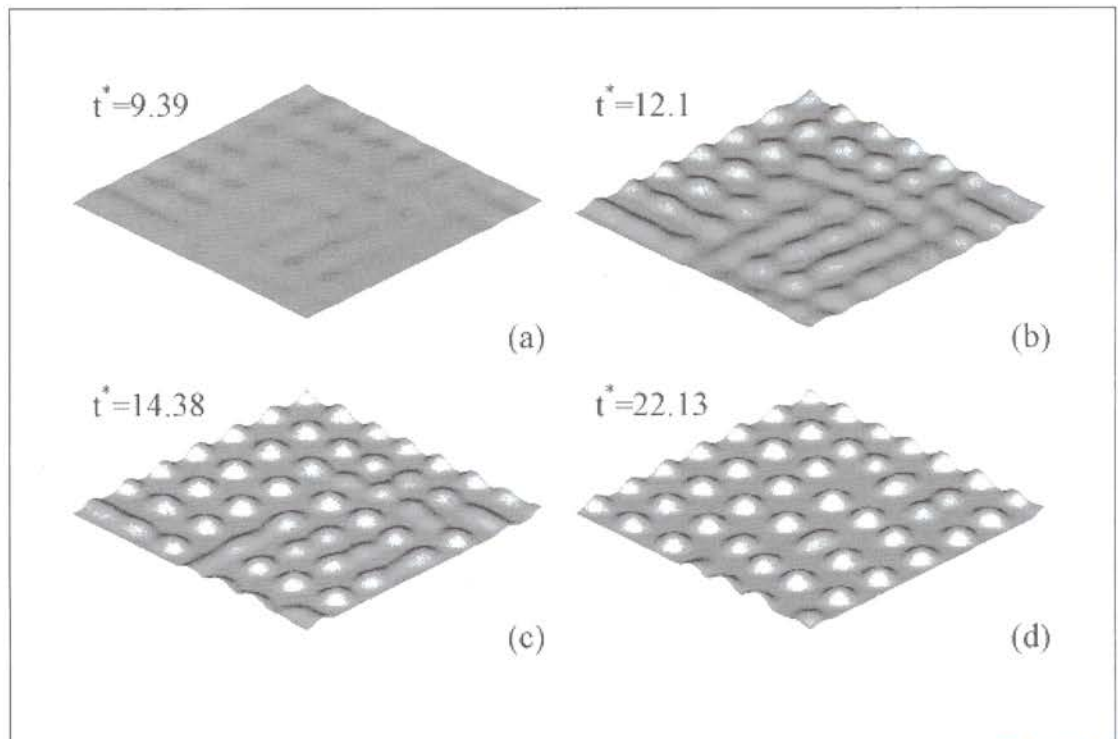
*Figure 2:*
*Effects of elastic anisotropy strength on surface evolution*
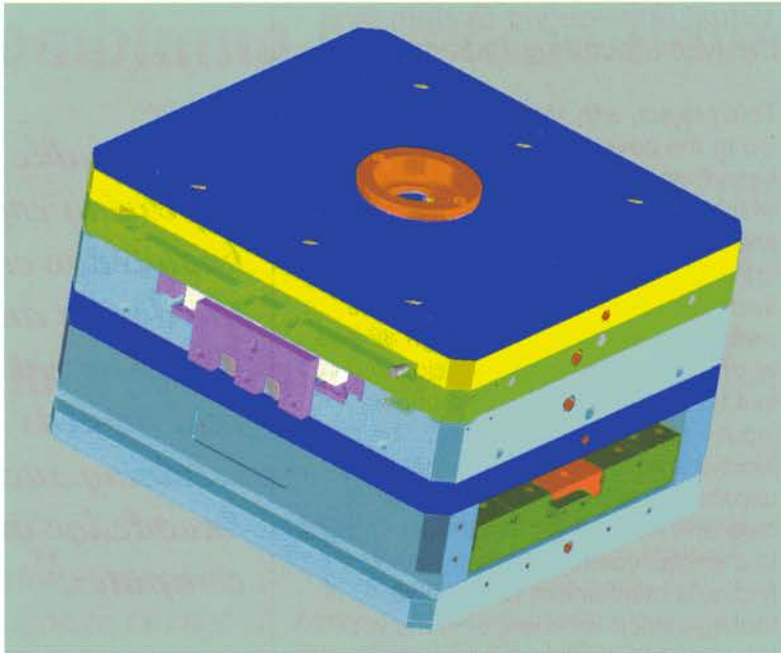
**Figure 3:**
*Simulation of mould assembly*

The research also shows that bio-molecules stretch, compress, tumble and migrate as they pass through the slit. The extent of molecular stretching is at its longest near the wall surface and shortest or coiled in the center part of the slit. Furthermore, it is found that the depletion effect of the walls on the concentrated distribution becomes very pronounced in a narrow slit. Even in the central region, the concentration is always non-uniform.

## Bubble-Structure Interaction

To understand how structures such as ships and submarines are affected in an underwater explosion, a project was initiated by IHPC to study the effects of bubble-structure interactions. The focus was to couple PAMCRASH (a code that is also used for simulating car crashes) and BUBBLE (a code developed in-house) to perform the necessary simulations. PAMCRASH simulates the structural response while the BUBBLE code models the corresponding fluid loading.

## Design of lead-free solders

To combat the harmful effects of lead on human health and the environment, IHPC undertook a project to identify suitable substances for 63Sn/37Pb alloy for the electronics industry. The acceptable substitute alloy was to possess properties similar to the Sn-Pb solder: a melting point of about 183 degree Celsius and similar thermo-chemical and mechanical properties.

New techniques using thermodynamics and quantum calculation methods were developed to compute the thermochemical and mechanical properties of alloys.

*"Results of the slit-flow simulation show that velocity profiles can be fitted into power-law curves..."*

## Simulation of Bio-Molecular Suspension Flow through Micro Channels in BioMEMS Devices

MEMS researchers at IHPC have successfully applied dissipative particle dynamics (DPD) to simulate bio-molecular suspension flow through microchannels. This is accomplished by using simple DPD particles to model the solvent, and finite extendable non-linear elastic (FENE) chains to model the bio-molecules. Results of the slit-flow simulation show that velocity profiles can be fitted into power-law curves, indicating that the suspension becomes non-Newtonian with shear thinning.



$t = 2000, \phi = 0.107$
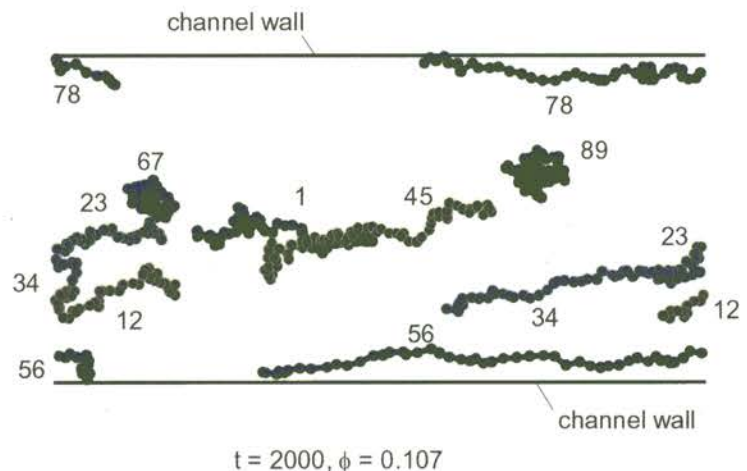
**Figure 4:**
*The conformation of some typical macromolecules in fully developed slit-flow*

Extensive research and evaluation were performed using the supercomputers at IHPC on all possible combinations of the tin-rich ternary compositions, which eventually led to the selection of two tin-rich ternary alloys as viable alternatives to the existing lead-based solder.

## Nurturing Computational Talents for the Nation

At IHPC, manpower development and training is a major focus and the Institute is active and fervently seeks to train and build a critical pool of CSE researchers for the knowledge-based economy. The Institute has in place a comprehensive recruitment and manpower training programme.

Considerable resources have been devoted to train postgraduates in a diverse range of disciplines related to HPC.

Staff in IHPC are involved in the supervision of postgraduate students together with academic staff from either NUS or NTU. This enables the transfer of knowledge from the Institute's team of HPC expertise to young aspiring scientists and researchers. Since inception, IHPC has graduated more than 80 Masters and PhD students.

In addition, IHPC has been actively recruiting post-doctoral research fellows (PDRFs) not only to support the Institute's research, but also to supply the local companies with a steady pool of multidisciplinary computational scientists to be tapped on.

When these PDRFs are eventually spun off to the industry after the completion of their training, the industry will automatically become beneficiaries of a pool of highly qualified HPC scientists.

IHPC also plays a major role in the training of research scientists and engineers from industry through collaborations with local companies and other research organisations. The joint projects permit intellectual exchange and cross fertilisation of knowledge to fuel creativity and innovation.  ●
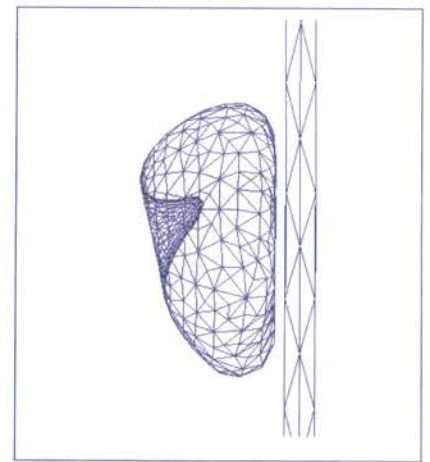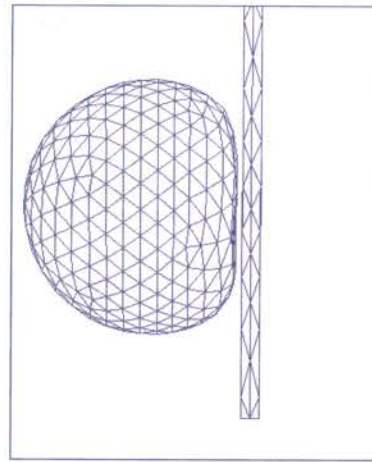


*Figure 5:*
*Interaction between a bubble and a nearby structure*

*Institute of High Performance Computing, Singapore*

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## International Conference on Scientific and Engineering Computation (IC-SEC)
### 3 to 5 December 2002
### @ Raffles City Convention Centre in Singapore

The inaugural IC-SEC 2002 aims to create a forum for engineers and scientists who are involved in the use of high performance computers, advanced numerical strategies, computational methods and simulation in various scientific and engineering disciplines. The conference will enable participants to present and discuss latest trends and findings or simply to learn about the state-of-the-art in their particular field/s of interest. Registration and other details on the conference can be found at the IC-SEC website at

www.ic-sec.ihpc.a-star.edu.sg.

# Moore´s Law
## and the Diminishing Importance of
# Parallel Computing

by

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School of
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George Mason
Univeristy
Failfax

*" ... massive parallelism seems the only possible way of solving the problem, ...."*

One of the most remarkable constants in a rapidly changing world has been the rate of growth for the number of transistors that are packaged onto a square inch. This rate, commonly know as Moore´s Law, is approximately a factor of 2 every 18 months, which translates into a factor of 10 every 5 years [8]. This rate, which governs the increase in computing speed and memory, has held constant for more than 3 decades, and there is no end in sight for the foreseeable future.

Let us consider the effects of Moore´s Law on the life-cycle of typical large-scale computational mechanics codes.

The life-cycle of these codes may be subdivided into the following stages:

- Conception;
- Demonstration / Proof of Concept;
- Production Code;
- Widesperad Use and Acceptance.

In the conceptual stage, the basic purpose of the code is defined, the physics to be simulated identified, proper algorithms are selected and coded. The demonstration stage consists of several large-scale runs that are compared to experiments or analytical solutions. A run during this stage may take weeks for months to complete. Once the basic code is shown to be useful, the code may be adopted for production runs. This implies extensive benchmarking for relevant applications, quality assurance, bookkeeping of versions, manuals, etc. If the code is successful and can provide a simulation capability not offered by competitors, the fourth phase, i.e. widespread use and acceptance, will follow naturally. For commercial codes, the third and fourth stages are sometimes referred to as industralization and market penetration respectively.

The time from conception to widespread use can span more than a decade. During this time, computing power will have increased a factor of 1:100. Moreover, during a decade, algorithmic advances and better coding will improve performance by at least another factor of 1:10. Let us consider the role of parallel computing in light of these advances.

During the demonstration stage, runs may take weeks or months to complete on the largest machine available at the time. This places heavy emphasis on parallelization. Given that optimal performance is key, and massive parallelism seems the only possible way of solving the problem, **distributed memory parallelism** on $O(10^3)$ processors is perhaps the only possible choice.



