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         Geomechanics Group
         Industrial Processes Group
         Structural Mechanics Group
      2.3.2. Energy and Environment Area
         Building, Energy and Environment Group
         Risk Assessment Group
      2.3.3. Computational and Information Tech. Area
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         Pre and Post-Processing Group
         Information and Communication Tech. Group
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The International Centre for Numerical Methods in Engineering (CIMNE) was created in April 1987. CIMNE’s mission is the development and dissemination of original research in the field of Numerical Methods in Engineering (NME), the education of researchers and the transfer of the research outputs to industry.

CIMNE is a leader as an international centre of excellence in the field of NME through four main action vectors:

1. Excellence in research on NME for multidisciplinary engineering applications, in terms of scientific outputs and software-based tools.
2. International dimension.
3. Active participation and management in scientific societies.
4. Commitment with technology transfer to industry.

Research at CIMNE focuses on the development of NME of interest to the following scientific fields: structural mechanics, geomechanics, fluid dynamics, material sciences, optimization, biomechanics coupled multi-physics processes and high performance computing. Applications include problems in civil, mechanical, aeronautics, naval/marine, biomedical and environmental engineering, energy efficiency and fusion technology, among others.

Since 1987 CIMNE has evolved to become a prestigious international research centre on NME. Its research staff (90% of whom are engineers) includes (by April 2019): 18 Full Research Professors, 13 Associate Research Professors, 18 Assistant Research Professors, 16 Postdocs, 35 PhD Students, 6 Staff Scientists, 53 Research Engineers, 18 Visiting Researchers and 36 Administration Staff from 23 countries.

Several researchers of CIMNE (most of them in the two upper research categories) are faculty members of the Technical University of Catalonia (UPC) and develop their research duties in CIMNE. These distinguished affiliated researchers play an important role as liaison between researchers at different groups of UPC and CIMNE.

RESEARCH PRIORITIES AND APPLICATIONS

The priorities of CIMNE for research excellence target new NM and software codes to help engineers to better predict, design and optimize systems affecting our lives, including our environment, our security and safety, and the products we use and export. Indeed these goals can only be attempted from a multidisciplinary perspective.

Some relevant problems where the NMs developed at CIMNE are applied include: structural analysis of constructions and vehicles; safety of structures to natural hazards; geotechnical engineering and ground water flow; oil and gas engineering; thermal-mechanical analysis of structures and mechanical systems; metal forming processes (sheet forming, casting, welding, additive manufacturing, machining, etc.); shape and material optimization; aerodynamics of aircrafts, sail boats and road vehicles; blast, crashworthiness and impact problems; ship hydrodynamics; analysis of coastal and offshore structures; flow of granular materials in the mining, construction, food and pharmaceutical industries and fusion technology, among other applications.

NEW FOCUS OF CIMNE ON TERRITORY AND SUSTAINABILITY

Since December 2017 CIMNE is under the auspices of the Department of Territory and Sustainability (DTES) of the Catalan Government. This has strengthened the research activities of CIMNE of interest to the civil and environmental engineering sector with a focus on applications to predictive territory management, smart infrastructures, water resources, energy efficiency, transport and mobility and environmental quality.
ORGANIZATION OF RESEARCH

Research in CIMNE is structured in research lines (RLs) covering topics applicable to different engineering disciplines. See current CIMNE RLs at the "Research" section of this report. Researchers at CIMNE carry out their activity within Research and Technical Development (RTD) Groups managed by a GroupLeader. The research activities are coordinated by one or more Principal Investigators (PIs). RTD Groups are gathered in RTD Areas that target fields such as Civil & Mechanical Engineering, Transport (naval, aeronautics and land transport), Energy, Environment and Information and Communication Technologies.

INTERNATIONAL PRESENCE

CIMNE has established 2 legal international branches. CIMNE Latin America (Santa Fe, Argentina); and CIMNE USA (Washington DC, USA) and has also set up an International network of Joint Labs (the Aulas CIMNE) with 31 members: 6 in Spain and 25 in Latin America. (cimne.com)

The International Association of the Aulas CIMNE (AIAC), created by CIMNE in 2015, aims to coordinating and fostering the activities of the Aulas CIMNE network. More information of AIAC can be found on Aulas: Section of this report.

The International Association of the Aulas CIMNE (AIAC), created by CIMNE in 2015, aims to coordinating and fostering the activities of the Aulas CIMNE network.

RESEARCH OUTPUTS

All together, since 1987 CIMNE researchers have published some 2,600 JCR journal papers, 462 book chapters, 82 edited books, 564 technical reports and organized 2% international scientific conferences. CIMNE has 6 patents. CIMNE scientists are chief editors or associated editors of 6 international JCR journals and members of the editorial board of 15 JCR journals.

In 2018 CIMNE researches have taken part in 25 RTD projects funded by international and national organizations (mainly sponsored by 4 ME for CIMNE. In the same period CIMNE had 92 RTD contracts with companies and private organizations amounting some 3.68 ME, managed 2 international MSC courses, 2 PhD programs and organized an average of 2 short courses and 20 seminars annually. Its research staff has supervised 771 PhDs and some 720 MSc students. Research at CIMNE has lead to many software codes that are useful for solving specific problems in each of the engineering areas addressed. The "CIMNE Products" section of this report lists the main software codes developed at CIMNE in 1987-2018.

CITATION RECORDS

By June, 2019, CIMNE scientists had an h-index of 117 and 64,244 citations (h-index and some 28,740 citations since 2014). Source Google Scholar. Scopus records 526 JCR papers and 4,451 citations for the period 2014-18. Several CIMNE researchers are ranked in the first positions of the ranking for Mathematics & Interdisciplinary Applications and other of engineering created by Group for the Dissemination of the h Index (Further information cimne.com/research-ranking).

By February 2019 the Ranking Web of World Research Centres (research.webometrics.info) reports that 123 CIMNE researchers the 60-460 most cited scientists of Spain best scientists in Spain in terms of citations (webometrics.info/en/GoogleScholar/Spain).

MANAGEMENT OF SCIENTIFIC ORGANIZATIONS

CIMNE is the permanent Secretariat of the following scientific organizations:

• International Association for Computational Mechanics (IACM) (www.iacm.org)
• European Community on Computational Methods in Applied Sciences (ECCOMAS - ECCOMAS.org)
• Spanish Association for Numerical Methods in Engineering (SNUMI - www.snumi.es)
• Pilot Centre of the European Research Community in Flow, Turbulence and Combustion (ECoFC2 - www.ecofc2.org)
• UNESCO Chair on Numerical Methods in Engineering of UPC (cimne.com/unesco). This is the first UNESCO Chair in the world, created in 1989.

TECHNOLOGY TRANSFER

CIMNE has a vocation for technology transfer. Since 2001 it has launched 20 spin-off companies (16 companies in 2012-18). These companies market a number of products emanating from CIMNE technology. Details of the companies are given in Section 3.2 and in cimne.com/spin-offs.

AWARDS TO CIMNE AND ITS SCIENTISTS

Since 1987 CIMNE and its scientists have received some 30 awards by national and international organizations. The list of CIMNE Awards can be seen in page 88 and in cimne.com/awards.

ORGANIZATION OF SCIENTIFIC CONFERENCES

The organization of international scientific conferences and workshops is a relevant activity of its research strategy. The CIMNE Conference Bureau Dpt., acts as a professional organizer of international events of scientific and technical interest to CIMNE. Since 1987 CIMNE has organized some 200 international events. In 2018 CIMNE organized 4 international conferences on different topics related to NME. Some 17 events are planned for 2019-2020. Further details of future and past events can be found in Section 5.2 of this report and in congress.cimne.com.

RTD ALLIANCES

CIMNE is a founding partner of the FLUMEN Institute in River Dynamics and Hydraulic Engineering (www.flumen.es). On July 2017 CENTI (Centre for Innovation in Transport, cni-trans.es) merged its current structure into that of CIMNE, thus broadening the scope of the research activities of CIMNE in the field of transport engineering. CIMNE has established research alliances with numerous prestigious institutions around the world. A compilation of the most outstanding collaborations can be found in the “Alliances” section of this report.

DISSEMINATION AND COMMUNICATION STRATEGY

Dissertation and communication tasks in CIMNE involve various activities to bring the research outcomes to the attention of as many relevant people as possible. The Publications Dpt. (www.cimne.com/publications) of CIMNE publishes research and technical reports, monographs, text and edited books and software codes. The Aulas CIMNE network is also used for dissemination actions.

SCIPEDIA: CIMNE STRATEGY TOWARDS THE HOLISTIC 4.0 OPEN-ACCESS SCIENCE

In March 2016 CIMNE, via its spin-off company Scipedia SL, launched the innovative web platform Scipedia. Scipedia (scipedia.com) provides free publishing and Open Access services to disseminate the results of scientific and technical work.

CIMNE has implemented an (almost) self-sustainable financial model with limited annual public funding.

A SELF-SUPPORTED ORGANIZATION

CIMNE has implemented an almost self-sustainable financial model with limited annual public funding. This has been possible by combining public seed funding (mainly from the Generalitat de Catalunya) with income from RTD projects (sponsored by public and private organizations), dissemination activities, revenues from its spin-off companies and an efficient management structure. Since 1987 the self-obtained income obtained each year by CIMNE has amounted (in average) to 95% of its total annual budget.

I thank CIMNE staff and its many partners and friends in universities, research centres and industry worldwide for their cooperation that contributes in making of CIMNE a centre of reference in its field.

Eugenio Oñate
Vicepresident and Director of CIMNE
CIMNE in numbers

ACTIVITIES 2018
Postgraduate Studies 4
Conferences 4
Seminars 11
Courses 8
Coffee Talks 15
Publications
Books 110
Monographs 2
Research Reports 0
Papers in Journals 100
Spin-off Companies 16
Aulas CIMNE 31
Patents 6 (5)
Contracts with Industry 92 (143)
Competitive Projects 23 (80)
National Projects 16 (47)
International Projects 7 (33)

In brackets, the total number of on-going contracts and RTD projects.

STAFF / POSITION TITLE 2018
Management Staff 3
Administration Staff 36
Research Staff 71
Full Research Professors 18
Associate Research Professors 13
Assistant Research Professors 18
Staff Scientists 6
Post Docs 16
Research Engineers 53
Research Students 56
PhD Students 35
Master Students 15
Undergraduate Students 6

TOTAL Staff 219

Income from projects (2002-2018)
in M€

Evolution of Annual income (1987-2018)
in M€

Split of Annual income (1987-2018)
in M€

CIMNE Annual Report # About CIMNE
Governing bodies

Governing council

President
Mr. Damià Calvet
President Departament de Territori i Sostenibilitat (Generalitat de Catalunya)

Representing Catalan Government
Ms. Maria Matilde Villarroya
Directora General d’Indústria (Generalitat de Catalunya)

Mr. Isidre Gavín
Secretari d’Infraestructures i Mobilitat (Generalitat de Catalunya)

Dr. Joan Gómez Pallarés
Director General de Recerca (Generalitat de Catalunya)

Vice-President
Dr. Eugenio Oñate
Catedràtic (UPC · BarcelonaTech)

Representing UPC · BarcelonaTech
Dr. Francesc Torres
Rector (UPC · BarcelonaTech)

Dr. Gabriel Bugeda
Vicerector of Scientific Policy (UPC · BarcelonaTech)

Dr. Pedro Díez
Catedràtic (UPC · BarcelonaTech)

Representing UNESCO
Dr. Lluís Ramallo
President of the Spanish Commission of UNESCO

Executive council

President
Dr. Jordi Berenguer
Catedràtic (UPC · BarcelonaTech)

Dr. Esteve Codina
UPC · BarcelonaTech

Ms. Cecília Soriano
UNESCO

Members
Mr. Xavier Baulies
Departament de Territori i Sostenibilitat, Generalitat de Catalunya

Dr. Antonio Cens
UPC · BarcelonaTech

Dr. Alejandro Josa
UPC · BarcelonaTech

Dr. Juan Miquel
UPC · BarcelonaTech

Dr. Juan Jesús Pérez
UPC · BarcelonaTech

Dr. Estanislau Roca
UPC · BarcelonaTech

Dr. Lluís Rovira
Institució Centres de Recerca de Catalunya

Ms. Ana Simon
ACCIÒ, Generalitat de Catalunya

Scientific Advisory Council

Chairman
Dr. Roger Owen
Swansea University, UK

Prof. Bernd Kröplin (†)
University of Stuttgart, Germany

Prof. Rainald Löhner
George Mason University, USA

Prof. Herbert A. Mang
Technische Universität Wien, Austria

Prof. Xavier Oliver
Technical University of Catalonia, Spain

Prof. Manolis Papadrakakis
National Technical University of Athens, Greece

Prof. Ekkehard Ramm
University of Stuttgart, Germany

Prof. Bernhard Schrefler
University of Padova, Italy

Prof. Mateu Turró
Technical University of Catalonia, Spain

Prof. Peter Wriggers
Leibniz University, Germany

Prof. Gabriele von Voigt
Leibniz University, Germany

† Professor Bernd Kröplin passed away on January 1st, 2019. He was a recognized scientist in the field of computational mechanics. In the period 1988-2010 Prof. Kröplin was director of the prestigious Institute for Static and Dynamics of Aerospace Structures (ISD) of the University of Stuttgart. The research contributions of Prof. Kröplin to new numerical methods for structural mechanics applications, and in particular, for stability analysis of structures, are recognized internationally. Prof. Kröplin maintained a close cooperation with CIMNE in the last 12 years. He was a member of the Advisory Scientific Committee of CIMNE. CIMNE, ISD and TAO have participated in many research projects with funding from the European Commission. Together with Prof. Eugenio Oñate (director of CIMNE), he was founder and co-organizer of the series of international conferences on Textile Membranes and Inflatable Structures (STRUCTURAL MEMBRANES). The death of Prof. Kröplin is a very sad loss for CIMNE and the computational mechanics community in general. From CIMNE we would like to express our sincere condolences to the family, colleagues and friends of Prof. Kröplin.
Research and Technology Development

RESEARCH ENGINEERS (Cont.)
Jose Ignacio Torres
Javier Tous
Luis Ubalde
Sergio Valero
Ignacio Valero
Ahmad Zarazadamiyan
Claudio Zinggerling

RESEARCH STUDENTS
PhD Students
Matías Alonso
Ferran Arrufat
Ramón Barboza
Jesús Bonilla
Martí Burcet
Jordi Carbonell
Fabiola Cavallero
Jaime Cipriano
Jonathan Colom
Alejandro Cornejo
Agustín Cuadrado
Alessandro Fraccica
Rodrigo Gómez
Cimneronicollage, US

Visiting Scientists
Kashmir Amir
(University of Manchester, UK)
Axel Larreguy
(Universidad de Buenos Aires, Argentina)
Roman Lenner
(Stellenbosch University, South Africa)

DIRECTOR
Eugenio Oñate
GENERAL MANAGER
Anna Font
SCIENTIFIC DIRECTOR
Pedro Díez

Administration

DIRECTOR SECRETARY
Mercè Alberich
HUMAN RESOURCES
Irene Latorre
(Head of Unit)
Mercè Linares
Irene Martínez

PROJECT MANAGEMENT
Sandra Pérez
(Head of Unit)
Daniel Cuadrat
Marina de la Rosa
Jon Rodríguez

POSTGRADUATE TRAINING
Leila Zelenka
(Head of Unit)
Cristina Pérez

PUBLICATIONS
Marta Sampedro
(Head of Unit)
Jesus Sanchez

INTERNATIONAL SERVICES
Mercedes Benitez
(Head of Unit)

Aitor Lazaro


Visiting Students
2018

Moisés Ortega
Rafael Pacheco
Samuel Parada
Carlos Pérez
Shu-Shin Qin
Zaha Rajastan
Felipe Robles
Juan Pedro Boldan
Francesc X. Sánchez
Ahmed Sherif
Pablo Leonel Sierra
Daniel Yago
Boyi Ye

Undergraduate Students
Pol Baladas
Oscar Cuatrecasas
Oriol Garcia
Oscar Daniel Leduc
Ramón Mercè
Hernani Jose Silva
Francisco Turón

VISITING SCIENTISTS
CIMNE promotes the
visits of academics and
researchers from around
the world. Visiting
Scientists at CIMNE in
2018.

VISITING SCIENTISTS
CIMNE promotes the
visits of academics and
researchers from around
the world. Visiting
Scientists at CIMNE in
2018.

Eugenio Oñate
Anna Font
Pedro Díez
Main premises at UPC

CIMNE’s main premises are located at the heart of the North Campus of Universitat Politècnica de Catalunya · BarcelonaTech.

The offices are situated at the C1 Building, adjacent to the Civil Engineering School of UPC and occupy some 1,000 m² of modern office facilities and state of the art equipment with last generation computers linked via a fast intranet and a multicore cluster for parallel computing.

This space, created in 1987, hosts around 90 CIMNE researchers and the main administration offices.

CIMNE-BARCELONA
Campus Nord UPC, C1 Building
C/ Gran Capità, S/N, 08034 Barcelona, Spain
+34 93 401 74 95

B0 Building

In September 2014 CIMNE started the construction of a new building of some 2,000 m² in the North Campus of the Universitat Politècnica de Catalunya · BarcelonaTech.

The new B0 building, that also hosts the Flumen Institute, was completed by the end of 2015. Several CIMNE researchers moved to the new facilities during the first months of 2016. This new building is equipped with modern experimental facilities for model scale testing of river dynamic and hydraulic problems and it also provides work areas for researchers at the graduate level (master, doctoral and postdocs) and for senior researchers from CIMNE and UPC · BarcelonaTech.

CIMNE-B0
Campus Nord UPC, B0 Building
C/ Gran Capità, S/N, 08034 Barcelona, Spain
+34 93 401 09 50

Photos:

C1 Building at Campus Nord UPC Barcelona

BO Building at Campus Nord UPC Barcelona
Apart from CIMNE’s headquarters, located in Barcelona, CIMNE has six other branches: four premises in Spain (Castelldefels, Ibiza, Madrid and Terrassa) and two legal offices around the world (US and Latin America).

The worldwide presence of the research centre is also represented by the 31 Aulas CIMNE (Joint Labs with universities all around the world).
CIMNE offices in Terrassa (Barcelona, Spain) opened in 2001. The premises cover an area of 150m² and house part of the department of Building Energy and Environment Group (BeeGroup).

**Director:** J. Cipriano

**CIMNE - Terrassa**
Campus de Terrassa UPC
Edifici CAIA (TR14)
C/ Rambla Sant Nebridi, 22
08222 Terrassa (Barcelona), Spain
+34 93 789 91 69

CIMNE’s headquarters in the city of Castelldefels (Barcelona, Spain) were inaugurated on October 15th 2008. The facilities are located in the building CIMNE-C3 of the Mediterranean Technology Park of the UPC, and occupy 1,500m² in a new building constructed in collaboration with the UPC. The premises are shared with the Technical School of Castelldefels.

**Director:** J. Mora

**CIMNE - Castelldefels**
Campus del Baix Llobregat UPC
C/Esteve Terradas, 5
08860 Castelldefels, Barcelona, Spain
+34 93 413 41 86

CIMNE - MADRID started its activities in September 2007 and on May 2008 CIMNE opened its premises located in the centre of the city (150m²). The main goal of CIMNE Madrid is to build a strong research team in Madrid and foster the links between CIMNE, the Central Government of Spain, the Technical University of Madrid (UPM) and partner companies and research centres based in Madrid.

**Director:** F. Salazar

**CIMNE - MADRID**
Paseo General Martínez Campos, 41, 9º
28010 Madrid, Spain
Tel. +34 91 319 13 59

CIMNE inaugurated the CIMNE - IBIZA branch in 2009. It has 80m² and is located in the city of Ibiza. CIMNE Ibiza activities focus on the development and application of numerical methods and decision support systems to problems of interest to the environment and the sustainability of island communities.

**Director:** G. Molina

**CIMNE - IBIZA**
C/Bisbe Azara, 4, 3º 2ª
07800 Ibiza, Spain
Tel. +34 97 193 11 94
CIMNE-USA is an educational and scientific research organization, affiliated with the International Centre for Numerical Methods in Engineering (CIMNE).

The objective of CIMNE-USA is leading scientific research and development projects supported by government, foundations and industry sources.

The branch also carries out educational activities related to advanced numerical methods. It participates in national and international conferences and symposia and works jointly with Aulas CIMNE, in cooperation with US and international universities. CIMNE-USA also supports visiting scientists.

Dr. David Cranmer (on the left side photo), CIMNE US Acting Executive Director, is a senior scientist at the National Institute of Standards and Technology (NIST) and advisor of many US companies. Mr. Varadaraju (Raju) Gandikota (on the right side photo) is CIMNE USA Scientific Director. Ms. Francisca García-Sicilia has coordinated the USA activities until 2018.

Selected RTD Projects

MUD MOTORS: Agreement between Mind Mesh LTD and CIMNE for the development of a software package for the computer simulation of Mud Motors.
Mind Mesh — 01/11/2016 - 01/05/2018

ALTAIR/KRATOS: Kratos App for Casting.
Altair — 22/10/2015 - 22/07/2018

CIMNE is represented in Latin America by the CIMNE Latin American Foundation (FCL).

The CIMNE-Latin American Foundation (FCL) is located in the city of Santa Fe (Argentina), the place where the first CIMNE Classroom in the Latin American region was created in cooperation with University of Litoral.

Since its creation, the CIMNE-Latin American Foundation has developed a wide range of activities in Latin America related to training, research and dissemination of advances in numerical methods.

Many of these projects are developed with the support of CIMNE, Aulas CIMNE, universities and public organizations.

The projects in which FCL participates can be classified into the following research areas:

- Engineering and Environment
- Industrial Processes
- Numerical Methods

FCL also takes part and organises courses, seminars, workshops, among others.

Activities

Development of advanced tools for computational design of engineering materials. CIMNE Latin America also carries out actions of representation and dissemination of numerical methods in engineering of the centre in the area.

Project Laguna Paiva
Hydrodynamic study
Aulas CIMNE

Aulas CIMNE are physical spaces (Joint Labs) for cooperation in education, research and technological development (RTD) activities created jointly by CIMNE and one or several universities. The 31 Aulas CIMNE promote educational and training activities at graduate and postgraduate level and development of RTD projects in cooperation with companies around the world.

TOTAL: 31 AULAS CIMNE

Argentina 🇦🇷
Brazil 🇧🇷
Chile 🇨🇱
Colombia 🇨🇴
Cuba 🇶🇨
El Salvador 🇸🇻
Guatemala 🇬🇹
Mexico 🇲🇽
Peru 🇵🇪
Spain 🇪🇸
Venezuela 🇻🇪

Argentina 🇦🇷
Brazil 🇧🇷
Chile 🇨🇱
Colombia 🇨🇴
Cuba 🇶🇨
El Salvador 🇸🇻
Guatemala 🇬🇹
Mexico 🇲🇽
Peru 🇵🇪
Spain 🇪🇸
Venezuela 🇻🇪

Aulas CIMNE

Universidad Nacional del Litoral
Director: Gerardo Franck
Created on: October 2002
Activity: Applications of numerical methods to problems related to water resources, mechanical and computer engineering.