*Figure 1:*
*Gordon Moore*

**transistors**

MOORE'S LAW

- Pentium® 4 Processor — 100,000,000
- Pentium® III Processor
- Pentium® II Processor — 10,000,000
- Pentium® Processor
- 486™ DX Processor — 1,000,000
- 386™ Processor
- 286 — 100,000
- 8086
- 8080 — 10,000
- 8008
- 4004 — 1000

1970  1975  1980  1985  1990  1995  2000
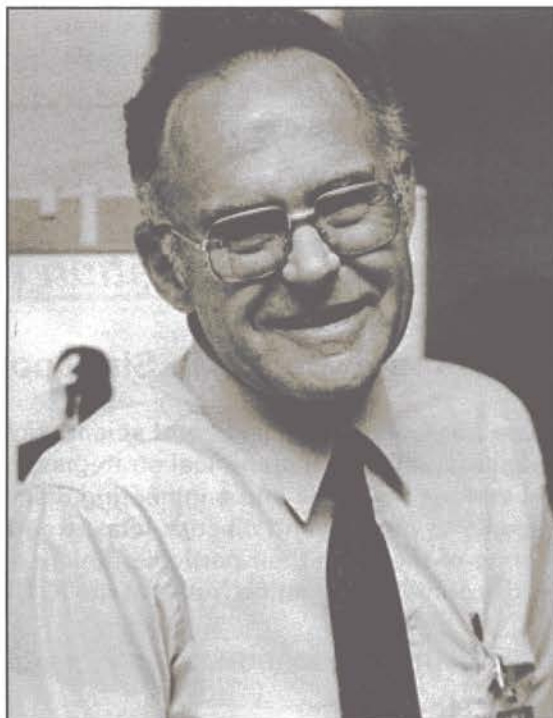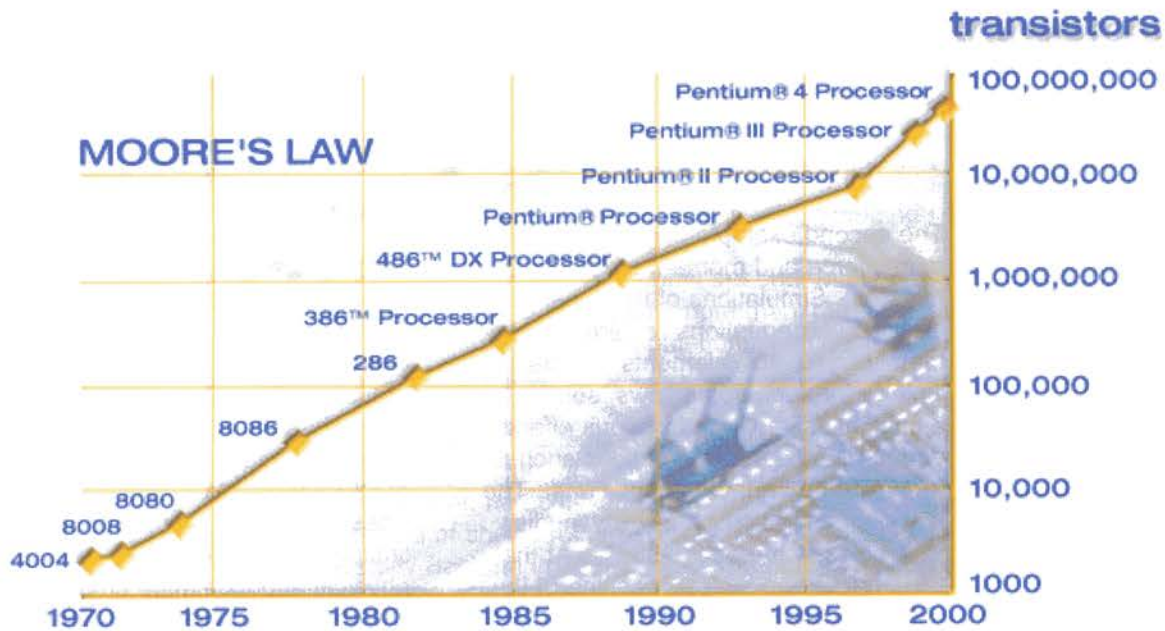
*Figure 2:*
*Moore´s Law for Intel CPU´s*

Once the code reaches production status, a shift in emphasis becomes apparent. More and more 'options' are demanded, and these have to be implemented in a timely manner. By this time, processors have become faster (and memory has increased) by a factor of 1:10, implying that the same run that used to take $O(10^3)$ processors can now be run on $O(10^2)$ processors. Given this relatively small number of processors, and the time constraints for new options/variants, **share memory parallelism** becomes the most attractive option.

Widespread acceptance only accentuates the emphasis ton quick implementation of options and user-specific demands. Widespread acceptance also implies that the code will no longer run exclusively on supercomputers, but will migrate to high end servers and ultimately personal computers. The code has now been in production for al least 5 years, implying that computing power has increased again by another factor of 1:10. The same run that used to take $O(10^3)$ processors in the demonstration stage can now be run using $O(10^1)$ processors, and soon will be within reach of $O(1)$ processors. Given that user-specific demands dominate this stage, and that the developers are now catering to large user base working mostly on low-end machines, **parallelization diminishes in importance**, even to the point of completely disappearing as an issue.

One could consider the 5the phase, 20 years into the like of the code. The code is run thousands of times per day, but each of these runs is part of a stochastic analysis or optimization loop, and is run on a commodity chip-based, uni-processor machine. Moore´s law has effectively **removed parallelism** from the code.

Let us show two examples where this cycle has become apparent.

**1. Crash Simulation**

The first example considers crash simulation code. A crash simulation will require approximately $O(10^5 - 10^6)$ elements, many material models, contact, and numerous specific options such as spot welds. Crash codes grew out of the DYNA3D impact-code legacy of Lawrence Livermore National Labs [1],[3]. The first demonstration /feasibility studies took place in the early 1980´s. At that time, it took the fastest machine of the day (CRAY-XMP) a night to compute a car crash. Several commercial codes were soon adopted in the car industry [4], and found their way into a large segment of consumer products (for droptests) by the mid 1990´s.

*" ... parallelization diminishes in importance, even to the point of completely disappearing ..."*

At present (mid-2002), crash simulations can be accomplished on a PC in a matter of hours, and are carried out by the hundreds on a daily basis for stochastic analysis on PC clusters.

## 2. External Missile Aerodynamics:

The second example considers aerodynamic force and moment prediction for missiles. Simulations of this type based on the Euler equations require approximately $O(10^6-10^7)$ elements, special limitors for supersonic flows, semi-empirical estimation of viscous effects, and numerous specific options such as transpiration boundary conditions. The first demonstration / feasibility studies took place in the early 1980's. At that time, it took the fastest machine of the day (CRAY-XMP) a night to compute such flows. The code used were based on structured grids [2], as the available memory was small compared tot he number of gridpoints. The increase of memory, together with the development of codes based on unstructured [6], [5] or adaptive Cartesian grids [7] allowed for a high degree of automation. Presently, external missiles aerodynamics can be accomplished on a PC in twenty minutes, and runs are carried out daily by the thousands for envelope scoping and simulator input on PC clusters.

The statement that parallel computing diminishes in importance as codes mature is predicted on two assumptions:

- The doubling of computing power every 18 months will continue;
- The total number of operations required to solve the class of problems the code was designed for has    an asymptotic (finite) value.

The second assumption may seem the most difficult to accept. After all, a natural side-effect of increased computing power has been the increase in problem size (grid points, material models, time of integration, etc.). However, for any class of problem there is an intrinsic limit for the problem size, given by the physical approximation employed. Beyond a certain point, the physical approximation does not yield any more information. Therefore, we may have to accept that parallel computing diminishes in importance as a code matures. ●

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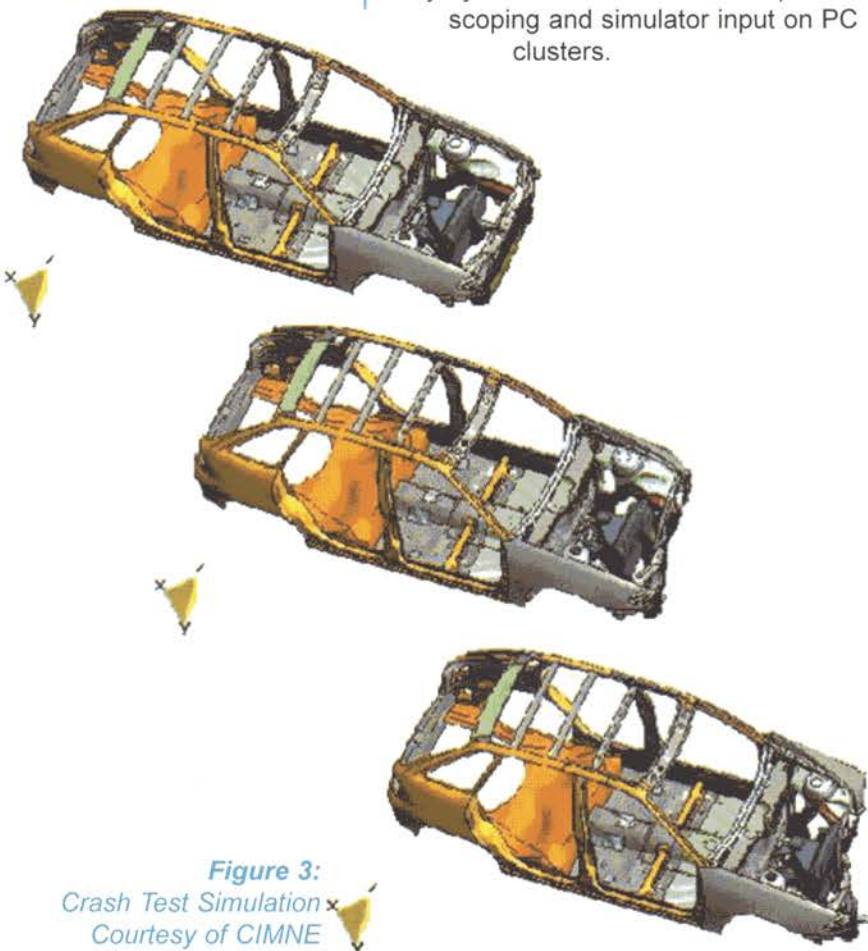
**Figure 3:**
*Crash Test Simulation*
*Courtesy of CIMNE*

## In Memory Of
## Prof. Dr.-Ing. Yavuz Basar

On August 30, 2002, our highly-esteemed colleauge, friend and mentor, Prof. Yavuz Basar, died suddenly and unexpectedly. He leaves behind his wife Emine and his two sons Emre and Eray.

Due to Yavuz Basar's sudden death, Ruhr University Bochum and the whole international scientific research community in the area of computational mechanics lose one of their outstanding scientists and researchers.

He greatly enjoyed science and was very productive up until the end. Many new plans were jointly developed only recently at our institute. His four published books and more than 130 publications earned Yavuz Basar a highly-esteemed reputation world-wide in the field of computational mechanics and, in particular, in the field of numerical analysis of shell structures.

Yavuz Basar was born on March 15, 1935 in Istanbul. After graduation from the Galatasary High School in Istanbul he studied at the Swiss Federal Institute of Technology in Zurich. There, he obtained his diploma in civil engineering in 1960. Four years later, he achieved his doctoral degree at Hannover University with a Ph.D. thesis on the numerical analysis of shell structures. Together with his highly-valued teacher, Wolfgang Zerna, he changed to Ruhr University Bochum in 1969. There, he obtained his professor title in 1973. Five years later, in 1978, he held a professorship at Technical University Istanbul. Yavuz Basar taught at universities in Germany, France, Italy and Turkey. However, with the exception of a short period as professor and director of the Institute for Structural Mechanics at Yildiz University Istanbul, he always remained loyal towards Ruhr University Bochum, where he was engaged in scientific research and taught as a professor since 1983. He was an outstanding teacher who put forth great effort for his students. Especially for his diploma and doctoral students where he often was more a father-like mentor, far beyond just being a teacher.

Scientific excellence and high ethical standards were deeply integrated in Yavuz Basar's personality. His opinions and his advice were always positive, of great tolerance and integrity. He was always an honest and trustworthy partner. Some of us even had the opportunity to get to know Yavuz Basar as an admirer of the fine arts who was fond of music, paintings, literature – and who, from time to time, even produced essays and lyrics himself.

The Institute for Structural Mechanics deeply mourns over a very special colleague and teacher. We will always remember him with great respect.
Our cordial sympathy rests with his familiy.