Instituto Tecnológico de Buenos Aires
Director: Sebastián d’Hers
Created on: April 2015
Activity: Application development of numerical methods in the field of mechanical, naval, petroleum, chemical, electronics, electrical, industrial engineering and bioengineering.

Instituto Universitario Aeronaútico
Director: Carlos Sacco
Created on: September 2002
Activity: Applications of numerical methods to problems related to fluid mechanics, structures, heat transfer, etc.

Universidad Nacional de Entre Ríos
Director: José Di Paolo
Created on: March 2013
Activity: Applications of numerical methods to problems related to Bioengineering.

Universidad Nacional de Salta
Director: Liz Nallim
Created on: April 2008
Activity: Development of computer models for application in civil engineering.

Universidad Nacional de Tucumán
Director: Guillermo Első
Created on: November 2002
Activity: Development of computational models of bridges (degradation and repair mechanisms).

Universidad Federal de Uberlândia
Director: Sonia Goulart
Created on: April 2004
Activity: Forming process applications, structural design and biomechanics.
AULA UCI - CIMNE (Cuba)
Universidad de las Ciencias Informáticas
Director: Jorge Gulín
Created on: October 2015
Activity: Development of computational models and tools with application in high performance computation.

AULA UCLV - CIMNE (Cuba)
Centro de Investigación de métodos computacionales y numéricos en la ingeniería. Universidad Central de las Villas
Director: Carlos Recarey
Created on: July 2003
Activity: Modelling and analysis of structures and grounds to the application of numerical methods.

AULA UCA - CIMNE (El Salvador)
Universidad Centroamericana “José Simeón Cañas” UCA
Director: Mauricio Pohl
Created on: February 2010
Activity: Civil eng. applications and multi objective optimization and applications.

AULA UNG - CIMNE (Guatemala)
Universidad Mariano Gálvez
Director: Rolando Torres
Created on: February 2011
Activity: Development of computer models for application in civil engineering.

AULA CIMAT - CIMNE (Mexico)
Centro de Investigaciones en Matemáticas
Director: Salvador Botello
Created on: January 2002
Activity: Applied mathematics, numerical methods, engineering and statistical analysis.

AULA UCTO - CIMNE (Mexico)
Universidad de Guanajuato
Director: Mabel Mendoza
Created on: January 2002
Activity: Civil engineering applications and multi objective optimization and applications.

AULA UCM - CIMNE (Mexico)
Universidad Michoacana de San Nicolás de Hidalgo
Director: Francisco Domínguez
Created on: October 2015
Activity: Civil, mechanic and electric engineering.

AULA ITESM - CIMNE (Mexico)
Inst. Tecnológico de Estudios Superiores de Monterrey
Director: Sergio Gallegos
Created on: May 2009
Activity: Applications of numerical methods in civil engineering.

AULA PUCP - CIMNE (Perú)
Universidad Católica de Perú
Director: Rosendo Franco
Created on: April 2009
Activity: Modelling and analysis of structures and grounds to the application of numerical methods.

AULA ESIEIAAT - CIMNE (Spain)
UPC - BarcelonaTech Terrassa
Directors: Roberto Flores; Oscar Fruttós
Created on: April 2007
Activity: Industrial and aeronautical engineering.

AULA EEBE - CIMNE (Spain)
Escola Tècnica de Enginyeria Industrial
Director: Daniel Di Capua
Created on: July 2001
Activity: Development of numerical methods in industrial and civil engineering.

AULA ETSINO - CIMNE (Spain)
Universidad Politécnica De Cartagena
Director: José Curiñez
Created on: May 2018
Activity: Development of numerical naval engineering.

AULA FNB - CIMNE (Spain)
Facultad de Náutica de Barcelona
Director: Julio García
Created on: March 2002
Activity: Applications of numerical methods to problems related to marine engineering.

AULA UC - CIMNE (Venezuela)
Universidad de Carabobo
Director: David Ojeda
Created on: April 2009
Activity: Applications of numerical methods in optimization and inverse problems in engineering failure analysis.

AULA UCLA - CIMNE (Venezuela)
Universidad Centrooccidental "Lisandro Alvaro" (UCLA)
Director: Tuan Carlos Vielea
Created on: October 2008
Activity: Applications of numerical methods to civil engineering problems.
Activities in Asia Pacific

China
For over 10 years, CIMNE has been collaborating with research organizations, universities and companies in the People’s Republic of China in a number of fruitful cooperation agreements, RTD projects and some educational activities.

CIMNE has strong links with the most renowned scientific institutions in China, such as Peking University, Tsinghua University and several research centres of the Chinese Academy of Sciences or the Chinese Aeronautics Establishment.

Supported by the 6th and 7th Framework Programme and the Horizon 2020 of the European Union, CIMNE has carried out the coordination on the European side of a series of projects aimed at promoting joint EU-China research in aeronautics. CIMNE also participates in research projects in areas of risk assessment of natural disasters.

The most outstanding example of research collaboration with Chinese institutions is the study carried out in cooperation with the Tan Tock Seng Hospital and NTU on mechanistic and pathology of the genesis, growth, and rupture of abdominal aortic aneurysms.

Singapore
CIMNE has collaborated for many years with Singaporean research organizations and companies in the field of biomedical, energy and marine engineering.

The most relevant activities with China in 2018 have been:

  H2020-MG-2015
  Coordinated by Chalmers
  01/04/2016 - 31/03/2019

  H2020-MG-2015
  Coordinated by DLR
  01/04/2016 - 31/03/2019

CIMNE has an important scientific structure split into different Research and Technological Development (RTD) Areas and Groups that cover a wide spectrum of research fields.

We list below the research lines at CIMNE and the Research and Technological Development (RTD) Areas and Groups. Principal investigators (PI) leading the research lines of each group are also shown. Researchers are appointed to research groups which are related to relevant engineering areas. In 2018, CIMNE had twelve research groups organized in four different research areas: Civil and Mechanical Engineering, Energy and Environment, Computational and Information Technologies and Transport.

Research lines often cover basic aspects applicable to different engineering areas. It is common that researchers from different RTD groups contribute to the same research line.

### Research Lines

#### 1. Algorithms for Multiphysics Problems

- Computational Fluid Dynamics
- Computational Geomechanics
- Mathematical and Computational Modelling
- Computational Modelling of Engineering Materials
- Computational Solid and Structural Mechanics
- Optimization
- Computation and Information Technologies
- Numerical Methods and Technologies for Energy and Environment
- Transport System Analysis

#### Civil and Mechanical Engineering Area

FLUID MECHANICS GROUP
- PIs: R. Codina, S. Idelsohn, E. Oñate, R. Rossi and J. Baiges
  - RL: 1 and 2.

GEOMECHANICS GROUP
  - RL: 3.

INDUSTRIAL PROCESSES GROUP
- PIs: M. Chiumerti and C. Alegre de Saracibar
  - RL: 1 and 7.

STRUCTURAL MECHANICS GROUP
- PIs: E. Oñate, M. Chiumerti, M. Cervera, X. Oliver and S. Oller
  - RL: 1, 5 and 6.

Energy and Environment Area

BUILDING, ENERGY AND ENVIRONMENT GROUP
- PI: J. Cipriano

RISK ASSESSMENT GROUP
- PI: A. Barbat
  - RL: 6 and 9.

Transport Area

AEROSPACE ENGINEERING GROUP
- PIs: J. Pons, E. Ortega and G. Bugeda
  - RL: 2 and 7.

CENTI - INNOVATION IN TRANSPORT GROUP
- PIs: S. Saurí
  - RL: 10 and 7.

NAVAL AND MARINE ENGINEERING GROUP
- PI: J. Garcia
  - RL: 2 and 7.
Research lines of CIMNE

1. ALGORITHMS FOR MULTIPHYSICS PROBLEMS
   Numerical methods for complex coupled problems such as fluid-soil-structure interaction, aero-acoustics, electromagnetics, magneto-hydrodynamics and atmospheric/thermal flows, etc.

2. COMPUTATIONAL FLUID DYNAMICS
   Numerical methods for incompressible and compressible flows. Applications to internal and external flows, free-surface flows, multi fluids, flow in porous media, aerodynamics and acoustics.

3. COMPUTATIONAL GEOMECHANICS
   FEM and particle methods for dry, saturated and partially saturated soils and rocks. Applications to geotechnical engineering; foundations, underground structures, tunnels, dams and slopes.

4. MATHEMATICAL AND COMPUTATIONAL MODELLING
   Mathematical models and algorithms for error estimation, mesh adaption and quality of the numerical solution. Reduced order models for (quasi) real time solution of complex engineering systems.

5. COMPUTATIONAL MODELLING OF ENGINEERING MATERIALS
   Methods for multiscale analysis of materials and structures. Applications to the design of new smart structural materials.

6. COMPUTATIONAL SOLID AND STRUCTURAL MECHANICS
   FEM and particle-based procedures for linear and nonlinear analysis of solids and structures. Applications to most engineering fields.

7. OPTIMIZATION
   Robust optimization procedures for shape and material design and process optimization in civil, mechanical, aerospace and naval engineering.

8. COMPUTATION AND INFORMATION TECHNOLOGIES
   Methods for mesh generation and visualization of huge sets of numerical results in parallel computers using data mining and cloud storage techniques. Integration of decision support systems in engineering.

9. NUMERICAL METHODS AND TECHNOLOGIES FOR ENERGY AND ENVIRONMENT

10. TRANSPORT SYSTEM ANALYSIS
    Urban mobility. Port logistics and maritime transport. Transport infrastructure management.

All the research carried out at CIMNE is developed around 10 research lines, which cover several challenging topics:

Fluid Mechanics Group

The Fluid Mechanics Group focuses on the development of mathematical models and numerical methods for the solution of a wide range of problems in engineering and other applied sciences involving external and internal flows.

Applications include, among others, high speed compressible flows, turbulent flows, shallow water flows, flow in porous media, bio-flows and many multidisciplinary coupled problems involving fluids, such as magneto-hydro-dynamics, fluid-structure interaction and thermal flows.

Research topics

1. COMPUTATIONAL FLUID DYNAMICS (CFD)
   - Stabilized finite element methods for problems involving waves, viscoelastic flows, compressible flows, shallow water flows, magneto-hydro-dynamics and approximation of eigenvalues. PI: R. Codina.
   - Fractional step schemes for incompressible flows. PI: R. Codina.
   - Weak imposition of boundary conditions. PI: R. Codina.
   - Meshless methods in CFD. PI: S. Idelsohn and E. Oñate.

2. ALGORITHMS FOR MULTIPHYSICS PROBLEMS
   - Aeroacoustics: Acoustic analogies in incompressible flows, direct numerical simulation of sound, aeroacoustics in time dependent domains, application to human voice simulation. PIs: R. Codina and J. Baiges.
   - Reduced order models (ROM): Domain decomposition, fluid-structure interaction, thermally coupled flows. PIs: R. Codina and S. Idelsohn.

On-going RTD Projects

ELASTIC-FLOW - Aumento de la eficacia en procesos de mezcla y transmisión de calor utilizando fluidos viscoelásticos en régimen laminar y turbulento
MINECO - Retos Investigación: Proyectos de I+D+i
PI: Laura Moreno, Arnau Pont, Sergio Idelsohn (Leader)
PIs: Joa Baiges, Jordi Cotela, Riccardo Rossi, Eduardo Soudah
Geomechanics Group

The research achievements of the Geomechanics Group focus on the contribution to fundamental understanding and modelling of soil and rock behavior, the development of advanced computational tools and testing techniques at laboratory scale and the participation in applied engineering projects.

Achieving a proper balance among these aspects has been a permanent objective of the group over the years. The research of the group and the software developed are a reference in the analysis of coupled thermal, hydraulic, mechanical and chemical processes in porous media applied to the analysis and design of underground structures (tunnels, foundations, georeservoirs, etc), earth and rockfill dams and fluid-soil-structure interaction problems.

Research topics

1. COMPUTATIONAL GEOMECHANICS
   • Constitutive models and numerical methods for analysis of unsaturated soils and rocks. PI: E. Alonso
   • Particle Methods in Geomechanics
   • Unsaturated Soil Mechanics
   • Landslides
   • FEM for coupled problems in geotechnical engineering. Particle based and discrete element methods for geomechanical problems. PIs: A. Cens and S. Olivella
   • Bio-geo-chemical processes in artificial recharge practices. PI: X. Sánchez-Vila

2. OPTIMIZATION
   • Reactive transport, emerging contaminants (ECs) and associated risk. PI: X. Sánchez-Vila
   • Computational methods for environmental technologies and geohazards. PI: X. Sánchez-Vila

Ongoing projects

TERRE - Training Engineers and Researchers to Rethink geotechnical Engineering for a low carbon future - H2020 (2014-2020) - EC
Coordinator: University of Strathclyde
01/11/2015 - 31/07/2019
LOOK - Extracción masiva y no destructiva de información en pruebas experimentales
Proyectos Explora Ciencia y Explora Tecnología - MCiu
Coordinator: CIMNE - 01/11/2018 - 30/10/2019

Staff

- Eduardo E. Alonso (Leader)
- Antonio Cens (Leader)
- Núria M. Pinyol (Leader)
- Matías Alonso
- Mauricio Alvarado
- Ramón Barboza
- Oriol Bertran
- Jose A. Canas
- Caia Di Carluccio
- Jordi Comín
- María S. De la Fuente
- Alessandra Di Mariano
- Jordi Corominas
- Imad Derbel
- Cristina Falabella
- Laura González
- Alejandro Jose
- Peiman Khadivipanah
- Arsleidy Mesa
- Alberto Leledema
- Luis Monforte
- Ferran Parera
- Ivan Puig
- Enrique E. Romero
- Ana Ramón
- Daniel Ruiz
- Roger Ruiz
- Xavier Sánchez
- Núria Sau
- Fernando A. Sosa
- Daniel Tarragó
- Erdem Toprak
- Saeed Touchi
- Claudia Z. Villarraga
- M. Teresa Yubero
- Cristina Valhondo
- Ningning Zhang

Industrial Processes Group

The Industrial Processes Group specializes in the field of metal forming processes, elastomers, composites and environmental impact.

The group performs applied research. There is an important collaboration in R&D with universities, research centres and companies to make them available their expertise on the following topics:

- Studies of improved manufacturing processes
- Treatment and recovery of wastes
- Development of pre/post processing interfaces for specific industrial applications, including adaptations for users with disabilities.

The activities of this group are included in the context of the Help Center Network for Technology Innovation of Catalonia Regional Government and national railway sector and industry cluster RAILGROUP (www.railgroup.net).

Research topics

1. ALGORITHMS FOR MULTIPHYSICS PROBLEMS
   • FEM for analysis of industrial forming processes (casting, mold filling, sheet metal stamping, 3D printing, friction stir welding, etc.). PIs: M. Chiumenti and C. Agelet de Saracibar

   - Particle methods for industrial forming processes. PI: J.M. Carbonell
   - Numerical methods for coupled thermal-mechanical problems for constructions and mechanical components. PIs: M. Chiumenti and M. Cervera

2. OPTIMIZATION
   • Numerical methods for optimization of industrial forming processes. PI: M. Chiumenti

Ongoing RTD Projects

- ADAMANT - Marco Computational para la Fabricación Additiva de Componentes de Aleaciones de Titánio
  - Instituto de Hidráulica e Engenharia Monotécnica
  - Projectes col·laboratius MCiu - Proyectos de I+D (Excelencia) - Acció
  - Coordinator: CIMNE - 01/12/2018 - 31/12/2020
  - AVINT - Estrategies de mecanització i predicción de la rugositat per a una intel·ligència superfiacial óptima (RISSCAT industries del futur)
  - ACCIO - Projectes col·laboratius recerca industrial (o innovació) - Coordinator: CTM - 01/01/2018 - 31/12/2020

   - Coordinator: SINTEF - 01/09/2015 - 31/08/2018

   - TRANSPORT - Ecosistema d’R+D+i per la implementació i adopció de la Fabricació Additiva/Impressió 3D a la indústria del transport (RISSCAT industries del futur)
   - ACCIO - Projectes col·laboratius recerca industrial (o innovació) - Coordinator: CIMNE - 01/01/2018 - 31/12/2020

   - Staff
     - Michele Chiumenti (Leader)
     - Josep M. Carbonell
     - Jesús Conde
     - Miquel Cervera
     - Josep M. Carbonell
     - Alberto Ferriz
     - Oscar Fruílos
     - Emilio Salsi
     - Alberto Férriz
     - M. Chiumenti
     - Marie S. De la Fuente
     - Jordi Corominas
     - Jordi Comín
     - Maria S. De la Fuente
     - Alessandra Di Mariano

3. COMPUTATIONAL SOLID AND STRUCTURAL MECHANICS
   - Structural analysis of mechanical components. PIs: M. Cervera
   - Pre/Postprocessing interfaces for industrial forming processes. PIs: O. Fruílos

Research Groups # Civil and Mechanical Engineering Area
The Structural Mechanics Group specializes in the development of next-generation numerical methods and software for the accurate and efficient solution of large scale multidisciplinary engineering problems in structural mechanics.

The research activities of the Structural Mechanics Group have spread over a range of multidisciplinary fields to which it has contributed relevant theories and methods of practical relevance.

The research achievements of the Structural Mechanics Group can be found in the field of numerical methods for the analysis and design of structures, new materials, fluid-structure interaction problems and industrial manufacturing processes are internationally recognized.

Research topics

1. ALGORITHMS FOR MULTIPHYSICS PROBLEMS
   - FEM and particle-based methods for fluid-solid-structure interaction. NM for the oil and gas industry. PI: E. Oñate

2. COMPUTATIONAL MODELLING OF ENGINEERING MATERIALS
   - Constitutive models for metallic and frictional materials (concrete, rocks, soil, ceramics, etc.). Multiscale FEM analysis of materials. Optimum material design. PI: X. Oliver
   - Material models for discrete element methods (DEM). PI: E. Oñate

3. COMPUTATIONAL SOLID AND STRUCTURAL MECHANICS
   - FEM for non-linear analysis of solids and structures. Fracture analysis in solids. PI: M. Cervera and X. Oliver

Staff

- Eugenio Oñate (Leader)
- Carlos Agelet de Saracibar
- Ivana Aras
- Mano Arroyo
- Ferran Arrufat
- Andrés Conde
- Alejandro Conde
- Juan Carlos Carreño
- Martí Coma
- Narges Dalami
- Daniel Di Capua
- Alessandro Franci
- Jose Manuel González
- Joaquín A. Hernández
- Joaquín Irazabal
- Sergio Jiménez
- Joel Jurado
- Oriol Llibereras-Valls
- Xavier Martínez
- Miguel Masó
- Juan Miquel Canet
- José Javier Muñoz
- Alejandro Núñez
- Xavier Oliver
- Carlos Pérez
- Albert Puigferrad
- Marcelo Raschi
- Fernando Rastellini
- David Roca
- Carlos A. Roig
- Riccardo Rossi
- Pavel Ryzhakov
- Fernando Salazar
- Pedro L. Sierra
- Javier San Mauro
- Ignacio Valero
- David J. Vicente
- Francisco Zárate

- On-going RTD Projects

- AVINT - Estrategias de mecanitzat i predicció de la ru- gositat: per a una integritat superficial-óptima
- ACCIO - Comunitat RISCAT industries del Futur
- ACOMBO - Código de cálculo para el análisis termo-tenso deformacional complejo de las presas bóveda
- ADAHANT - Marco Computational para la Fabricación Aditiva de Componentes de Aleaciones de Titanium

- MINECO - Retos Investigación. Proyectos I+D+I
- DRACY - Drag Reduction in Turbulent Boundary Layer via Flow Control – EC - H2020
- DSSARA - Desarrollo de un Sistema de Apoyo a las Decisiones basadas en Técnicas de IA para el manejo rutinario de la Artritis Reumatoide
- ISCIII - Acción Estratégica en Salud
- ELASTIC-FLOW - Aumento de la eficacia en procesos de mezcla y transmisión de calor utilizando fluidos viscoelásticos en régimen laminar y turbulento
- MINECO - Retos Investigación. Proyectos I+D+I
- EMUSIC - Efficient Manufacturing for Aerospace Components Using Additive Manufacturing, Net Shape HIP and Investment Casting – EC - H2020
- FIBRESHIP - Engineering, production and life-cycle management for massive application of FIBRE-based materials in large length SHIPS
- MINECO - Retos Investigación. Proyectos I+D+I

- Cofre - Computa Fusible RECuperable para la me- jora de la Seguridad Hidrológica de las Presas
- ACOMBO - Código de cálculo para el análisis termo-tenso deformacional complejo de las presas bóveda
- ADAHANT - Marco Computational para la Fabricación Aditiva de Componentes de Aleaciones de Titanium

- MINECO - Retos Investigación. Proyectos I+D+I
- DRACY - Drag Reduction in Turbulent Boundary Layer via Flow Control – EC - H2020
- DSSARA - Desarrollo de un Sistema de Apoyo a las Decisiones basadas en Técnicas de IA para el manejo rutinario de la Artritis Reumatoide
- ISCIII - Acción Estratégica en Salud
IMPRESIÓN - Desarrollo de una herramienta para el tratamiento de imágenes de presas tomadas mediante drones y su integración en el sistema de auscultación de la presa – MEIC - Retos Colaboración Proyectos I+D
Coordinator: TECOPY - 01/10/2016 - 31/12/2018

IMAGE - Inovative Methodologies and technologies for reducing Aircraft noise Generation and Emission
EC - H2020 - Coordinator: CHALMERS - 01/04/2016 - 30/06/2019

METATMAT - Computational design of acoustic and mechanical metamaterials - MCU - Proyectos de I+D
Coordinator: CIMNE - 01/01/2018 - 31/12/2020

MONICAB - Desarrollo de herramientas para la modelización numérica del efecto de la contaminación del balasto con arena en líneas de alta velocidad
MINECO - Proyectos de I+D. Retos de la Sociedad 2015
Coordinator: CIMNE - 01/01/2016 - 31/12/2018

MOVASE - Desarrollo de nuevos métodos y herramientas para la optimización del proceso de fabricación de envases de vidrio
MEIC - Retos Colaboración Proyectos I+D
Coordinator: COMPASS INC. Y SISTEMAS, S.A. - 01/07/2016 - 31/12/2018

NICE-SHIP - Development of new Lagrangian computational methods for ice-ship interaction problems
ONR - NICOP
Coordinator: CIMNE - 30/09/2016 - 01/10/2019

NUMA - Desarrollo de una plataforma para la integración de modelos NÚmericos de base física y Modelos basados en datos en la gestión de la Auscultación de presa – MEIC - Retos Colaboración Proyectos I+D
Coordinator: DACARTEC - 01/06/2016 - 31/12/2018

PABLO - Prototipo de Aliviadero de BLOques en forma de cuña
MCU - Retos Colaboración Proyectos I+D
Coordinator: PREHORQUI - 01/07/2018 - 30/06/2021

PRO2 - Ecosistema dR+D+i por la implementación i adopción de la Fabricación Additiva (Impresión 3D a fabricación de productos industriales) y a los procesos industriales de producción
ACCIÓ - Comunitat RIS3CAT Llavor3D
Coordinator: LEITAT - 01/01/2018 - 31/12/2020

PS BRIDGE - Desarrollo de un puente liviano, modular y portable con vigas Tensartity
MCU - Retos Colaboración Proyectos I+D
Coordinator: PSTECH - 01/07/2018 - 30/06/2020

ResCiclo - Evaluación de la resistencia residual de estructuras de hormigón armado sometidas a eventos sísmicos
MINECO - Retos Investigación Proyectos de I+D - 01/01/2016 - 31/12/2018

TRANSPORT - Ecosistema dR+D+i por la implementación i adopción de la Fabricación Additiva (Impresión 3D a la industria del transporte
ACCIÓ - Comunitat RIS3CAT Llavor3D
Coordinator: CIMNE - 01/01/2018 - 31/12/2020

SCAVE - Espacio interactivo, interactivo e itinerante para la gestió colaborativa de proyectos constructivos
MEIC - Retos Colaboración Proyectos I+D
Coordinator: PMS - 01/10/2016 - 31/03/2019

SIMSOLIDAM - Simulation of metal Solidification in Additive Manufacturing processes
Coordinator: INCLAM - 01/01/2016 - 31/12/2018

SMILER - Desarrollo de un Sistema basado en Machine Learning para la Reducción de pérdidas en redes de distribución de agua
MCU - Retos Colaboración Proyectos I+D
Coordinator: INCLAM - 01/07/2018 - 31/12/2020

StampackXIII - Desarrollo de un nuevo código para simulación de procesos de conformado de piezas laminares – MEIC - Retos Colaboración Proyectos I+D
Coordinator: QUANTECH - 01/10/2016 - 31/03/2019

The Building, Energy and Environment Group (BEE Group) focus on the development of numerical methods in energy saving, at building and consumer levels, and the environment.