*The staff members of the Institute for Structural Mechanics*
*Ruhr University Bochum, Germany* ●
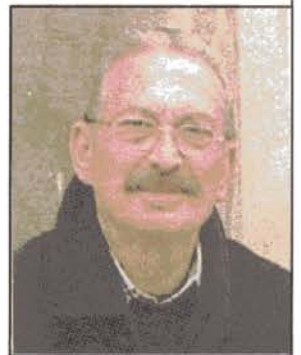
# FEM class of 42

A group of distinguished colleagues and friends in the field of Finite Element Methods (FEM) and computational mechanics turned 60 during 2002. The group named FEM Class of 42 Fellows included Profs. M. Crisfield[†], H Mang, R. Ohayon, R. Owen, K.C. Park, J. Periaux and B. Schrefler. An informal collective celebration was held on the beautiful Island of Ibiza (Spain) on 30 and 31 May 2002 which gave colleagues common friends a chance to meet and celebrate. Participants at the meeting also contributed to the celebration via a Web Page where personal greetings were sent to each of the FEM Class of 42 Fellows. A public section of the web page includes scientific papers dedicated to each of the FEM Fellows.For details visit **www.femclass42.com** or contact Profs. G. Peric (D.Peric@swansea.ac.uk) or E. Oñate (onate@cinme.upc.es). ●



*Participants of FEM Class of 42 in Ibiza*

# Computational Mechanics
## in China

*by*
**Wanxie Zhong**,
**Gengdong Cheng**
Dalian Uuniversity of
Technology
and
**Mingwu Yuan**
Peking University

*" This had a great impact on Chinese scholars and also an important promotion of the progress of computational mechanics in China. "*

## Pioneers of Computational Mechanics in China

Computational mechanics in China was started in the early 1960's. L.X. Qian emphasized that the large scale structural mechanics problems could be solved by computers. In the early 1970's, the book titled "The finite element method" written by O.C. Zienkiewicz and Y.K. Cheung translated and published it in Chinese. Since 1972, W.X. Zhong et al, developed programs using direct stiffness methods to solve general civil engineering structures and also pressure vessels etc. Z.L. Xu firstly published a book in Chinese on finite element method with a program introducing FEM to engineers, then computational mechanics became a hot spot of applied mechanics in China. In 1979, T.H.H. Pian et al, came to China from the US. Their lectures brought advanced ideas about hybrid method, nonlinear computation and large software system. This had a great impact on Chinese scholars and also an important promotion of the progress of computational mechanics in China.

In 1978, L.X. Qian suggested putting computational mechanics as an important part in the development of applied mechanics in China. Since then, the national conferences for computational mechanics has been organized regularly every four years, until today. The Chinese Association of Computation Mechanics was established in 1986 as a subsidiary of the Chinese Society of Theoretical and Applied Mechanics. The doctoral degree system for computational mechanics was first started in Dalian University of Technology, Peking and Jilin Universities. The professional journal, ¨Chinese Journal of Computational Mechanics¨, has been published since 1984, and is distributed nationwide. Computational mechanics in China has played a very important role in the past 20 years. Most civil engineering design projects have used FEM as the major checking tool. Civil engineering applications in China´s construction dominated all other industries. A lot of important

dams, bridges, high-rise buildings, tunnels, subway and railway systems etc. have been constructed rapidly. Most of them using software developed in China for design and computation.

Computational mechanics has become one of the most active disciplines in applied mechanics and closely connected to engineering applications in various universities in China. Universities, and a number of institutions of various disciplines, have developed their own computational mechanics research groups. Among them, there are Dalian University of Technology, Peking University, Tsinghua University, Jilin University, Beijing University of Aero/Astronautics, Shanghai Jiaotong University, Xian Jiaotong University, Zhejiang University, Tongji University, Southwest University, Central China University of Science and Technology, Science and Technology University of China to name a few.

L.X. Qian and K. Feng joined the founder group of the International Association of Computational Mechanics (IACM) where Chinese engineers have participated in a series of International Conferences. A number of professors from China also play roles in the general assembly of the IACM. Almost all the main international journals on computational mechanics presently have Chinese members on the editorial boards, among them there are L.X. Qian, W.C. Chien, Q.H. Du, L.M. Tang, G.D. Cheng, W.X. Zhong, etc. Also, the Chinese professors actively organize a series of international conferences on computational mechanics, such as EPMESC, APCOM, EASEC, etc. and bilateral SINO-Japan, SINO/US, SINO/Australia conferences on computational mechanics, multi-disciplinary optimization, boundary element, etc.

## Theoretical Contribution and New Algorithms

Chinese scientists have made a number of important contributions to fundamental theories, methodologies and algorithms

for computational mechanics. The present review is based on the authors' knowledge. It mainly covers the part of computational structural mechanics and solid mechanics. Chinese scientists have also made some important contribution in the field of computational fluid mechanics.

## The finite element technology and its mathematical foundation

As early as in 1954, Hai-Chang Hu proposed the well-known variational principle in elasticity called the Hu-Washizu variational principle, which is the foundation of hybrid and mixed finite elements. Pioneered by Chinese American T.H.H. Pian, the hybrid and mixed finite elements investigated in depth by D.P. Chen, C.C. Wu, Z.S. Tian and others collaborated with Pian. L.M. Tang and W.J. Chen and their research group investigated the multi-variable quasi-conforming elements and highly precise finite elements. Y.Q. Long is leading a research group on generalized conforming element. They have all developed a series of efficient and reliable membrane, plate, shell and brick elements. A class of rational elements was proposed recently in Dalian University of Technology. In the sixties, K. Feng developed the numerical solution method for PDEs, based on piecewise interpolation and variational method, which is considered the earliest mathematical foundation of convergence proof of FEM. Z.C. Shi and H.Q. Zhang etc. developed the mathematical theory of convergence for FEM. The mathematical theory of super-convergence of FEM was extensively investigated by S.M. Chen. Q.H. Du and Z.H. Yao further developed the boundary element theory and applications. C.D. Xu and his group contributed the weighted residual method etc.

## The efficient algorithms

Because China is a developing country, the computer conditions available in China are far less than those in the developed countries. These difficult conditions made the efficient algorithms investigation stressful for computational mechanics engineers in China.
Various mathematical methods were pro-

posed for different types of symmetric structures by W.X. Zhong and J.K. Wu and their colleagues. Numerical methods based on the group representation theory and the cyclic matrix method were implemented and thus improved the algorithms dramatically. Based on these algorithms, the television and cooling tower problems were solved on the very small computers available in 1970's. The finite strip method of Y.K. Cheung was improved by Z.Y. Cao in collaboration with Cheung himself, so that the semi-analytical method and super-element were further used for the structural and geotechnical engineering problems. Q.H. Du, Z.H. Yao, R. Qing and S. Yuan investigated boundary elements, Spline boundary elements, finite element line methods etc. and applied thermo-elasticity and vibration problems to plate bending contacts.

Plus the combination of these methods can be used for nonlinear problems. Important improvements were made by J.K. Wu, M.W. Yuan and others for the quasi-arc method, which improves the efficiency and reliability of the algorithm when integration passing the bifurcation point. W.X. Zhong, H.W. Zhang and colleagues pioneered the parametric variational principle and the respective parametric quadratic programming method, which solved those classes of physical and geometrical nonlinear

*"Software will dominate the future."*



*Figure 1:*
*Beijing botanical exhibition greenhouse used SAP84 to check the design for wind loading (Designed by Beijing Institute of Architectural Design and Research)*

problems, such as elastic-plastic contact problems, non-associative flowing plasticity and visco-plastic lubrication problems etc. K. Feng proposed the symplectic conservation finite difference method for the Hamilton dynamical system, which directed numerical integration for conservative systems. W.X. Zhong and colleagues discovered the analogy relationship between computational structural mechanics and optimal control. Based on which the Hamilton system, theory and symplectic mathematics are introduced into finite element methods, and also established the precise integration method for both the initial value integration and the two point boundary value problems, especially the integration of the Riccati differential equations for optimal control and Kalman filtering. M.W. Yuan and Z.C. Zheng proposed efficient eigenvalue algorithms in dynamic analysis. J.H. Lin proposed the highly efficient random vibration computational algorithm. R.Q. Zhang, X.C. Wang and M.R. Li etc. investigated the parallel algorithms for structural analysis and optimizations.

### Structural optimization

In 1973, L.X. Qian delivered a lecture, *"recent development of theory and methodology for optimal design in structural mechanics"*, at the development program for applied mechanics in China meeting, which attracted wide attention and strong public response in applied mechanics and engineering disciplines. Under the guidance of L.X. Qian, a group at the Dalian University of Technology implemented the program system DDDU (multi-elements multi-loading and multi-constraints structural optimization design), which combined the fundamental ideas in applied mechanics with the mathematical programming method, with some techniques by-passing the traditional difficulties. The reliable and efficient sequential quadratic programming algorithm for structural optimization was developed, around which the high precision approximation for the constraints was investi-gated. R.W. Xia, J.C. Huang and H. Huang et al. investigated the duality algorithm based on the second order approximation of the related function, and improved the selection of intermediate variables in the geometric optimization. The researches on elastic bending plate optimization given by G.D. Cheng resulted in pioneering structural layout optimization work. Later, the

group, guided by G.D. Cheng, carried out in-depth research on the singular optimal solution of structural topological optimization. The semi-analytical method for sensitivity analysis proposed by G.D. Cheng and Y.X. Gu resulted in an efficient method for combining the structural analysis software with optimization algorithm software. S.H. Chen investigated the method for sensitivity analysis of duplicated eigenvalues. G.Y. Wang proposed the fuzzy structural optimal design and developed the soft engineering design theory and methodology. B.F. Zhu and S.Y. Wang applied the structural optimization technology to the large dam structure and obtained noticeable economic benefit. A number of practical engineering optimizations were with discrete variables, H.C. Sun, for a number of years, lead his group in investigating discrete variable optimization and a number of effective algorithms were proposed. X.S. Li developed the entropy based efficient algorithm for nonlinear optimizations.

### The analogy between computational structural mechanics and optimal control

The analogy between computational structural mechanics and optimal control provides the condition for exchanges between the two disciplines. Looking from the applied mechanics side, the foundations of state space method, the Hamilton system theory and symplectic mathematics can be further developed to solve more problems. Via mathematical physics, the new solution methodology can be widely spread to the related disciplines, such as to electro-magnetic waveguide problems, energy band analysis, etc. Looking from the numerical analysis-side, the precise integration method developed from this basis has a wide application aspect. In contrast to the traditional approach of integration with finite difference approximation, such as the Newmark method or the Wilsom-method in structural dynamics etc., the precise integration method makes use of analytical equations as much as possible, so as to reach high precision in algorithms. As anticipated, the numerical result almost reaches the computer real number precision, which will be quite meaningful to a number of disciplines.

The analogy relationship points out that the time coordinate of modern control the-

*" ...the precise integration method makes use of analytical equations as much as possible, so as to reach high precision in algorithms."*

ory corresponds to the longitudinal space coordinate. Therefore, the Riccati differential equation, and the corresponding two point boundary value problems, can also develop the respective precise integration algorithm in the solution. Here again, the numerical result almost reaches the computer precision. Furthermore , for the robust control theory, its critical parameter determination corresponds to the eigenvalue problem of a generalized Rayleigh quotient, which can also be solved via the precise integration method.

### Environment problems

This problem attracts ever increasing attentions. Seepage in soil is one of the most important problems in the discharge of polluted water. X.K. Li et al proposed the pioneered work on the non-drained soil model as the deformed porous media, through the media which the multi-phase fluid flows. Both mathematical models and FEM solutions are established for such problems. The pollutant transportation process is modelled via permeability fluid mechanics and mass transfer coupling problems. Transient nonlinear convection-diffusion equations of pollutant transportation process are discretized by the characteristic Galerkin FEM method and the equation is solved via the unconditionally stable implicit algorithm. The combination of the precise integration method with the traditional implicit numerical integration method gives the implicit characteristic Galerkin approach better stability behaviour, more precision, and efficiency than the prevalent upwind stream Petrov-Galerkin (SUPG) method.

## Application and Software

### FEM software development and applications

Software is an indispensable part of computational mechanics. The mechanical behaviour of important and complicated engineering structural analysis must make use of large scale integrated software systems. Software will dominate the future. Since the early 1970's, software has been developed in China. The first stage was for the special purpose structural analysis program. Very quickly, various general purpose computational mechanics software was developed. The FEM analysis software JIGFEX, DDDU and DDJ/W were implemented in the Dalian University of Technology, and the general purpose program, HAJIF, was

developed within aeronautical engineering. The MAC program system developed by D.H. Deng et al, is widely used in the mechanical engineering analysis. M.W. Yuan et al, developed software which is also used widely in civil engineering projects (Fig. 1). In the implementation of these FEM software, the techniques of program modular structure, structured programming, object oriented programming, and so on, are applied so that the software can be further developed as the applied mechanics theory advances. Moreover, the featured algorithms developed in China were quickly incorporated into the program system as a special module.