The Building Energy and Environment Group (BEE Group) is an autonomous research unit of CIMNE centre involving over 20 researchers (Physics, Engineering, ICT, Environmental Science and Statistics specialists). It was founded in 2001 and has two main offices, one in the CAIA building of the UPC Campus in Terrassa and the other in the EUROTRADE building (C-Pere de Cabrera,16.2 G, 25002, Lleida).

BEE Group meets the challenge of employing our knowledge and experience to help users to get the best possible use out of the energy that they consume.

**Staff**

Jordi Cipriano (Leader)  
Javier Cipriano  
Xavier Cubillas  
Stoyan Danov  
Eliot Gabaldón  
Benedetto Grillo

Jaime E. Martí  
Gerard Mor  
José Santos López  
Jaume Palmer  
Daniel Pérez

**Research topics**

1. **COMPUTATION AND INFORMATION TECHNOLOGIES**
- Development of data driven models to get insights of the energy performance of huge amounts of buildings in real operation conditions.

2. **NUMERICAL METHODS AND TECHNOLOGIES FOR ENERGY AND ENVIRONMENT**
- A comprehensive work about design, implementation and installation of domestic and industrial biodigesters, adapting to simple technologies in cold climates. More than 2000 bio digesters have been installed in Latin America.
- Working actively to raise the awareness of the trend towards near zero and energy positive buildings; towards the time in the near future when buildings will produce as much or more energy than they consume.

3. **OPTIMIZATION**
- Developing technologies to maximize the flexibility of the electricity network while optimizing the use of Renewable Energy Sources in urban environments.
- Help energy users to save energy by positively manage their energy consumption with new developments to understand their behavior and performance.
On-going RTD Projects

EDI-Net - The Energy Data Innovation Network
Coordinator: DMU
01/03/2016 - 01/03/2019

FCU - Fortalecimiento de la cooperación universitaria
AECID
Coordinator: ISF
01/09/2017 - 30/03/2019

FLEXCoop - Democratizing energy markets through the introduction of innovative flexibility-based demand response tools and novel business and market models for energy cooperatives
Coordinator: Fraunhofer
01/10/2017 - 30/09/2020

REFER - Reducció Energètica i Flexibilitat en Edificis en Rehabilitació
ACC1Ó - Projectes col·laboratius recerca industrial i/o innovació
Coordinator: COMSA EMTE, S.L.
01/06/2016 - 31/05/2019

SHERPA - Shared knowledge for Energy renovation in buildings by Public Administrations
EC - MED Programme 2014-2020
Coordinator: CENCAT
27/09/2016 - 31/10/2019

Sim4Blocks - Simulation Supported Real Time Energy Management in Building Blocks
Coordinator: ZAFH
01/04/2016 - 31/03/2020

SIE3 - Sistema de Información Energética de Edificios en Ecuador
AECID - Coordinator: CINLNE
01/04/2017 - 31/03/2019

Technology transfer

The BEE Group collaborates with national and international companies and institutions since 2001. A long journey with more than 41 national and international RTD projects that has carried on a trade to emerge two new business “Start-ups”: Inergy (created in 2012) and Beedata Analytics (created in 2017).

Further information at “Spin-off Companies” section at page 68.

Risk Assessment Group

The Risk Assessment Group has made important contributions to seismic vulnerability and risk studies in Spain, Europe and Latin America. This group has developed numerous natural hazards and risk modelling studies for several countries in the Latin America and Caribbean Region, Europe, South-East Asia and Indic Ocean.

These studies have been developed for different resolution levels and with different objectives; thus, their results have been used for risk reduction, land use planning, financial risk transfer, insurance and re-insurance, and for integrated disaster risk management.

The developments performed on the vulnerability and risk evaluation and on the holistic risk approach, as well as on the development and use of risk indicators and the development of urban risk scenarios, are well known in the scientific community.

More recently, contributions have been made in the fields of probabilistic modelling of hazard and risk, economic evaluations for risk transfer and financial protection. In 2018, for example, the group has collaborated with the Inter-American Development Bank to create risk profiles for the Northern Region of Central America and Uruguay.

Staff
Alex H. Barbat (Leader)
M. Liliana Carreño (Leader)
Lucía G. Barbu
Ignasi de Pouplana
Bárbara Illacay
Julio M. Martí
Cecilia Soriano

Research topics

1. COMPUTATIONAL SOLID AND STRUCTURAL MECHANICS
Seismic vulnerability assessment of structures using computational models. Risk evaluation using deterministic and probabilistic approaches at several spatial scales for different natural hazards such as earthquakes, tsunamis, floods, drought, tropical cyclones, volcanic eruptions, among others.

2. NUMERICAL METHODS AND TECHNOLOGIES FOR ENERGY AND ENVIRONMENT
Holistic evaluation of disaster risk at different levels. Risk evaluation from a comprehensive approach taking into account socio-economic fragilities and lack of resilience of the community. Development of tools for effective and integral disaster risk management. This involves the use of the risk evaluation results in risk reduction, disaster management, and the performance evaluation of disaster risk management.

On-going RTD Projects

E-ZUANA - Evaluación de la vulnerabilidad y el riesgo de Zonas Urbanas expuestas a Amenazas Naturales y Anttropicas
MINECO - Retos Investigación- Proyectos de I+D+i
Coordinator: CINLNE
30/12/2016 - 29/12/2019
The large-scale scientific computing group develops advanced numerical methods for the simulation of problems governed by PDES, e.g., solid and fluid mechanics and electromagnetics, together with the design and implementation of scalable solvers for the arising linear systems.

**Research topics**

**PI:** S. Badia

1. **Mathematical and Computational Modelling**
   - Weakly scalable algorithms for finite element problems
   - Unfitted finite element methods
   - hp-adaptive finite elements
   - Space-time formulations and solvers
   - Optimization at large scales
   - Uncertainty and quantification at large scales

2. **Algorithms for Multiphysics Problems**
   - Preconditioners for multiphysics problems
   - Interface problems with unfitted finite elements
   - Large scale multiphysics simulations
   - Coupling of electromagnetical, thermal, and solid and fluid mechanics problems

**On-going RTD Projects**

**EFES - Algoritmos de elementos finitos para exascales y su implementación en código libre**
- **PLAN ESTATAL (2013-16)** - MINECO
- **Coordinator:** CIMNE
- **01/01/2015 - 31/02/2018**

**EUROPUSION**
- **Coordinator:** EURATOM
- **01/01/2015 - 31/02/2018**

**NuWaSim - On a Nuclear Waste Deep Repository Simulator**
- **EC - ERC-2016-PoC**
- **Coordinator:** CIMNE
- **01/11/2016 - 30/04/2018**

**Staff**

- Santiago Badia (Leader)
- Jerrad Davis Hampton
- Alberto F. Martin
- Marc Olm
- Javier Princible
- Victor Sande
- Francesc Verdugo

The Pre and Postprocessing Group works on the development of advanced methods for efficient generation of data for numerical simulations and visualization of computational results.

**Research and development activities include:**

- Geometry creation, importation and edition (CAD).
- Mesh generation.
- Interfacing between preprocessor, solvers and postprocessor.
- Visualization of huge amount of data in a 3D environment.
- Advanced visualization techniques for stereoscopic and realistic visualization.

**On-going RTD Projects**

**ACASIAES - Advanced Concepts for Aero-Structures with Integrated Antennas and Sensors**
- **Coordinator:** NLR
- **01/06/2017 - 31/05/2020**

**Staff**

- Abel Coll (Leader)
- Enrique Escalona
- Javier Cárast
- Adrià Melendo
- Anna Morenos
- Miguel A. Pasenau

The main commercial product of the group is the software GiD, which is a universal pre and postprocessor (www.gidhome.com) able to be connected with several numerical simulation codes and provide them with several advanced tools in the geometry creation and edition, mesh generation, assignment of data to the geometry or mesh, advanced visualization tools, and results visualization.
On-going RTD Projects

BIRMiTICA - Digitalización de los Procesos de Prevención de Riesgos Laborales en el Sector de la Construcción
MCIU - Retos Colaboración: Proyectos I+D
Coordinator: COMSA - 01/07/2018 - 31/12/2020

COFRE - Diseño Industrial de una Cúpula Fusible Reúperable para la mejora de la Seguridad Hidrológica de las Presas
MCIU - Retos Colaboración: Proyectos I+D
Coordinator: Ventilación, Estructuras y montajes metálicos, SL - 02/07/2018 - 30/06/2021

EnETNetMob - Mediterranean Interregional Electromobility Networks for intermodal and interurban low carbon transport systems
EC - MED Programme 2014-2020
Coordinator: RECPEL - 01/02/2018 - 31/01/2022

ONLBlockChain - Implementación de un prototipo pre-industrial de ultracongelación utilizando CPL y desarrollo de herramientas de trazabilidad mediante el concepto Blockchain
MCIU - Retos Colaboración: Proyectos I+D
Coordinator: E4EFFICIENCY - 01/07/2018 - 30/06/2021

IMPRESIÓN: Desarrollo de una herramienta para el tratamiento de imágenes de presas tomadas mediante drones y su integración en el sistema de auscultación de la presa
MEIC - Retos Colaboración: Proy. I+D
Coordinator: TECOPY - 01/10/2016 - 31/12/2018

Coordinator: RISE - 01/05/2019 - 30/04/2023

PABLO - Prototipo de Aliviadero de BLOques en forma de cuña - MCIU - Retos Colaboración: Proyectos I+D
Coordinator: PREHORQUI - 01/07/2018 - 30/06/2021

PAVIRE - Plataforma TIC para la Gestión del Estado del Pavimento y su influencia en el consumo con información cruzada del tipo de conducción
MCIU - Retos Colaboración: Proyectos I+D
Coordinator: COMSA - 01/07/2018 - 31/12/2020

PS BRIDGE - Puente liviano, modular y portable con viga Tensarility - MCIU - Retos Colaboración: Proyectos I+D
Coordinator: PSTEC - 01/07/2018 - 30/06/2020

PICASSO - Preventing Incident and Accident by Safer Ships on the Oceans
EC - INEA - CEF Programme 2014-2020
Coordinator: Sasamar - 01/06/2016 - 30/06/2018

SCAVE - Espacio inmersivo, interactivo e itinerante para la gestión colaborativa de proyectos constructivos
MINECO - Retos Colaboración: Proyectos I+D
Coordinator: PMS - 01/10/2016 - 31/03/2019

Coordinator: SYNVO - 01/09/2017 - 29/02/2020

SMILER - Sistema basado en Machine Learning para la Reducción de pérdidas en redes de distribución de agua - MCIU - Retos Colaboración: Proyectos I+D
Coordinator: INCLAM - 01/07/2018 - 31/12/2020

STM Validation Project
EC - CEF Programme 2014-2020
Coordinator: Swedish Maritime Administration 01/01/2015 - 30/06/2019

TERRE - Training Engineers and Researchers to Rethink geo-technical Engineering for a low carbon future - H2020 (2014-2020) - EC
Coordinator: University of Strathclyde 01/10/2015 - 31/10/2019

The Information and Communication Technology Group of CIMNE specializes in research, development and innovation of new and disruptive technologies, applicable to multiple engineering areas.

The group activities aim to improving simulation tools, smart embedded systems, Artificial Intelligence (AI) and GIS in order to develop Decision Support Systems (DSS) and prediction systems for advancing knowledge and real-time decision making in engineering areas. The Information and Communication Technology Group of CIMNE specialises in research, development and innovation of new and disruptive technologies, applicable to multiple engineering areas.

Research topics

1. COMPUTATION AND INFORMATION TECHNOLOGIES (PI: J. Jiménez)
   - Decision Support Systems
   - Smart Management Systems
   - Internet of Things
   - App Technology
   - Embedded ICT Systems
   - Internet Tools
   - GIS (2D/3D)
   - WSN Deployments
   - BOT Technology
   - Blockchain
   - Machine Learning
   - Virtual and Augmented Reality
   - Data Science and Artificial Intelligence

The research topics of the Information and Communication Technology Group aim to improve simulation tools, smart embedded systems, Artificial Intelligence (AI) and GIS in order to develop Decision Support Systems (DSS) and prediction systems, advancing knowledge and real-time decision making in engineering areas.
With the integration of CENIT in CIMNE in 2017, synergies in research, development and technology transfer on the transport field have been enhanced.

The Centre for Innovation in Transport (CENIT) was incorporated in CIMNE as a new research group in the area of transport. This has contributed to provide solutions on the transport and mobility area of interest to society from a cross-cutting point of view.

**Research topics**

1. **TRANSPORT SYSTEM ANALYSIS** (PI: S. Saurí)
   - Urban Mobility
     - Public Transport
     - Travel Behavior
     - Transport Economics
     - Urban Freight Distribution
   - Electromobility and Traffic Modelling

2. **OPTIMIZATION**
   - Assessment of transport investments and policies, improvement of public transport networks, optimization of operations, application of technology to transportation, demand modeling and urban mobility.

**Staff**

- Sergi Saurí (Leader)
- Pere Arrom
- Eglantina Dani
- Irene de Cubas
- Julia García
- Javier Carrido
- Francesc Gasparín
- Umit Gul
- Miquel Jofra
- Genís Majoral

- Pau Morales
- Moisés Ortega
- Domingo Peñalver
- Francisco Rodero
- Kristi Ann Shalla
- Ana Elisabeta Ripoll-Zarraga
- Jose Ignacio Torres

**On-going RTD Projects**

- EnrNETMob - Mediterranean interregional Electromobility Networks for intermodal and interurban low carbon transport systems
  - EC - MED Programme 2014-2020
  - Coordinator: REGPEL
  - 30/12/2018 - 31/01/2022

- INTERMODEL - Simulation using Building Information Modeling Methodology of Multimodal, Multipurpose and Multiproduct Freight Railway Terminals Infrastructures (TRA.16P042)
  - Coordinator: IDP Ingeniería y Arquitectura Iberia SL
  - 01/09/2016 - 31/08/2019

- LASH FIRE - Legislation Assessment addressing Safety Hazards of Fire and Innovations in Ro-ro ship Environments
  - Coordinator: RISE
  - 01/05/2019 - 30/04/2023

- NOVELOG - New cooperative business models and guidance for sustainable city logistics infrastructures
  - Coordinator: CERTH
  - 01/06/2015 - 31/05/2018

- GrowSmarter - Transforming cities for a smart, sustainable Europe
  - Coordinator: STOCKHOLMS STAD
  - 01/01/2015 - 31/12/2019

- REG4SSEA - Estrategias regulatorias para fomentar el transporte sostenible a través del Short Sea Shipping
  - MINECO - Retos Investigación: Proyectos de I+D+I
  - Coordinator: CENIT
  - 10/08/2020 - 12/07/2023

**Photo:** Optimization traffic regulation of 22 @ District
The Aerospace Engineering Group develops innovative research in the fields of aeronautics and space, optimization and data modelling, as well as fuel cells.

The group deals with research in fluid dynamics, optimization, and fuel cells technology and also collaborates with other CIMNE groups in composites materials analysis and IT technology applied to sensing and data management.

Research topics
1. COMPUTATIONAL FLUID DYNAMICS (CFD)
   • FEM and meshless methods for aerodynamics analysis and drag reduction in aeronautics.
     PIs: J. Pons-Prats and E. Ortega

2. OPTIMIZATION
   • Optimization algorithms for robust optimal design, shape optimization and material design in aeronautics.
     PIs: J. Pons-Prats and E. Ortega

Staff
Jordi Pons-Prats (Leader)
Gabriel Bugeda
Marti Coma
Roberto M. Flores
Oriol Frigola
Jacques Périaux
Enrique Ortega

On-going RTD Projects
AVINT - Estratègies de mecanització i predicción de la rugositat per a una integritat superficial óptima
ACCIÓ - RISCAT - Coordinator: CTM
01/07/2017 - 30/06/2020

DRACY - Drag Reduction in Turbulent Boundary Layer via Flow Control
01/04/2016 - 31/03/2019

ExaQute - EXAscale Quantification of Uncertainties for Technology and Science Simulation
01/06/2018 - 31/03/2019

ECO-COMPASS - Ecological and Multifunctional Composites for Application in Aircraft Interior and Secondary Structures
01/04/2016 - 31/03/2019

FIBRESHIP - Engineering, production and life-cycle management for massive application of FIBRE-based materials in large-length SHIPs
01/04/2016 - 31/03/2019

Coordinator: ERDYN - 01/10/2017 - 31/03/2020

IMAGE - Innovative Methodologies and technologies for reducing Aircraft noise Generation and Emission
01/04/2016 - 31/03/2019

CIMNE has a large experience in conducting RTD projects in naval and marine engineering.

The main activities of the Naval and Marine Eng. Group are related to the development and application of computational methods and computer aided design and verification tools on the following topics:

- Hydrodynamic and seakeeping analysis of vessels and marine structures
- Hydro-elasticity and fatigue analysis in large marine structures
- Navigation in ice (ice-structure interaction)
- Environmental problems in marine and ocean engineering
- Near-time simulation (operational) tools for ocean wave converters
- Design and assessment of offshore wind turbines and ocean energy converters
- Optimization and design support systems in naval architecture and ocean engineering

Research topics
1. COMPUTATIONAL FLUID DYNAMICS (CFD)
   Semi-Lagrangian methods for hydrodynamic analysis of ships and marine structures.
   PIs: B. Serván and J. García

2. OPTIMIZATION
   Optimal design of ship hulls, wind energy structures and offshore structures.
   PIs: B. Serván and J. García

Staff
Julio García (Leader)
Daniel Di Capua
Jesús Carbajosa
Jonathan Colom
Rafael Pacheco
Borja Serván

On-going RTD Projects
FIBRESHIP - Engineering, production and life-cycle management for massive application of FIBRE-based materials in large-length SHIPs
Coordinator: TSI - 01/06/2017 - 31/05/2020

STM Validation Project
EC - CEF Programme 2014-2020 - MAP
Coordinator: Swedish Maritime Administration
01/01/2015 - 31/12/2018

NICE-SHIP - Development of new Lagrangian computational methods for ice-ship interaction problems
ONR - NICOP
Coordinator: CIMNE - 30/09/2016 - 01/10/2019

MOVASE - Desarrollo de nuevos métodos y herramientas para la optimización del proceso de fabricación de envases de vidrio
MEIC - Retos Colaboración: Proyectos I+D
Coordinator: COMPASS Ing. y Sistemas, S.A.
01/07/2016 - 31/12/2018
Research Webometrics Ranking

Recently, it has been published the twelfth edition of Webometrics Ranking of Spanish researchers and researchers working in Spanish Institutions (Spain) according to their Google Scholar Citations public profiles (http://www.webometrics.info).

This edition data was collected during the last week of February 2019. The list includes the top 65,000 profiles ranked by H-index in decreasing order and then by the total number of citations.

Eugenio Oñate, professor of the School of Civil Engineering of UPC, is in the position 261th of the ranking with a H-index of 69 and 20,055 citations.

There are 123 CIMNE researchers listed in Webometrics, four of them in the 1,000 first positions:
- Prof. Eugenio Oñate (261th position)
- Prof. Antonio Cens (400th position)
- Prof. Eduardo Alonso (724th position)
- Prof. Antonio Huerta (919th position)

This list ranks Prof. Eugenio Oñate, director of CIMNE, as the highest cited researcher of Universitat Politècnica de Catalunya - BarcelonaTech (UPC).

Research Webcindario Ranking

Another reference website in research ranking is Webcindario (https://indice-h.webcindario.com). In March 2019, it has updated its yearly list about prizes, women researchers and its ranking list by provinces.

The following list is a summary of the Webcindario researchers that appear in the one made by DHI Group / Webcindario.

Researcher Name (H (ISI/DII) Hindex): Knowledge area:
- Oñate, Eugenio (1,5); Mathematics, Interdisciplinary Applications (Ranked Nº1 in this field)
- Cens, Antonio (1,3); Engineering, Geographical
- Huerta, Antonio (1,7); Mathematics, Interdisciplinary Applications
- Alonso, Eduardo (1,03); Engineering, Geographical
- Idelsohn, Sergio (0,7); Mathematics, Interdisciplinary Applications
- Oller, Sergio (0,1); Mathematics, Interdisciplinary Applications; Mechanics; Engineering, Multidisciplinary
- Barral, Alex H. (32); Engineering, Civil
- Arroyo, Marino (3,9); Mathematics, Interdisciplinary Applications; Mechanics
- Agost de Saracibar, Carlos (8); Engineering, Multidisciplinary

Webcindario Ranking

RANKING OF CIMNE SCIENTISTS IN SPAIN (WEBOMETRICS.INFO)

<table>
<thead>
<tr>
<th>NAME</th>
<th>H-INDEX</th>
<th>CITATIONS</th>
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<tr>
<td>Eugenio Oñate</td>
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<td>Jerard Hampel</td>
<td>51103</td>
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</tr>
</tbody>
</table>

SEE FULL LIST ON CIMNE.COM/RESEARCH-RANKINGS
CIMNE publishes books, journals, monographs, scientific reports and educational software on the theory and applications of numerical methods in engineering and applied science. The publications of CIMNE can be visited and ordered via Internet on the website cimne.com. Most publications can be freely downloaded from the web. We list below the publications of CIMNE in 2018.

### Papers in Journals

In 2018 CIMNE researchers have published 100 papers in 3CR Journals:


Scipedia (scipedia.com, https://goo.gl/XNfjQb) is an initiative promoted by CIMNE for fostering the publication and dissemination of documents in Open Access format and which has several innovative features.