All the software played a very important role in China´s construction. The most important structural design used software developed in China for design purposes. C.H. Wu used the JIGFEX program to solve tremendous Diesel Engine locomotive contact problems, which solved the machine detail strength problems, and got satisfactory results. J.Z. Chui, W.X. Zhong and others published books for treating the FEM software methodologies. Imported FEM software also played a very important role in engineering applications in China, which have solved quite a number of structural analysis problems in civil, astro/aeronautical and mechanical engineering applications. The meaning of FEM software application is not only limited to solving a large number of application problems, but to also widely spread the knowledge of FEM to the engineering community. With the development of computer technology, especially the abundance of personal computers and powerful computer software, the recently developed software such as the SAP-84 by M.W. Yuan and the MCADS by Y.X. Gu, the pre/post- processing and graph capability have continuously strengthened. Their services to civil, mechanical, and astro/aeronautical engineering are constantly growing. In civil engineering, universities and research institutes developed CAD software, such as TBSA and PK/PM, which have dominated the China market for a period. The large number of high-rise buildings constructed in recent years in China and the astro/aeronautical engineering structures applied the FEM based software in their design. All of these are the contributions from the computational mechanics community in China. ●

*"Software is an indispensable part of computational mechanics. The mechanical behavior of important and complicated engineering structural analysis must make use of large scale integrated software systems."*

## Some Reminiscences
### of my Academic Life
### in the Context of Computational Mechanics

**S. Valliappan**
IACM Vice President
Asia-Australia

I wish to share with the readers my early experiences in our group's pioneering work in the field of numerical analysis of biomechanics problems.

We started our research in this field during early 70's. The year 1973 has been a memorable one for me - (1) I had my heart attack and (2) our first paper on biomechanics entitled 'Stress Analysis of Human Femur' was presented on my behalf in Tokyo conference by late Professor Richard Gallagher who spent sometime with me as a Visiting Professor in UNSW. I could not attend the conference due to my health.



**Bone**

**Location of Prosthesis**

**Acrylic**
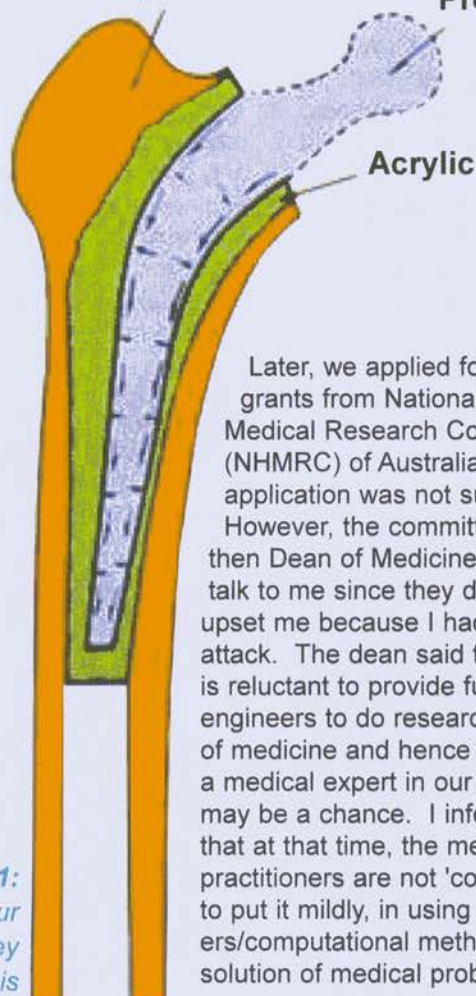
Later, we applied for research grants from National Health and Medical Research Council (NHMRC) of Australia. But our application was not successful. However, the committee asked the then Dean of Medicine in UNSW to talk to me since they did not want to upset me because I had the heart attack. The dean said that NHMRC is reluctant to provide funds for engineers to do research in the field of medicine and hence if we include a medical expert in our team, there may be a chance. I informed him that at that time, the medical practitioners are not 'comfortable', to put it mildly, in using the computers/computational methods for the solution of medical problems.

*Figure 1:*
*Human Femur*
*with Implanted Charnley*
*Prosthesis*

So, we went ahead and did further research in the application of finite element method to human femur. In 1977, our paper on "Three Dimensional Stress Analysis of the Human Femur" was published in Computers in Biology and Medicine, which was included in 'Calcified Tissue Abstracts' and a short note was printed in "Computers and Medicine"'. Another paper on "Stress Analysis of Human Femur with Implanted Charnley Prosthesis" (attached sketch) was published in Journal of Biomechanics. These two papers attracted the attention of not only a number of other researchers in this field but also more than 30 practitioners around the world.

Also, during this period, we were contacted by a medical practitioner in Sydney, who sent the X-rays of the femur of an old lady, with other necessary details, in order to predict the location of the fracture where it may occur. I used my 'no-tension' analysis and predicted the location of the fracture where it can occur. I am pleased to state that the medical practitioner informed me later that was the precise location where the fracture occurred.

So, combined with my strong belief in efficient application of numerical methods in biomechanics and backed by the number of accolades received from medical practitioners around the world, we applied for grants for further research, from NHMRC in 1978. And indeed we received the grants for two years continuously (1979 and 1980).

This personal experience of mine clearly indicates that there is certainly a place for 'Computational Mechanics' and 'Numerical Methods' to solve real world problems, as far as the correct modeling is used with realistic data. ●

# WCCM V
## Fifth World Congress on Computational Mechanics
### July 7 - 12, 2002, Vienna, Austria

**Herbert A. Mang**
*Chairman WCCM V*
**Franz G. Rammerstorfer**
*Chairman WCCM V*
**Josef Eberhardsteiner**
*Secretary General
WCCM V*

The most prominent scientific events under the auspices of IACM are the World Congresses on Computational Mechanics which until now were held at four years' intervals. The venue of the Fifth World Congress on Computational Mechanics (WCCM V) was Vienna, Austria, where WCCM V took place from July 5 to 12, 2002. WCCM V was organised jointly by the Vienna University of Technology (TU Vienna), the Austrian Academy of Sciences (ÖAW), and the Austrian Federal Ministry of Education, Science and Culture (bm:bwk). Chairmen of WCCM V were Prof. Herbert A. Mang, Secretary General of ÖAW, and Prof. Franz G. Rammerstorfer, Vice Rector for Research of TU Vienna. Secretary General of WCCM V was Prof. Josef Eberhardsteiner.

The scientific programme of WCCM V consisted of 2 plenary lectures, 16 semi-plenary lectures, 73 minisymposia, 126 regular sessions, and 16 poster sessions. The average number of lectures in a minisymposium and a regular session was 8-9 and 5-6, respectively. The average number of contributions to a poster session was 12.
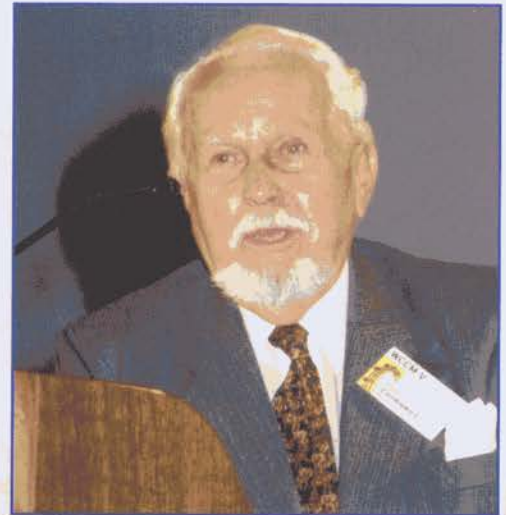


**Figure 2:**
*Prof. O.C.Zienkiewicz giving a Special Address during the Opening Ceremony*

The Local Organising Committee had made a determined effort to include not only engineering scientists but also engineers applying computational mechanics to solve challenging practical problems. For that purpose, an Industrial Committee was established in addition to the Scientific Advisory Board.

**Figure 1:**
*The Press Conference in the Hofburg showing Profs. Eberhardsteiner, Rammerstorfer, Mang, Kleiber and Hughes.*



**Figure 3:**
*Prof. J.T. Oden delivering the Introductory Plenary Lecture*
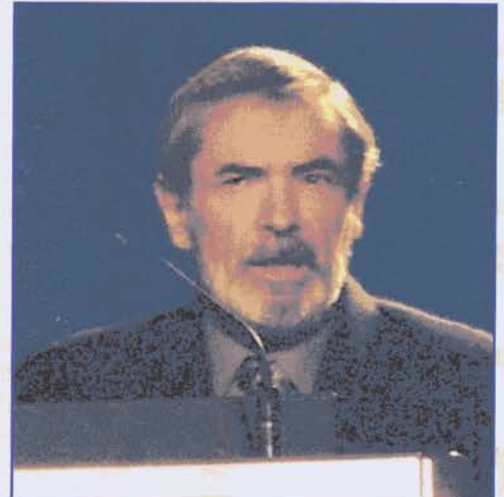
In a press conference immediately before the Opening Ceremony of the Congress on July 8, 2002, the impact of computational mechanics on technological progress was emphasised by the panellists. Among them was M. Kleiber, Minister for Science and Research of the Republic of Poland, P. Skalicky, Rector of Vienna University of Technology, and T.J.R. Hughes, President of IACM. Computational mechanics was represented to the press as a far-reaching field, ranging from basic science over applied research to applications in a variety of engineering disciplines. Its prominent role among the fields in the lead of technological progress was portrayed.

The Opening Ceremony in the Festive Hall of the Hofburg contained welcome addresses by H.A. Mang, P. Skalicky, M. Kleiber, and T.J.R. Hughes. Historical remarks on the development of the FEM were made by O.C. Zienkiewicz, UK, and one plenary lecture was delivered by J.T. Oden, USA, on the topic "A Posteriori Estimation of Modeling and Approximation Error in Computational Science and Engineering: New Tools in Verification and Validation of Computer Simulations". The Vienna Chamber Orchestra, conducted by J. Hattori, played W.A. Mozart's Divertimento, K138, and the waltz "Wiener Blut" by J. Strauß.



*Figure 4:*
*The Vienna*
*Chamber Orchestra*



*Figure 5:*
*An informal get-together at a ¨Heurigen¨in the foothills of the Vienna Woods*

The organisers were overwhelmed by the response for the Call for Papers. Out of 1493 accepted contributions, 887 came from Europe and Africa, 364 from the Americas, and 242 from Asia and Australia. The approximately 1480 registered participants and 120 accompanying persons came from 57 different countries.

*Figure 6:*
*Prof. J. Mittelstross,*
*the official speaker at the Opening of the*
*Leibniz Exhibition at the Austrian Academy of Sciences*





*Figure 7:*
*Prof. T.J.R. Hughes*
*presenting the*
*IACM awards*

| Country | Number of participants |
|---|---|
| United States | 225 |
| Germany | 178 |
| Japan | 106 |
| Brazil | 84 |
| France | 84 |
| Italy | 83 |
| United Kingdom | 64 |
| Poland | 59 |
| Austria | 55 |
| Spain | 46 |
| Russia | 45 |
| The Netherlands | 42 |
| South Korea | 33 |
| China | 31 |
| Sweden | 27 |
| Ukraine | 27 |
| Switzerland | 21 |
| Belgium | 19 |
| Greece | 19 |
| Portugal | 17 |
| Argentina | 16 |
| Canada | 16 |
| Czech Republic | 15 |
| Finland | 14 |
| Taiwan | 14 |
| Chile | 12 |
| Croatia | 11 |
| Hungary | 9 |
| Iran | 9 |
| Slovenia | 9 |
| Denmark | 8 |
| Norway | 8 |
| Singapore | 8 |
| Slovak Republic | 8 |
| Australia | 7 |
| Romania | 6 |
| Ireland | 5 |
| Israel | 5 |
| Thailand | 5 |
| Turkey | 5 |
| Mexico | 4 |
| Venezuela | 4 |
| Belarus | 3 |
| Latvia | 3 |
| Malaysia | 3 |
| South Africa | 3 |
| Bulgaria | 2 |
| Colombia | 2 |
| India | 2 |
| Macedonia | 2 |
| New Zealand | 2 |
| Yugoslavia | 2 |
| Cyprus | 1 |
| Egypt | 1 |
| Estonia | 1 |
| Liechtenstein | 1 |
| Saudi Arabia | 1 |

Number of participants per country

The organisers were pleased to announce that financial support was granted to 370 participants. The total amount of money spent for this purpose was 143,000€. This sum consists of 50,000€ for support of young scientists defined as presenters younger than 35 years, and 93,000€ for participants who are either students or do not come under the definition of young scientists.