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CIMNE has its own institutional profile in Scipedia that consists of four sections: Overview, Publications, Members and Analytics.

This space is a repository of papers, monographs, technical reports and conference lectures given by CIMNE researchers, as well as we can find here the magazine “Revista Internacional de Métodos Numéricos en Ingeniería”, edited by CIMNE. To sum up, a comfortable site where is possible find all the scientific production of CIMNE and interact with its members.

CIMNE RTD activities are based on a holistic approach.

CIMNE aims at providing comprehensive solutions for solving problems that affect human beings, through the integration of existing knowledge in a particular field with quantitative information emanating for prediction methods, such as computational-based techniques, and experimental measurements.

These four concepts, the problem to be solved, computational methods, experimental methods and existing knowledge can be represented by the tetrahedron shown in the figure above. Each of the nodes is connected to the other three by lines that represent information transfer pipelines.

The holistic approach for solving problems at CIMNE:

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The holistic approach for solving problems at CIMNE:
CIMNE Products

PRE AND POST PROCESSING SOFTWARE

**GID**
A universal and adaptive pre and postprocessor for computer simulation in engineering and applied science. Developed & marketed by CIMNE since 1998. [www.gidhome.com](http://www.gidhome.com)

**DIPPO**
Versatile platform for digital image processing combined with numerical modelling and simulations. Developed and marketed by CIMNE since 2011.

ENGINEERING SYSTEMS AND HARDWARE

**INFATABLE STRUCTURES**
Inflatable pavilions, shelters and bridges for applications in engineering and architecture. Developed by Buildair and CIMNE. Marketed by Buildair since 2002. [buildair.com](http://buildair.com)

**OKO**
Interactive frame for displaying images and videos. Developed by CIMNE. Marketed by Tecnologías Avanzadas para el Ocio (TAOC). SL since 2016. [okoproject.com](http://okoproject.com)

**WATER-PS**

COLLABORATIVE WORK PLATFORMS

**MI COLEGIO EN RED**
Communications system and integrated services designed specifically for schools via the Internet. Developed and marketed by CIMNE since 2000. [cimne.com/mcr](http://cimne.com/mcr)

**FRAKTLIS**
Fully customizable web application that creates virtual communities where users can communicate and share. Developed and marketed by CIMNE since 2009. [fraktalis.com](http://fraktalis.com)

**LHINGS**
Cloud platform to provide access and links to all kind of things and let users management, share and interaction with them. Developed and marketed by Lyncos SL and CIMNE. [lhings.com](http://lhings.com)

**SIGPRO**
Integrated software platform for the management of the research and financial activities and reports in RTD projects. Developed by CIMNE. [cimne.com/sigpro](http://cimne.com/sigpro)

**SCIPEDIA**
Web platform for free publishing and open access of scientific publications. Developed by Scipedia, S.L in cooperation with CIMNE. Marketed by Scipedia, S.L since 2016. [scipedia.com](http://scipedia.com)

EDUCATIONAL SOFTWARE

**MAT-FEM**
Educational program in MATLAB for introduction to the finite element method for analysis of structures and field problems. Developed by CIMNE. [cimne.com/mat-fem](http://cimne.com/mat-fem)

**SCEPEDIA**
Web platform for free publishing and open access of scientific publications. Developed by Scipedia, S.L in cooperation with CIMNE. Marketed by Scipedia, S.L since 2016. [scipedia.com](http://scipedia.com)

DECISION SUPPORT SYSTEMS

**BEACHING**
Information system for management of tourism activities in beach areas. Developed by CIMNE and marketed by TAOC SA since 2011. [beaching.com](http://beaching.com)

**RMOP**
Integrated platform for robust multobjective optimization in engineering. Developed by CIMNE. [tts.cimne.com/RMOP](http://tts.cimne.com/RMOP)
DECISION SUPPORT SYSTEMS

GIS+
Web-based interactive Geographic Information System. Developed by CIMNE.

SIE
Information system for management of energy consumption in public buildings and municipalities. Developed by CIMNE. Marketed since 2005 by Casso Auditores SL and CIMNE. [energybcn.com]

ROEM
Information system for assessment of the environmental quality in reservoirs and lakes. Developed by CIMNE.

E-TESTING

FLOOD
Artificial neuronal network package. Developed by CIMNE. [cimne.com/flood]

RAMFLOOD
Decision support system for risk assessment and management of floods. Developed by CIMNE and Flumen. [www2.cimne.com/ramflood]

RAMWASS
Decision support tool for the risk assessment and management of environmental and human-induced hazards on the water/sediment/soil system in fluvial ecosystems. Developed by CIMNE.

WEB-PACK
An integrated platform for e-monitoring using wireless sensor network technology. Developed by CIMNE. [www2.cimne.com/wsnp]

BEEDATA
Open source Big Data Analytics platform for deep analysis of massive data coming from smart metering infrastructure of utility companies. Developed by CIMNE and marketed by Inergy. [beedataanalytics.com]

SIMULATION SOFTWARE FOR INDUSTRIAL PROCESSES

WELDPACK
Welding processes software. Developed by CIMNE.

STAMPACK
Software for sheet metal forming processes. Developed by Quantech ATZ, SA and CIMNE. Marketed by Quantech ATZ, SA since 1999. [stampack.com]

CLICK2CAST
Software for fast simulation of casting processes. Developed by Quantech ATZ in cooperation with CIMNE. Marketed by Altair since 2015.

SCUT
Software able to simulate cutting processes for the metal manufacturing industry. Developed by CIMNE.

ADD2MAN
Additive manufacturing processes software. Developed by CIMNE in cooperation with Eurecat.

FORGEPACK
Forging manufacturing processes software. Developed by CIMNE.

MACHPACK
Software able to simulate machining manufacturing processes. Developed by CIMNE.

SPREADDEM
Simulation software for the study of the particle flow on centrifugal fertilizer spreaders. Developed and marketed by CIMNE. [cimne.com/spreaddem]
SIMULATION SOFTWARE FOR MULTIPHYSICS

**KRATOS**
Object-oriented software platform for the development and application of finite element codes for multidisciplinary applications. Developed by CIMNE.
[cimne.com/kratos]

**ERMES**
Computational electromagnetics using advanced finite element methods. Developed by CIMNE.
[tts.cimne.com/ermes]

**PFIRE**
Analysis of propagation of fire and its effect on the burning and melting of objects. Developed by CIMNE.

gd cimne.com/kratos
gd tts.cimne.com/ermes
gd cimne.com/pfire

SIMULATION SOFTWARE FOR FLUID DYNAMICS

**TDYN**
Finite element code for analysis of a wide range of multi-physic problems in engineering and applied science. Developed by Compass Ingeniería y Sistemas, SA and CIMNE. Marketed by Compass since 2003.
[compassis.com]

**SEAFEM**
[compassis.com]

**PFLOW**
Analysis of fluid dynamics and fluid-structure-soil-thermal interaction problems into the Particle Finite Element Method (PFEM). Developed by CIMNE.
[cimne.com/pfem]

gd compassis.com
gd cimne.com/seafem
gd cimne.com/pflow

PARACHUTES
Computer program for the fast simulation of parachute-payload systems. Developed and marketed by CIMNE since 2016.
[cimne.com/parachutes]

SIMULATION SOFTWARE FOR STRUCTURAL ENGINEERING

**RAMSERIES**
Finite element code for analysis of structures in engineering and architecture. Developed by Compass Ingeniería y Sistemas, SA and CIMNE. Marketed by Compass since 2003.
[www.compassis.com]

**DEMPACK**
Analysis of granular systems and multi-structuring problems in geomechanics and industrial processes using discrete and finite element methods. Developed by CIMNE.
[cimne.com/dem]

**COMET**
Finite element code for nonlinear analyses of thermomechanical problems in solids and structural mechanics accounting for frictional contact situations. Developed by CIMNE.
[cimne.com/comet]

BIOMECHANICS & HEALTH

**HEALTH APP**
App to control eating disorders. Developed by HealthApp in cooperation with CIMNE. Marketed by HealthApp SL since 2014.
[bcnhealthapp.com]

**BODYGID**
Multiscale representation and analysis of the human body. Developed by CIMNE.
[cimne.com/bodygid]

VISIT CIMNE PRODUCTS AT C IMNE.COM/PRODUCTS

CIMNE Annual Report # Innovation and Technology Transfer
Spin-off companies

CIMNE TECNOLOGÍA, SA
Created in 2011

cimnetecnologia.com
Company 100% owned by CIMNE aiming to industrialize and market the products and technology developed at CIMNE. CIMNE Tecnología SA. is also an incubator and promoter of new companies.

COMPASS INGENIERÍA Y SISTEMAS, SA
Created in 2002
compassis.com
It develops commercial activities related to numerical methods in engineering, with emphasis on civil, naval and maritime engineering. CIMNE owns 24% of COMPASS.

INGENIA AIE
Created in 2006
EIG formed by several companies and CIMNE. The objective is to promote the participation of its members in projects of aeronautics and the space field, in cooperation with the main international manufacturers in the sector.

QUANTECH ATZ
Created in 1996
quantech.es
Development and marketing of simulation software for production processes.

BUILDAIR INGENIERÍA Y ARQUITECTURA, SA
Created in 2001
buildair.com
Inflatable structures for engineering and architecture applications. CIMNE Tecnología SA owns 2.5% of Buildair.

BEEDATA ANALYTICS, SL
Created in 2017
beedatanalytics.com
ICT services based on mass analytical data treatment to users and business intelligence for companies and institutions. CIMNE Tecnología owns 49.36% of Beedata Analytics, SL.

BIOMECHANICS DEVELOPMENTS, SL
Created in 2015
cimnetecnologia.com/links.aspx
Software solutions and services in biomedical field. CIMNE Tecnología SA owns 43.67% of Biomechanics Developments.

COMPUTATIONAL AND INFORMATION TECHNOLOGIES, SA
Created in 2012
citechnsa.com
Computational methods and information technology systems engineering 100% owned by CIMNE Tecnología SA.

FRESH WATER NATURE, SL
Created in 2013
freshwaternature.com
Solutions for obtaining fresh water from desalination and distillation of waste water. The company is 92.99% owned by CIMNE Tecnología SA.

INLOC ROBOTICS, SL
Created in 2014
inlocrobotics.com
Positioning and navigation solutions for mobile robots in buried environments. CIMNE Tecnología owns 77.3% of INLOC Robotics since October 2015.

PORTABLE MULTIMEDIA SOLUTIONS, SL
Created in 2013
portablemultimediасomulations.com
Mobile pavilions with multimedia technology for leisure, sport and events. 10% owned by CIMNE Tecnología SA.

PNEUMATIC STRUCTURES TECHNOLOGIES, SL
Created in 2015
ps-technologies.com
Pneumatic structures for a wide range of engineering problems. 10% owned by CIMNE Tecnología SA.

SCIPEDIA, SL
Created in 2015
scipedia.com
Free publishing and open access for scientific publications. CIMNE Tecnología owns 16.67% of Scipedia, SL.

FRESH WATER NATURE, SL
Created in 2013
freshwaternature.com
Solutions for obtaining fresh water from desalination and distillation of waste water. The company is 92.99% owned by CIMNE Tecnología SA.

OKTICS ATZ, SL
Created in 2019
okobusiness.com
Digital Signance Technologies and products. CIMNE Tecnología SA owns the 24.5% of OKTICS ATZ SA.

HealthApp

HEALTHAPP, SL
Created in 2013
bcnhealthapp.com
Software for treatments of eating disorders. It improves the links therapist/patient. 18.52% owned by CIMNE Tecnología SA.

LYNCS TECHNOLOGIES, SL
Created in 2012
things.com
Software and systems for the Internet of Things. CIMNE Tecnología SA owns 4.77% of Lyncs Technologies, SL.