The availability of money for support of young scientists was the result of a successful application by F.G. Rammerstorfer for EC funding of WCCM V as a so-called High Level Scientific Conference. This money was distributed to 106 participants from 21 countries which are either EU-member-states or associated states. The number of applicants was considerably greater. The remaining 93,000€ consisted of financial support by the Ministry of Education, Science, and Culture and of income from the Congress. This sum was distributed to approximately 200 students and 63 scientists, most of whom were Russian and Ukrainian colleagues.

The congress website, which was established in 1999, proved to be an effective aid for a timely mode of communication of the organisers of WCCM V with potential participants of the congress.

The statistics of the web server revealed that the number of successful requests, within the last three years, was 398,285. The amount of data transferred during this period of time was 22.4 gigabytes. In the week before the congress, 81,365 successful requests were made. The amount of data transferred during this week was 9.4 gigabytes.

The congress website has also been used as the medium for publication of the full-length papers of the accepted publications.

The first event of the Social Programme was the Reception which took place as an informal get-together at a "Heurigen" at the foothills of the Vienna Woods. Literally, the adjective "heurig" means "of this year", referring to the age of the local wine. More than 30 buses were needed to transport the participants to the place of the "Heurigen".

As a further part of the Social Programme, on July 9, 2002, an exhibition concerning life and work of the famous philosopher, mathematician, natural scientist, and engineer Gottfried Wilhelm Leibniz (1646-1726) was opened in the Festive Hall of the administrative building of the Austrian Academy of Sciences. The official speaker, J. Mittelstrass, Germany, talked about "Leibniz's World: Calculation and Scientific Integration". E. Stein, Germany, one of the organisers lectured on "Gottfried Wilhelm Leibniz as a Philosopher, Mathematician, Physicist and Engineer".



*Figure 9:*
*A dance performance at the Vienna City Hall, a highlight of the Congress Banquet*

The exhibition was previously shown at the world exhibition EXPO 2000 at the University of Hannover and as the framework to the conference on Leibniz at Berlin University of Technology,

Vienna, the current site of the exhibition, was important to Leibniz. He was a highly esteemed consultant to Emperor Karl VI, elaborating a great variety of treatise. One of them was the plan of founding a society of sciences in Vienna. This plan had not been realised and it was not until 1847 that the "Kaiserliche Akademie der Wissenschaften" (today: "Austrian Academy of Sciences") was been established.

A highlight of the Congress Banquet which took place on July 11, 2002, in the City Hall of Vienna, was the awards ceremony. It was conducted by T.J.R. Hughes who cited the outstanding scientific accomplishments of the awardees.

Recipients of the Gauß-Newton Congress Medal, representing the most prestigious award of IACM, were T. Belytschko, USA, and R.L. Taylor, USA. Another highlight was a dancing performance organised by B. Pichler from the Institute for Strength of Materials of TU Vienna.

At a meeting of the Executive Council of IACM on July 7, 2002, E. Oñate, Spain, was elected to President of IACM for the coming four years' period. H.A. Mang, Austria, was re-elected to Vice President for Europe and Africa.

T. Belytschko, USA, was elected to Vice President of the Americas and S. Valliappan, Australia, to Vice President for Asia and Australia. S. Idelsohn, Argentina, was elected to Secretary General.

In the Closing Session of WCCM V on July 12, 2002, in the Auditorium Maximum of TU Vienna, E. Ramm, Germany, delivered the second of the two plenary lectures. The topic of his lecture was "Shells in Advanced Computational Environment".



Figure 11:
Prof. E. Oñate,
newly elected president of IACM



Figure 12:
Prof. E. Ramm delivering the Final
Plenary Lecture during the
Congress Closing Session

Figure 13:
Martina Pöll

Figure 14:
Dr. Heinz Pettermann

What is more important than the size of a scientific event, however, is its quality. In the case of WCCM V, to the great pleasure of the organisers, the level of the scientific presentations as a whole was high. It reflected the impression about computational mechanics as a dynamic field living up to its claim of a discipline on the forefront of technological progress.

The organisers would like to thank all individuals, organisations, institutions, boards, committees, councils, and last but not least sponsors that contributed to the organisation of WCCM V.

They regret that because of lack of space they can only mention two persons: Martina Pöll and Dr. Heinz Pettermann. Without them it would have been impossible to organise WCCM V.

Their exemplary dedication to the ambitious project of organizing WCCM V deserves special acknowledgement. ●

With this Session the largest congress in the relatively short history of computational mechanics and probably one of the largest scientific meetings in the long history of mechanics came to a very good end.

# NEW IACM WEB PAGE:
## *www.iacm.info*

The IACM web page is an electronic space to share information associated to Computational Mechanics and related topics. The IACM web page contains among other sections:

**ABOUT IACM:** How IACM is organised with their affiliated organisations, list of Executive and General Council and members.

**AWARDS:** The updated list of the IACM Awardees.

**NEWS:** Space where all members and organisations can publish relevant news that will be of interest for the IACM Community.

**WORLD CONGRESSES:** The latest information related to the Congresses organised by IACM.
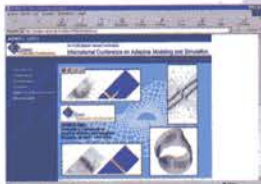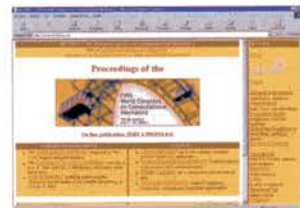
**CONFERENCES AND COURSES:** IACM supported meetings and events and other activities of interest to the computational mechanics community.

The IACM web page also has space for *job offers* and *other areas*, where members and organisations can disseminate their activities.

**NEW!** Now in the IACM web page, you can find *IACM Expressions* in its electronic version!

It is important for all IACM members and organisations to contribute to the web site by sending information of interest to the computational mechanics community. We will be happy to publish information on the activities organised or supported by the IACM affiliated associations, job offers, general news... as well as any other issue of general interest.

**Please send your contributions, comments and/or suggestions to: iacm@cimne.upc.es**

# iacm

## Awardees

### Congress Medal
#### (Gauss-Newton Award)
**2002**
T. Belytschko, R.L. Taylor
**1998**
T.J.R. Hughes, E. Stein
**1994**
J.T. Oden
**1991**
R.H. Gallagher, O.C. Zienkiewicz
**1990**
J.H. Argyris
**1986**
R.W. Clough

### IACM Award
**2002**
H. Mang, S. Idelsohn, S. Valliappan
**1998**
T. Kawai, E. Oñate, A. Samuelsson

### Computational Mechanics Award
**2002**
D.R.J. Owen, W.K. Liu, E. Ramm, R. Lewis,
C. Farhat, M. Ortiz, B. Schrefler
**1998**
T. Belytschko, R. de Borst, K. Morgan,
R. L. Taylor, T.E. Tezduyar

### Young Investigator Award
**2002**
F. Armero, C.A. Taylor
**1998**
C. Farhat, J. Peraire

### Fellows - 2002

| | |
|---|---|
| I. Babuska | P. Ladevèze |
| A. J. Baker | R. Lewis |
| F. Brezzi | M. Morandi-Cecchi |
| M. Casteleiro | C. Mota-Soares |
| C.K. Choi | P. Pinsky |
| R. de Borst | J. Oliver |
| L. Demkowicz | M. Papadrakakis |
| C. Farhat | E. Ramm |
| J. Fish | F. Rammerstorfer |
| L.P. Franca | T.E. Tezduyar |
| R. Haber | E.L. Wilson |
| A. Huerta | P. Wriggers |
| N. Kikuchi | |

### Fellows - 1998

| | | |
|---|---|---|
| E. Arantes e | S. Idelsohn | J.N. Reddy |
| Oliviera | M. Kawahara | A. Samuelsson |
| J. H. Argyris | T. Kawai | B. Schrefler |
| S. Atluri | M. Klieber | M. Shepherd |
| T. Belytschko | B. Kroplin | E. Stein |
| N. Bicanic | H. Liebowitz | G. Strang |
| G. Carey | W.K. Liu | R.L. Taylor |
| Y.K. Cheung | G. Maier | S. Valliappan |
| R. Dautray | H. Mang | N.-E. Wiberg |
| E. Dvorkin | J.T. Oden | W. Wunderlich |
| C. Felippa | R. Ohayon | G. Yagawa |
| M. Geradin | E. Onate | W. Zhong |
| E. Hinton | D.R.J. Owen | O.C. Zienkiewicz |
| T.J.R. Hughes | J. Periaux | |

# Seventh U.S. National Congress on Compu-tational Mechanics

*Albuquerque, New Mexico, U.S.A.*
## July 27 - 31, 2003
http://www.esc.sandia.gov/usnccm.html

The Seventh U.S. National Congress on Computational Mechanics (USNCCM7) will be held in Albuquerque, New Mexico, and hosted by Sandia National Laboratories. The Congress technical program will feature a broad array of topics ranging from advances in nanotechnology and bioengineering to numerical methods, multi-physics problems in science and engineering, and high-performance computing. The technical program will be highlighted by a series of nine plenary lectures that focus on new directions in computational mechanics. Pre- and post-conference short courses have been selected to complement the topical themes of the core technical program. Vendor exhibits and a cyber café are also planned for USNCCM7.

Call for Technical Papers: All technical papers, including keynotes, invited and contributed papers, will be presented within one of the Congress's minisymposia. One-page abstracts in PDF format are required, and must be submitted electronically using the electronic minisymposium abstract submission form on the Congress web. A list of minisymposia may be found at http://usnccm.sandia.gov/mslist/mslist.lasso.

Conference Fellowships: Approximately 75 fellowships for students and young investigators will be awarded for participation in the USNCCM7. Information regarding the fellowships may be found at http://www.esc.sandia.gov/USfellowship.html.

*For all inclusions under USACM please contact:*

**Jacob Fish**
**President - USACM**
*Professor*
*Civil, Mechanical and Aerospace Engineering*
*Rensselaer Polytechnic Institute*

*email: fishj@rpi.edu*
*tel: 518-276-6191*
*fax: 518-276-4833*
*fax-to-email: 702-993-7524*

Registration & Accommodations: The USNCCM7 will be held at the Albuquerque Convention Center. Official airline discounts are offered to US Congress attendees. A social program will take advantage of the numerous recreational and cultural offerings of the scenic Albuquerque region. Updated information about registration, accommodations, reservations, and the technical program can be found on the Congress website.



**Important Dates:**
February, 2003 -
Registration for the Congress begins
March 15, 2003 -
Notification to authors of abstract acceptance
May 31, 2003 -
Deadline for submission of revised abstracts
June 15, 2003 -
Deadline for Early Registration & Hotel Reservations
July 28-30, 2003 -
US National Congress on Computational Mechanics
July 27 & 31, 2003 -
Pre- and Post-Conference Short Courses

*Visit the USNCCM7 Website:*
http://www.esc.sandia.gov/usnccm.html

# Thematic Conferences
## and Workshops

**The European Community on Computational Methods in Applied Sciences (ECCOMAS)** supports the organization of Thematic Conferences and Workshops in fields of interest in computational science and engineering. The scope of the meetings ranges from basic aspects of mathematical and computational methods and modeling to practical applications in fluid dynamics, structural mechanics, material sciences and electro-magnetic problems, among others.

*The following ECCOMAS Thematic Conferences and Workshops will take place in 2003:*

**VII International Conference on Computational Plasticity**

www.cimne.com/congress/complas
Barcelona, Spain **April 7 - 10, 2003**.
**Also an IACM Special Interest Conference**
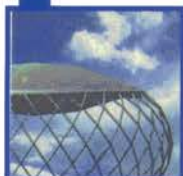
**International Conference on Textile Composites and Inflatable Structures**

www.cimne.com/congress/membranes03
Barcelona, Spain. **30 June - 3 July, 2003**

**Conference on Advances in Computational Multibody Systems**

http://www.dem.ist.pt
Lisbon, Portugal. **July 1-4, 2003**

**Workshop on Smart Materials and Structures**

http://smart.ippt.gov.pl/
Pultusk, Poland. **September 2- 5, 2003**

**Conference on Evolutionary Methods for Design, Optimisation and Control with Applications to Industrial Problems**

www.cimne.com/congress/eurogen03
Barcelona, Spain. **September 15-17, 2003**

**Conference on Adaptive Modelling and Simulation**

www.cimne.com/congress/admos03
Göteborg, Sweden. **September 29 -October 1st, 2003**
**Also an IACM Special Interest Conference**

**Conference on Methods of Artificial Intelligence**

http://www.ai-meth.polsl.gliwice.pl
Gliwice, Poland. **November 5  - 7, 2003**

### *Also, in 2004...*

**ECCOMAS CONGRESS 2004**
European Congress on Computational Methods in Applied Sciences and Engineering, ECCOMAS 2004

Jyväskylä, Finland. **July 24 - 28, 2004**

*For further information visit www.eccomas.org*

# NEWS

## 'FE im Schnee'

Finite Elements - a cold topic? Not at all, of course. Nevertheless part of the German Computational Mechanics community gathered for a meeting called 'FE im Schnee' [ef'e im sne] that could be translated as finite elements in the snow. The meeting took place in the beginning of April 2002 in a small guest house of Stuttgart University in the Austrian alps.

This kind of biennial meetings have a long tradition and go back to an initiative taken by Ekkehard Ramm, Erwin Stein and Walter Wunderlich in 1984. The idea and the format of these meetings stayed the same since then. To bring together mostly younger colleagues, i.e. mainly current PhD students, so that they get to know each other and exchange ideas. The schedule: a stimulating mixture of skiing/hiking, research presentations and discussions.



*Two founders of 'FE im Schnee' - Ekkehard Ramm & Erwin Stein (unusually without skis)*

This time participants from the Universities of Darmstadt, Hannover, Karlsruhe, Munich, Stuttgart and Weimar shared some nice days of 'body-brain interaction'.
In the scientific part a broad variety of topics was covered spanning from material modeling, simulation of processes, adaptive methods, contact over to topics like element technology and optimization. Besides talks from current PhD-students also two very special lectures were given this time. The first one was by Professor Erwin Stein from Hannover about 'Extremal and variational principles in the 17th century' and another one by Professor Christian Bucher from Weimar who presented a special cultural/computational project called 'Swinging Structures' (http://www.uni-weimar.de/Bauing/ism/SwiStru/).



*Participants in front of guest house*

## Two New Honorary Presidents of GACM



*Erwin Stein*



*Walter Wunderlich*

At the last general meeting of the German Association of Computational Mechanics (GACM), that took place during the fifth World Congress on Computational Mechanics (WCCM V) in Vienna, two well merited members were unanimously elected as Honorary Presidents of GACM. The two new Honorary Presidents that now join Professor John Argyris in this distinction are Professor Erwin Stein from Hannover and Professor Walter Wunderlich from Munich. Both were founding members of GACM in 1990 and together headed GACM until the year 2000 as vice-president and president, respectively. Erwin Stein could also be addressed as the founder of modern Computational Mechanics in Germany since he introduced this important field of Applied Mechanics long before it became known under this name. This includes also his successfull efforts to bring the areas of Mathematics and Mechanics together. Walter Wunderlich's career is related to the two Universities in Bochum and Munich where he had the chair of Structural Mechanics. His name is intensively combined with the development of semidiscrete analysis of shells of revolution and their interaction with soil and fluid. The outstanding scientific achievements of both distinguished colleagues have been acknowledged several times by the scientific community. The GACM executive council again congratulates their two new Honorary Presidents to this well-deserved honor.

# GACM Short Notes

## Meetings under the auspices of GACM
In the last couple of months two very successful scientific meetings, that have been organized under the auspices of GACM, took place in Germany.

### IWCMM 12 - 12th International Workshop on Computational Mechanics of Materials, September 16-17, 2002, TU Darmstadt
About 100 scientists from 14 contries all over the world followed the invitation of Professor D. Gross and Dr. H. Baaser (both from TU Darmstadt) who organized this workshop. It has been the first workshop of this series, which was organized under the auspices of GACM. Invited lectures were given by H.J. B#hm (Vienna), H. Gao (Stuttgart), E. van der Giessen (Groningen), J.-B. Leblond (Paris) and T. Zohdi (Berkeley). In addition 35 oral and about 40 poster contributions were presented in parallel sessions. Within the different fields of computational material sciences the workshop covered in particular the multiscale aspect of various materials. The series of workshops is intended to be continued in autumn 2003 with IWCMM13 in Magdeburg, Germany.

### FSA 2002 - International Workshop on Modelling and Simulation of Fluid/Structure/Acoustic Interaction, September 9-11, 2002, Stuttgart University
This very interesting workshop that has been organized by Professors Barbara Wohlmuth and Claus-Dieter Munz (both from University of Stuttgart) attracted more than 60 participants. The scientific program consisted of 18 contributed talks and eight invited lectures presented by J. Delfs (Braunschweig), C. Farhat (Boulder), L. Gaul (Stuttgart), Y. Maday (Paris), F. Nataf (Paris), S. Piperno (Sophia Antipolis), S. Wagner (Stuttgart) and W.A. Wall (Stuttgart). The talks covered a large variety of aspects among the general workshop theme - both theoretical and application oriented. Besides that the workshop afforded a number of opportunities for interesting and stimulating discussions, where one of the outstanding features of this workshop was the intensive interaction between mathematicians and engineers.



*Participants of IWCMM 12*

## GACM affiliated educational programs

A number of international educational programs in the area of Computational Mechanics in general taught in English, both on the MSc and on the PhD-level, have been established in Germany in recent years. Some have been awarded the status of GACM affiliated educational programs (http://www.gacm.de/). All of them are running very successful and enjoy great popularity. This shows up through rapidly increasing numbers of application from year to year. Another sign of success is the substantial number of current students attracted by word-of-mouth recommendations from first generation students. The question whether or not the German "Diplomingeniuer" training, since years also internationally accepted, will be abandoned one day in favor of the Anglo-Saxian BSc/MSc degrees is still a matter of discussion.

## In Memoriam Professor Yavuz Basar (1935-2002)

With great sadness we report the passing of Professor Yavuz Basar from the Institute of Structural Mechanics of Ruhr University Bochum on 30 August 2002. Y. Basar is in particular known for his excellent and up-to-date research of shell formulations and analyses. A detailed obituary can be found in the News section of the GACM webpage at http://www.gacm.de/

## CADFEM company awards 50 GACM student memberships for 2003

CADFEM (http://www.cadfem.de), a German company that is active in a variety of fields associated with Computational Mechanics, has decided to award 50 GACM student memberships for the year 2003. On the one hand this initiative is a consequence of one of the main interests of the current GACM executive council - to bridge the gap between academia and industry in the field of Computational Mechanics. On the other hand it also strongly shows how much importance both GACM and CADFEM attach to the offspring in our field, i.e. to our young students. These students and their profound education are the essential ingredients and the basis of a promising future of our field. GACM accepts this responsibility among others through its GACM affiliated educational programs (see also GACM short notes). More details about the awarded GACM student memberships can be found at our GACM webpage at http://www.gacm.de/. ●

# AMCA

## Asociación Argentina de Mecánica Computacional

# MECOM 2002
## First South-American Congress on Computational Mechanics
## III Brazilian Congress on Computational Mechanics
## VII Argentinian Congress on Computational Mechanics

The First South-American Congress on Computational Mechanics was held from **October 28 to 31, 2002** in Paraná and Santa Fe, two neighbours cities separated by the Paraná river, in Argentina.

The Argentinian Association of Computational Mechanics (AMCA), created in 1985, and the Brazilian Association for Computational Mechanics (ABMEC), created in 1997, decided to share the organization of MECOM 2002 as the First South American Congress, including the III Brazilian Congress and the VII Argentinean Congress on Computational Mechanics.

The motivation was, on the one hand, to continue with the tradition of the National Congresses organized periodically by both countries and, on the other hand, to start with the seed of a South American Congress, which will be of great importance in the frame of MERCOSUR (Southern Cone Common Market ).

**Figure 1:**
Opening ceramony of Mecom 2002.
E. Oñate, president of IACM, S. Idelsohn, president
of AMCA, S. Montiel, govenor of Entre Ríos and
P. Devloo, former president of ABMEC.

They also agreed on appointing the International Center for Computational Methods in Engineering (CIMEC) as local organizer of the Congress.



The congress was attended by some 200 delegates, mainly from Argentina, Brazil and Chile, but also from 15 countries from the Americas, Europe and Asia. Several lecturers were specially invited to Mecom 2002, including the following plenary and semiplenary lecturers: F. Armero, L. Cafffarelli, J.C. Heinrich, E. Dvorkin, R. Feijoo, M. Hogge, M. Géradin, R. Lohner, C. Maliska, X. Oliver, S. Oller, E. Oñate, M. Papadrakakis, D. W. Pepper, R. Rodriguez, E. Rofman, V. Ruas and T. Tezduyar, in addition to several keynote lecturers from South American countries.

**Figure 2:**
Manolis Papadrakakis
dancing tango at the
Mecom 2002 Banquet

The congress took place at the Mayorazgo Hotel located in the "Parque Urquiza", in Paraná, with a beautiful landscape over the Paraná river. The opening ceremony was presided over by the governor of the province of Entre Ríos, Sergio Montiel, and his welcome words were followed by addresses from the president of the IACM, Eugenio. Oñate, from the president of the AMCA, Sergio Idelsohn and from the former president of ABMEC, Philippe Devloo.



On Monday evening a welcome cocktail took place at the Paraninfo of the Universidad Nacional del Litoral, in Santa Fe, presided over by the rector of the University. On Tuesday dinner was offered to the invited lecturers in the Estudiantes Golf Club and on Wednesday the Congress Banquet took place at the Nautico Club, both in Paraná. These social activities were accompanied by regional music bands, including tango dancing. During the Banquet the AMCA Awards 2002 were granted.

The proceedings of the congress, published as Volume XXI of "Mecánica Computacional", S.Idelshon, V. Sonzogni and A. Cardona (eds.), contain 209 papers. The ordinary annual assembly of AMCA took place on Tuesday.
Additional information about Mecom 2002, as well as some photographs can be found at the web site:http://www.cimec.org.ar/mecom2002 ●

# AMCA Awards 2002

The **AMCA Awards 2002** have been granted during the Congress Banquet of MECOM 2002, on Wednesday 30th.

These awards have been instituted as a recognition of the scientific career in the field of computational mechanics and are granted in three categories: Young Researchers; Scientific, Professional and Teaching Career; and International Scientific Career.

The award for Young Researchers was granted to Enzo Dari, from the Bariloche Atomic Center (CAB), Argentina.

The award to the Scientific, Professional and Teaching Career was shared between two researchers: Gustavo Sanchez Sarmiento, from the University of Buenos Aires, and Angel Menéndez, from the INA (National Institute of Water), both from Argentina.

Finally, the award to the International Scientific Career, intended to recognize not only the scientific career in the field of computational mechanics but also the interaction with research centers of Argentina, was granted to Michel Géradin, from the European Laboratory for Structural Assessment, in Ispra, Italy.

The jury for the AMCA Awards 2002 was integrated by: F. Basombrio, E. Dvorkin, S. Idelsohn, C. Prato, G. Buscaglia, A. Cardona, and E. Oñate. ●



*Figure 3. AMCA Awards 2002 for International Resercher: Michel Géradin*



*Figure 4. AMCA Awards 2002 for Senior Resercher: G. Sanchez Sarmiento*



*Figure 5. AMCA Awards 2002 for Senior Resercher: Angel Menéndez*



*Figure 6. AMCA Awards 2002 for Young Resercher: Enzo Dari*

## Call for papers
## XIII Congress on Numerical Methods and their Applications
## ENIEF 2003
*Bahía Blanca, Argentina, November 4-7, 2003*

AMCA announces **ENIEF 2003**, the XIII Congress on Numerical Methods and their Applications. The congress is of interest for engineers, mathematicians, physicists, researchers and other professionals who develop numerical methods or use them as part of their professional practice. The ENIEF meetings started in 1983 as the only national meeting of users and researchers of the Finite Element Method. The success that the meeting had in the computational mechanics community in Argentina and neighboring countries promoted a sequence of periodic ENIEF events, which alternate with the national MECOM congress.

**ENIEF 2003** is jointly organised by Departamento de Ingeniería, Universidad Nacional del Sur, and Facultad Regional Bahía Blanca, Universidad Tecnológica Nacional.

**Topics**: Fluid mechanics; Heat transfer; Solid mechanics; Structural analysis; Discrete mathematics; Mesh generation; Visualisation on computational mechanics; Software development to numerical methods; Algorithms on scientific computation.

**Congress Location**: Bahía Blanca is one of the most important cities of Argentina. It has a well known industrial petrochemical center, as well as a large seaport, road, railway and airport infrastructure, all of which make it an important center of communications. That is the reason why this city is called the "gate" and "seaport" of the south of Argentina. The city concentrates a remarkable academic and cultural activity, having two national universities and several superior institutes. There are nearby beautiful and important recreations centers, such as "Sierra de la Ventana" hills and the village of "Monte Hermoso", with beaches of warm water. The weather in November is warm with mild sea breezes.

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*http://www.frbb.utn.edu.ar/enief2003* ●

# Centre for Advanced Computations in Engineering Science (ACES)

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Centre for ACES was established in 1998 in Singapore with the objective of conducting fundamental research in the area of advanced computations in engineering science. The Centre is jointly established by the Faculty of Engineering, the National University of Singapore and the Institute of High Performance Computing, Singapore. It has been promoting R&D activities in the areas of High-Performance Computing (HPC)

· WaveFace©: a wave analysis code capable of computing phase and group velocities and wave surfaces of Lamb waves in composite laminates



*Figures 2, 3 & 4:
Various on-line simulations visible
on the Centre Web Site*
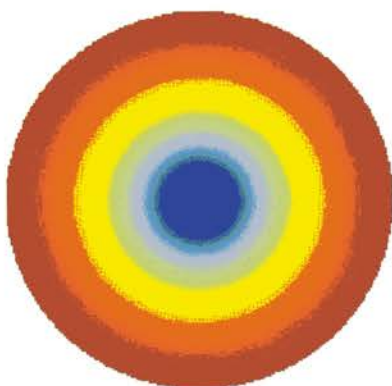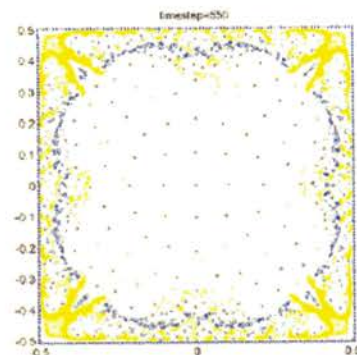
· TransWave©: capable of computing transient waves in composite laminates

All these software packages can be downloaded free from the Centre website -
http://www.nus.edu.sg/ACES/. ●

applications and Computer-Aided-Engineering (CAE). ACES is currently undertaking a number of research projects including Meshfree methods, computational inverse techniques, nano- and multi-scale computation, micro bio-system computation, etc.

ACES has so far developed the following software packages:

· MFree2D©: an adaptive stress analysis code developed based on meshfree methods
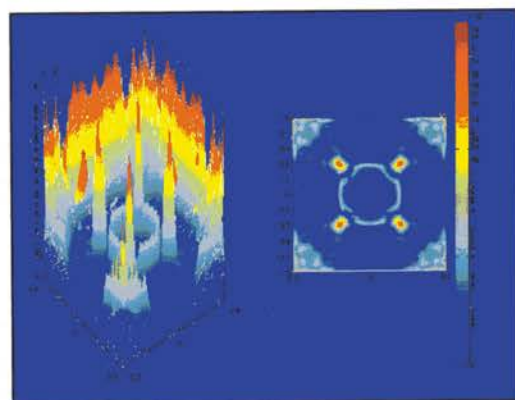


Featured by
**G. R. Liu, Director**, *Centre for ACES, Department of Mechanical Engineering, National University of Singapore*

*Figure 1:
G.R. Liu*

## ACES
**Centre for**
### Advanced Computation in Engineering Science

# JACM

## Japan Association for

## Computational Mechanics

JACM (Japan Association for Computational Mechanics) has been officially formed on December 17, 2002. The purpose of JACM is to establish the communication network among the scientists involved in computational mechanics.

The JACM differs from societies because it is an union of various Japanese societies devoted to computational mechanics such as: Japan Society of Mechanical Engineers, Japan Society for Industrial and Applied Mathematics, Japan Society for Computational Engineering and Science, Japan Society for Simulation Technology, Japan Society of Fluid Mechanics, Japan Society of Civil Engineers, Atomic Energy Society of Japan, Visualization Society of Japan, Architectural Institute of Japan, Society of Chemical Engineers, Japan, Society of Rheology, Japan, Chemical Society of Japan, Society of Materials Science, Japan, Combustion Society of Japan, Textile Machinery Society of Japan, Japan Society of Thermophysical Properties, Japan Society for Fuzzy Theory and Systems, Japan Association for Wind Engineering, Society of Polymer Science, Japan and Japan Fluid Power System Society.

These societies have their members specializing in computational mechanics but in different disciplines of science and engineering. These members are now communicating through e-mail under JACM. As the starting point, JACM has been successful in proposing 26 organized sessions at WCCM VI in Beijing. All the information related to IACM will be transmitted to all these members by JACM.

Professor Takashi Yabe of Tokyo Institute of Technology is the chairman of the Steering Committee of JACM. ●

### Boundary Elements: Theory and Applications

J.T. Katsikadelis (Ed.)
www.elsevier.com/locate/isbn/0080441076
330 pages, Price: USD 112, EUR 112

The author's main task was to organize and present the material in such a way so that the book becomes "user-friendly" and easy to comprehe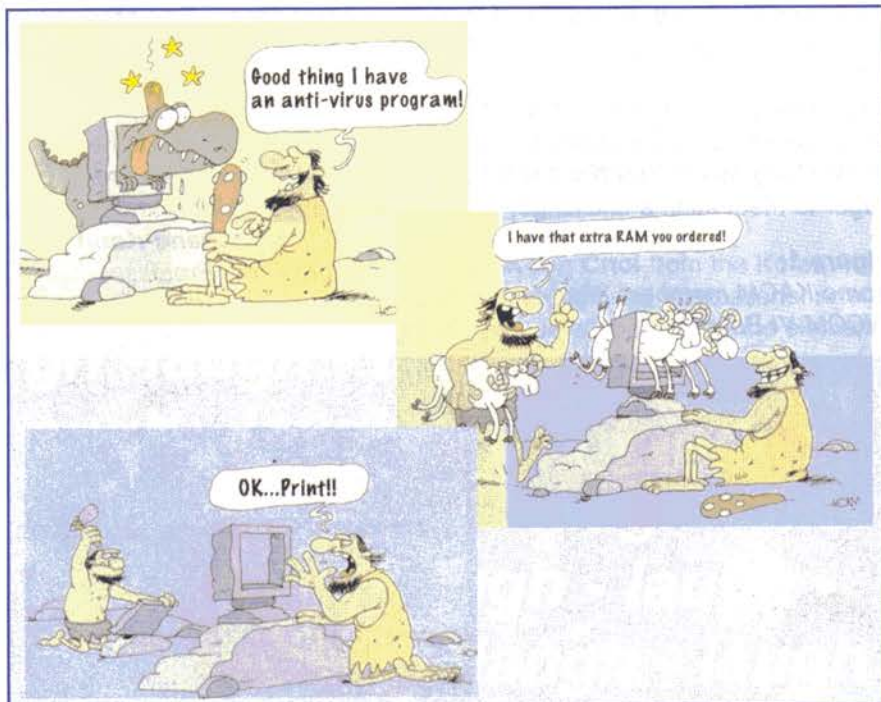nd, taking into account only the mathematics and mechanics to which students have been exposed during their undergraduate studies. This effort led to an innovative, in many aspects, way of presenting BEM, including the derivation of fundamental solutions, the integral representation of the solutions and the boundary integral equations for various governing differential equations in a simple way minimizing a recourse to mathematics with which the student is not familiar.

The CD-ROM which accompanies the book contains the source codes of all the computer programs developed in the book, so that the student or the engineer can use them for the solution of a broad class of problems.

For civil, structural and mechanical engineers and academic and scientific institutions specialising in computational methods. This text would also be a useful addition for students studying in the area of boundary elements. •

### Numerical Modeling in Materials Science and Engineering

M. Rappaz, M. Bellet, M. Deville (Eds.)
Springer, ISBN 3-540-42676-0
540 pages, Price: EUR 79,95

This book introduces the concepts and methodologies related to the modelling of the complex phenomena occurring in materials processing. The authors introduce the main numerical methods: finite differences, finite volumes and finite elements.

These techniques are developed in three main chapters of the book that tackle more specific problems: phase transformation, solid mechanics and fluid flow. •

# BookReport

## Mathematical Glimpses into the 21st Century

*C. Casacuberta, R.M. Miró-Riog,
J.M. Ortega and S. Xambó-Descamps
(Eds.)
CIMNE, ISBN 84-89925-85-2,
213 pages, Price EUR 29*

This book is the published report of the seven Round Tables held as a part of the scientific programme of the Third European Congress of Mathematics (Barcelona, July 10th to 14th, 2002).

It contains the texts delivered by moderators and panelist, together with carefully edited transcripts of the debates. European Congresses (previously held in Paris in 1992 and in Budapest in 1996) intend to disseminate knowledge, stimulate new developments and foster cooperation among mathematicians. One of their basic features is that they also aim to be a forum for debate on topics of general interest to the mathematical community.

Round Tables are addressed to the society at large through the overall influence of mathematics in everyday life.  •

## Flexible Multibody Dynamics

*M. Géradin (Ed.)
Wiley, ISBN 0471-48990-5,
340 pages, Price UK 60*

A comprehensive description of the numerical modelling of flexible multibody dynamics systems in space and aircraft structures, vehicles and mechanical systems.

Moreover, this book provides extensive coverage of the formulation of a general purpose software for flexible multibody dynamics analysis, based on a thorough treatment of large rotations and finite element modelling and incorporation useful reference material.

Features include different solution techniques such as:  time integration of differential-algebraic equations, non-linear substructuring; continuation methods and non-linear bifurcation analysis.  •

# KACM : A New Association Affiliated with IACM

Recently, the **Korea Association for Computation Mechanics (KACM)** was established and affiliated with the International Association for Computational Mechanics (IACM).  In July 2001, the first fifty five KACM members from academic societies and the industry who are active in Computational Mechanics in Korea celebrated the foundation of KACM. **Prof. Chang-Koon Choi of Korea Advanced Institutes of Science and Technology (KAIST)** was elected as the President of KACM.

The major objectives of the Association are to stimulate to promote the research activities and to encourage to participate in the international activities in the field of computational mechanics among its members. To achieve these goals, KACM has been actively organizing international conferences and symposia on the topics of Computational Mechanics and related areas.

The KACM is involved in the organization of many international conferences on computational and structural mechanics.  For example, a series of ASEM conferences (the International Conference on Advances in Structural Engineering & Mechanics) which has been originated by the key KACM members are held every two or three years and the next conference (ASEM'04 ) is planned to be held in Seoul, Korea on 2-4 September 2004.  The main purpose of this conference is to provide a forum for academics and participating engineers to review the state-of-the-technology in the application of computational mechanics to the area of structural engineering.  For those who are travelling a long distance to come to Beijing for WCCM-VI, it will be a good opportunity to attend another interesting conference at a minimum expense by stopping in Seoul for a few days on the way to Beijing.

Just one year after its inauguration, the members of KACM actively participated in the Fifth World Congress on Computational Mechanics (WCCM-V) held in Vienna, Austria July 7-12, 2002.  The nearly 40 participants from Korea was the second largest group from Asia-Pacific Region, just next to Japan and followed by China, and two minisymposia were also organized at WCCM-VI by Korean participants.  This may show the  potentials and bright future of KACM (see the photo).

Since one of the key roles of KACM is coordinating international conferences, KACM is willing to have an opportunity to organize the World Congress in Korea in the future.  All the KACM members are eager to meet such a challenge, when the next possible turn comes.

*Chang-Koon Choi
Institute Chair Professor, KAIST
President, KACM*

**Figure 1:**
*Some KACM members after
WCCM-VI Banquet*

# iacm news news news news news news news

## New IACM Affiliated Organization in Singapore.
The newly created **Association for Computational Mechanics in Singapore (ACMS)** has recently joined IACM. The president of the new IACM affiliated organization is professor Gui-Rong Liu. The aim of the ACMS is to foster advances in the field of Computational Mechanics in Singapore in cooperation with other member organizations in the Asian-Pacific region and worldwide. ACMS will cooperate actively in the organization of invited sessions for the VI World Congress on Computational Mechanics to be held in Beijing on September 6-11, 2004. You can contact ACMS at **acehanxu@nus.edu.sg**.

## Progress in the organization of WCCM VI
The organization of the VI World Congress on Computational Mechanics to be held in **Beijin on September 5-10, 2004** is making steady progress. The congress website can be visited at **http://www.wccm6-apcom04.org.cn/**. Over 50 invited sessions on selected topics on Computational Mechanics have already been chosen to be organized by prestigious scientists worldwide. Interested contributors and participants will find all the details at the Congress web site.

## 2003 - A year full of scientific events in the field of Computational Mechanics.
At least thirteen international conferences on different topics related to Computational Mechanics will take place during 2003. Many of the meetings will be organized by IACM affiliated organizations, such as the Seventh U.S. National Congress on Computational Mechanics (New Mexico - July 2003), the XII Conference on Finite Elements Methods in Fluids (Japan - April 2003); the VII Conference on Computational Plasticity (Spain - April 2003), and the International Conference on Adaptive Modelling and Simulation (Sweden - September 2003). For further details see the Conference Diary Planner.

## Honourary Doctorate
We commend Prof. **B.A. Schrefler** who, on May 8, 2002, was awarded an Honourary Doctorate at the Lodz Technical University in Poland. Prof. Schrefler is a renown scientist from the Facolta di Ingegneria, Universita degle Studi di Padova, Italy .

## New Members of the Executive Council of IACM

### *Regular Members*
**Prof. Anthony Jameson** from **Stanford University** is a world authority in the field of Computational Fluid Dynamics. He has contributed on new algorithms for practical aerodynamics analysis and design of aircrafts, among many other applications.

**Prof. Michael Kleiber** from the Institute of Fundamental Technological Research of the Polish Academy of Sciences in Warsaw (Poland). Prof. Kleiber is a worldwide expert in computational structural analysis. His main research contributions are in the field of computational plasticity, stochastic finite elements and non linear sensitivity analysis of structures.

**Prof. Wing-Kam Liu** from Nortwestern University (USA). He has developed many innovative numerical procedures for analysis of problems in structural and fluid mechanics using finite element methods and meshless techniques.

### *Corresponding Members*
**Prof. Chang-Koon Choi** from the Korea Advanced Institute of Science & Technology. Prof. Choi is a recognised international scientist in the field of structural analysis and design. He has developed new finite element methods for linear and non linear analysis of structures.

**Prof. Manolis Papadrakakis** from the National Technical University of Athens (Greece). He has an international reputation for his research contributions in the field of finite element analysis and design of structures. He has also developed new algorithms for analysis of large size problems in engineering mechanics using parallel computers.

**Prof. Tayfun Tezduyar** from Rice University (USA). Prof. Tezduyar is a worldwide recognized expert in computational fluid dynamics. He has developed new algorithms for finite element analysis of fluid flow problems involving free moving surfaces and fluid-structure interaction situations.

# conference

## EUROGEN 2003
### Evolutionary Methods for Design, Optimisation and Control with Applications to Industrial and Societal Problems

**EUROGEN'03** is the fifth of a series of International Conferences, devoted to Evolutionary Computing for Industrial Applications. Conference venue will be hosted at CIMNE, Barcelona, Spain and held from **15 - 17 September 2003**. It aims at bringing together specialists from universities, research institutions and industries developing or applying evolutionary methods in optimization or design and empha-sizing industrial and societal applications

**Topics for the conference read as follows:**
evolutionary algorithms, including evolutionary programming (EP), evolution strategies (ES), genetic algorithms (GA), and genetic programming (GP);
multi-objective evolutionary algorithms (EMOAs) and constraint handling methods;
hybridisation with standard optimization tools (gradient techniques, combinatorial optimization methods);
surface response methods and other embeddings of machine learning techniques;
parallel and distributed evolutionary algorithms (from LANs to the GRID);
multi-disciplinary optimization methods; and
economic and social simulations.

**Major application areas** are aeronautics, transport, turbomachinery, manufacturing, electromagnetics, electronics, energy, environment, bio engineering and medicine, dependability of systems,games, statistical shape analysis,stochastic geometry.

For further information, please contact the conference secretariat at: CIMNE, Phone: (34) 934 017 441, Email: eurogen03@cimne.upc.es or http://congress.cimne.upc.es/eurogen03



ECCOMAS
Thematic Conference

**EUROGEN 2003**

Evolutionary Methods for Design,
Optimisation and Control
with Applications to Industrial
and Societal Problems

## World Congress on Computational Mechanics VI
### in conjunction with
## APCOM´04

**IACM** and the **Asian-Pacific Association for Computational Mechanics (APACM)** are pleased to announce that the first combined World Congress (WCCM) and the regional congress (APCOM) will be held in **Beijing, China** during **September 5-10, 2004**.

Conference themes will include: computational mathematics and mathematical foundation of computational mechanics, mathematical modeling and numerical methods, computational fluid mechanics,
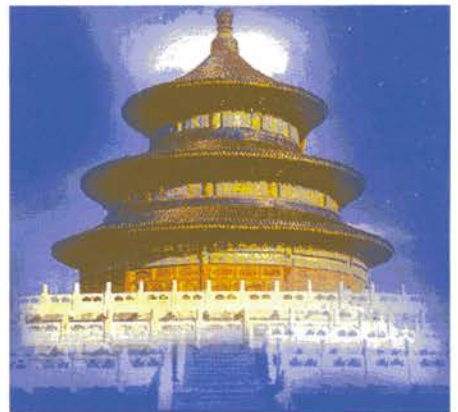


computational solid and structural mechanics, computational material sciences and computer simulation of solid materials, computer simulation of fluid-structure interaction and coupled problems, computational nonlinear dynamics, computational heat transfer, computer modeling of multidisciplinary topics in sciences, computational mechanics in advanced technology, computational inverse problems and optimization, algorithm, software development and high performance computing, computer modeling in engineering.

For updates and further information, please contact the web site:
http://www.wccm6-apcom04.org.cn/announcement.htm

# New Year´s Resolution?

# *Goal Setting Guidelines*
## for the office and at home

It´s New Year.  How many of us have made the same resolutions as last year.? How many have actually achieved last years goals - at the office and at home? Having clear goals is the best preparation for **effective decision making**. Effective decision making is a key component to **solving problems**, selecting a course of action and **time management**.  So lets start at the beginning.

An effective expression of the important goal setting guidelines is that you should set **SMART** goals. What the SMART goal setting guidelines actually mean is that your goals should be **Specific, Measurable, Attainable, Rewarding**, and **Timely**.

Neglect one of those guidelines, and the odds that you achieve your goals drop many times. *Why?*

The key force that either drives you towards your goals or holds you back is your subconscious mind. Those goal setting guidelines are the necessary criteria for your subconscious mind to accept your goals and start working for you. Otherwise it will work hard to keep you in the comfort zone of your present conditions and old habits.

With a **specific** goal you can clearly see what it is you want to achieve, and you have specific standards for that achievement. In making your goals specific it is important that you actually write them, which is crucial in all goal setting guidelines.

The more specific is your goal, the more realistic is your success, and the shorter is path to it.

When you work on making your goal **specific**, you program your subconscious mind to work for you. Then, your feelings and thoughts will lead you to your goal instead of pointing at the obstacles. To make your goals specific you also need to work out the other components of SMART goal setting guidelines below.

For a goal to be **measurable** you need a way to measure the progress and some specific criteria that will tell you when you can stop and the goal is achieved. Feeling the progress is very important for you to stay motivated and enjoy the process of achieving the goal.

An **attainable** goal is a goal for which you see a realistic path to achievement, and reasonable odds that you get there. This does not mean that the lower you aim the more likely you reach success. It is well known that goals that work best have a challenge in them. They are chosen as ambitious as possible, but still reachable. Then they will give you more motivation and sense of achievement.

A goal is **rewarding** when you have clear reasons why you want to reach that goal. This is one more place where it is important that the goal is really yours. Have your specific reasons and expected reward in writing. If possible, even with some visual pictures.

Imagine how you are going to feel when the goal is finally reached. This will ensure that the goal is really worth achieving. Then, every time you get stuck and don't feel motivated enough, read your reasons and look at the pictures. This is a known and very powerful practical technique of how to get through difficult moments and not quit.

The final requirement of the SMART goal setting guidelines is that your goal should have a specific **time limit**. This is also very important for your subconscious mind. Besides, time is the price you pay for the reward from achieving a goal. Setting the deadline will protect you from paying higher price than the goal is worth. **This is also your protection from procrastination and perfectionism.**

# conference diary planner

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|---|---|
| **20 - 21 February 2003** | **Workshop on Numerical Methods in Computational Mechanics Advances and Challenges** |
| | *Venue:* West Lafayette, Indiana     *Contact:* tezduyar@rice.edu |
| **2 - 4 April 2003** | **FEF 03 - 13th International Conference on Finite Elements in Flow Problems** |
| | *Venue:* Miejo University, Nagaya, Japan |
| | *Contact:* Email: fef03@cmlab.meijo-u.ac.jp,   WWW: http://cmlabtp.meijo-u.ac.jp/fef03/index.html |
| **7 - 10 April 2003** | **Complas 2003 - VII International Conference on Computational Plasticity** |
| | *Venue:* Barcelona, Spain |
| | *Contact:* Email: complas@cimne.upc.es,     WWW: http://www.cimne.upc.es/congress/complas |
| **13 - 15 May 2003** | **Parallel CFD 2003** |
| | *Venue:* Moscow, Russia      WWW: http://www.imamod.ru/-pcfd03/ |
| **3 - 6 June 2003** | **CMM 2003 - 15th International Conference on Computer Methods in Mechanics** |
| | *Venue:* Gliwice/Szczyrk, Poland,     WWW: www.cmm-2003.polsl.gliwice.pl |
| **17 - 20 June 2003** | **Second M.I.T. Conference on Computational Fluid and Solid Mechanics** |
| | *Venue:* Cambridge, MA USA     WWW: http://www.secondmitconference.org/ |
| **21 - 24 June 2003** | **Mathematics of Finite Elements and Applications 2003** |
| | *Venue:* Brunel University, UK     WWW: http://www.brunel.ac.uk/ |
| **30 June - 3 July 2003** | **Structural Membranes 2003 - International Conference on Textile Composites and Inflatable Structures** |
| | *Venue:* Barcelona, Spain |
| | *Contact:* Tel: (34) 93 - 401 74 41, Email: membranes03@cimne.upc.es |
| | WWW: http://congress.cimne.upc.es/membranes03 |
| **1 - 4 July 2003** | **Multibody Dynamics 2003** |
| | **Int. Conference on Advanced in Computational Multibody Dynamics** |
| | *Venue:* Lisboa, Portugal ,     *WWW:* www.dem.ist.uti.pt/multibody2003 |
| **27 - 31 July 2003** | **USNCCM VII - 7th U.S. National Congress on Computational Mechanics** |
| | *Venue:* Albuquerque, New Mexico,     *WWW:* http://www.escc.sandia.gov/usnccm.htlm |
| **2 - 5 September 2003** | **CAMAS/ECCOMAS/STC Workshop on Smart Materials and Structures** |
| | *Venue:* Jadwisin, Poland,     *WWW:* http://smart.ippt.gov.pl |
| **9 - 12 September 2003** | **9th International Conference on Numerical Methods in Continuum Mechanics** |
| | *Venue:* Zilina, Slovakia |
| | Email: kompis@mppserv.utc.sk     *WWW:* http://mppserv.utc.sk/NMCM2003 |
| **15 - 17 September 2003** | **Eurogen 2003 - Evolutionary Methods for Design, Optimisation and Control with Applications to Industrial Problems** |
| | *Venue:* Barcelona, Spain,     *WWW:* www.congress.cimne.upc.es/eurogen03 |
| **18 - 20 September 2003** | **ICCSM - 4th International Congress of Croatian Society of Mechanics** |
| | *Venue:* Bizovac, Croatia, *WWW:* www.csm.hr/iccsm4 |
| **29 Sept. - 1 Oct. 2003** | **Adaptive Modeling and Simulation** |
| | *Venue:* Götteborg, Sweden |
| | Contact: Pedro Diez, Email: pedro.diex@upc.es |
| | WWW: www.cimne.upc.es/congress/admos03 |
| **4 - 7 November 2003** | **ENIEF 2003 - XII Congress on Numerical Methods and their Applications** |
| | *Venue:* Bahía Blanca, Argentina     *WWW:* www.frbb.utn.edu.ar/enief2003 |
| **5 - 7 November 2003** | **Conference on Methods of Artificial Inteligence** |
| | *Venue:* Giwice, Poland,     *WWW:* www.ai-meth.polsl.gliwice.pl |
| **22 - 24 January 2004** | **III International Congress on Numerical Methods in Engineering and Applied Science** |
| | *Venue:* Monterrey, Mexico     *WWW:* www.cimne.com/Congress/mty2004 |
| **31 May - 2 June 2004** | **International Congress on Computational Methods in Engineering** |
| | *Venue:* Lisbon, Portugal     WWW: www-ext.lnex.pt/APMTAC/prospecto-2004.pdf |
| **24 - 28 July 2004** | **ECCOMAS 2004 - Eccomas Congress on Computational Methods in Applied Science and Engineering** |
| | *Venue:* Jyväskylä, Finland,     WWW: http://www.mit.jyu.fi/ECCOMAS2004 |
| **5 - 10 September 2004** | **WCCM VI - 6th World Congress on Computational Mechanics** |
| | *Venue:* Beijing, China |
| | *Contact:* Prof. M. Yuan   Email: yuanm@pku.edu.cn, *WWW:* www.wccm6-apcom04.org |