OKTICS ATZ, SL
Created in 2019
okobusiness.com
Digital Signance Technologies and products. CIMNE Tecnología SA owns the 24.5% of OKTICS ATZ SA.

LYNCS TECHNOLOGIES, SL
Created in 2012
things.com
Software and systems for the Internet of Things. CIMNE Tecnología SA owns 4.77% of Lyncs Technologies, SL.

CIMNE COMPANIES AT CIMNE.COM/COMPANIES

VISIT

CIMNE Annual Report # Innovation and Technology Transfer

SPIN-OFF COMPANIES

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69
CIMNE, leader in research on computational engineering, has established relevant alliances with international institutions and companies since its creation in 1987.

**Alliances**

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**Pilot Center of ERCOFDAC in Spain**

Since 1989

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**Secretariat of SEMNI**

Since 1989

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**Secretariat of ECCOMAS**

Since 1992

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**Secretariat of IACM**

1994 - 2016

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**Partner of FLUMEN**

Since 2012

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**Creation of AIAC**

Since 2015

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**CIMNE host of UNESCO Chair of Numerical Methods in Engineering**

Since 1989.

Prof. Olgierd Zienkiewicz was UNESCO Chair until his death (2009)

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**UNESCO and UPC · BarcelonaTech**

reached an agreement to create the first UNESCO chair in the world in 1989: the UNESCO Chair of Numerical Methods in Engineering.

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The main mission of the Chair is to promote the development, dissemination and application of numerical methods in engineering at an international level, through education, research and technology transfer, with the aim of contributing to the solution of complex problems in lower income countries.

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**Unesco Chair in Numerical Methods in Engineering**

**UNESCO and UPC · BarcelonaTech**

reached an agreement to create the first UNESCO chair in the world in 1989: the UNESCO Chair of Numerical Methods in Engineering.

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Prof. O. C. Zienkiewicz held the UNESCO Chair since its creation in 1989 until his death on January 2nd, 2009.

Since 2009 Dr. Jacques Périaux is the Chairholder of the UNESCO Chair of Numerical Methods in Engineering. He is a recognized expert in the field of numerical methods applied to aerospace engineering.

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Dr. Périaux contributions have resulted in a significant increase in the RTD activities of CIMNE in the aerospace sector, in particular with academic organizations and industry in China, the organization of numerous training courses, exchanges with leading scientists worldwide and several RTD projects at an international level.

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It is important to note that computational methods are especially useful in resource-limited countries because they enhance the ability of people to predict outcomes and optimize solutions before committing resources to specific investments.

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Dr. Cecilia Soriano is the coordinator of the UNESCO Chair of Numerical Methods in Engineering.

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An important UNESCO Chair activity over the years has been the creation of a series of “Aulas CIMNE” (CIMNE Classrooms), physical spaces of collaboration with other research groups in universities and research centers located mainly in Latin America and Europe. All nodes in the network connected to each other are using, transforming and broadcasting knowledge generated in CIMNE over the last thirty years.

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Both the people and the knowledge generated by the network members easily circulate within the network. “Aulas CIMNE” is now a growing network of centers of excellence in research and training in the field of numerical methods.

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A priority in the network is the promotion of joint projects in research and training using international competitive funds and existing programs that target specific local needs. Links with scientific groups and other organizations established locally are also actively encouraged. The network is the seed for creating other expected nodes in countries of Africa and Asia.

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Dr. Cecilia Soriano is the coordinator of the UNESCO Chair of Numerical Methods in Engineering.

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CIMNE Annual Report # Alliances
SEMNI

Sociedad Española de Métodos Numéricos en Ingeniería

Since 1989 CIMNE supports the activities of the Spanish Association for Numerical Methods in Engineering (SEIMEN).

The basic aims of SEMNI are the organization and coordination of all activities related to numerical methods in engineering in Spain and being the Spanish representative in the International Association for Computational Mechanics (IACM).

SEMNI is linked to similar associations in other countries, such as the European Community on Computational Methods in Applied Sciences (ECCOMAS), the International Association for Computational Mechanics (IACM), the Groupe pour l'Avancement des Méthodes Numériques de l'Ingénieur in France, the United States Association for Computational Mechanics in the United States, and the Asociación Argentina de Mecánica Computacional, among others.

The headquarters and the secretariat of SEMNI are based in CIMNE. Currently, SEMNI has over 400 members worldwide. Some of the main activities of SEMNI include the organization of technical workshops and the organization of the Spanish Conference on Numerical Methods in Engineering, held every two years.

SEMNI will organize, jointly with the Portuguese association APMTAC, the congress CMN 2019 (Congress on Numerical Methods in Engineering) on July 1-3, 2019, in the city of Guimarães (Portugal). During the event, it will be awarded the Prize SEMNI Olgierd Zienkiewicz to Manuel Doblare and the Prize SEMNI Juan Carlos Simó to Joan Baiges. The best theses of the year will also be awarded.

CIMNE Annual Report # Alliances
ECCOMAS
European Community on Computational Methods in Applied Sciences

ECCOMAS is a scientific organization founded in 1992. It groups European associations with interests in the development and application of computational methods in applied sciences and technology. The ECCOMAS Secretariat is located at CIMNE.

The mission of ECCOMAS is to promote joint efforts of European universities, research institutes and industries which are active in the broad field of numerical methods and computer simulation in Engineering and Applied Sciences (i.e. Computational Solid and Structural Mechanics, Fluid Dynamics, Acoustics, Electromagnetics, Physics, Chemistry, Applied Mathematics, and Scientific Computing), to address critical societal and technological issues with particular emphasis on multidisciplinary applications and disseminate innovative research.

The three main scientific events that ECCOMAS organizes every four years are the ECCOMAS Congress, the ECCOMAS Conference on Computational Solid and Structural Mechanics (ECCM) and the ECCOMAS Conference on Computational Fluid Dynamics (ECFD). They attract approximately 5,000 participants in total.

The ECCOMAS Congress is addressed to scientists and engineers both in and outside Europe. Its main objective is to provide a forum for presentation and discussion of state-of-the-art in scientific computing applied to engineering, with emphasis on basic methodologies, scientific development and industrial applications. It also includes invited lectures, Special Technological Sessions (STS), contributed papers from Academy and Industry and organized Minisymposia. Proceedings of the ECCOMAS Congresses are widely disseminated in Europe.

The next ECCOMAS Congress will be jointly organized with the 14th World Congress on Computational Mechanics (WCCM XIV) in Paris, France, on 19-24 July 2020.

The International Association for Computational Mechanics (IACM) was founded in 1981 and, since then, it has been strongly connected to CIMNE.

The goal of IACM is the promotion of advances in computational mechanics in a wide sense. IACM defines computational mechanics as the development and application of numerical methods and digital computers to solve problems in engineering and applied sciences with the objectives of understanding and harnessing the resources of nature.

Computational Solid Mechanics (CSM) and Computational Fluid Dynamics (CFD) are at the core of IACM activity. Subjects such as thermodynamics, electromagnetics, rigid body mechanics, control systems and some aspects of particle physics fall naturally within the scope of the IACM. Indeed providing a common forum for discussion, education and research information transfer between the diverse disciplines represented is the main raison d’être of IACM.

IACM publishes a periodic bulletin and supports Special Interest Conferences, IACM Symposia and courses in various fields of computational mechanics. The next World Congress of the IACM will take place in Paris, in 2020 (19-24 July).

From 22 to 27 July, 2018, the IACM and the United States Association for Computational Mechanics (USACM), in cooperation with the Columbia University and the University of Texas, organized jointly the 13th World Congress on Computational Mechanics (WCCM XIII) and 2nd Panamerican Congress on Computational Mechanics (PANACM II) in New York City (EEUU). During this event, Prof. Antonio Huerta was elected new President of the IACM. Full professor in civil engineering at the Technical University of Catalonia (UPC) and a regular collaborator of CIMNE, Prof. Huerta had been the General Secretary of the IACM in the period 2010-2018.

IACM publishes a periodic bulletin and supports Special Interest Conferences, IACM Symposia and courses in various fields of computational mechanics. The next World Congress of the IACM will take place in Paris, in 2020 (19-24 July).

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IACM publishes a periodic bulletin and supports Special Interest Conferences, IACM Symposia and courses in various fields of computational mechanics. The next World Congress of the IACM will take place in Paris, in 2020 (19-24 July).

Prof. Huerta, new IACM President at WCCM XIII

Conference during WCCM XIII
The ERCOFTAC network was founded in 1987. It is promoted by several European aerospace companies and it groups together more than 60 research centers and companies working primarily in the numerical simulation of fluid mechanics problems in engineering.

Since 1989, CIMNE is a Pilot Centre of ERCOFTAC in Spain.

CIMNE, acting as Pilot Centre, has organized a number of activities, including, among others, the 8th European Turbulence Workshop (Barcelona 2000), the Europe-Russia Workshop (Barcelona 2006), the 3rd Workshop on Research in Turbulence (Seville 2008), the 5th Workshop on Research in Turbulence (Tarragona 2010) and ERCOFTAC Spring Festival (Terrassa 2014).

CIMNE has coordinated the FP7 E-Caero projects 1 and 2 (E-CAERO: European Collaborative Dissemination of Aeronautical research and applications, 2009-2013 and 2014-2017). Both projects aim to promote joint activities of different scientific associations in the aeronautic field in Europe. ERCOFTAC is a partner in both projects.

AIAC
International Association of Aulas CIMNE

The International Association of Aulas CIMNE (AIAC) is a non-governmental non-profit civil organization with the objective of fostering the advances of numerical methods in a common academic space: the Aulas CIMNE (Joint Labs). Aulas CIMNE are the basis for cooperation in scientific, technological and training among its members, aiming to achieve social and economic improvements in society.

Mission
To contribute to the development, strengthening and consolidation in:
- Training, by promoting and organizing courses of interest to its members.
- Scientific and technological research, including the processes of innovation, adaptation and technology transfer in strategic areas.
- The use of numerical methods in engineering as a tool to help developing countries.
- The interaction of the members of the Association with the society at large, by disseminating scientific and technological advances that drive progress.

AIAC members benefit from:
- Continuous education, enhancing the set of high-level human resources of Aulas CIMNE and the Network and by the competitive advantage of installed capacity in the regions.
- The development of multi- and inter-disciplinary activities in areas of basic research, applied research and experimental developments.
- Exchange programs for teachers, researchers, students and academic and innovation managers.
- Research and development programs in emerging knowledge areas, related to new professional profiles identified as strategic.

AIAC’s vision
To promote a common project and create a network of experts from around the world, which results in the international benchmark in the field of numerical methods in engineering.

AIAC intends to encompass an international environment in which scientists, technical staff and engineers can benefit directly from CIMNE’s tools (developed or in development), international collaborations, participation in projects, exchange of information and industry technology transfer, among others.
Knowledge transfer is of vital importance for CIMNE, which invests great efforts in training and education addressed to its research staff as well as to graduates and professionals from schools of engineering and universities in applied sciences.

CIMNE regularly organises seminars, coffee talks, courses and post-graduate studies related to the theory and application of numerical methods in engineering. It has also developed a web environment for distance learning education via Internet.

The research centre plays also an important role as event organizer in the field of computational engineering. In the following pages, a summary of the conferences organized by CIMNE Congress Bureau during 2017 can be found. The wide agenda of congresses and conferences that will take place during 2018-2019, it is also included.

Post-graduate Studies

CIMNE supports the organization of the following postgraduate degrees awarded by the UPC - BarcelonaTech.

Master Degrees
- Master on Numerical Methods in Engineering
  Duration: 2 academic years, 120 ECTS
  cimne.com/mumni
- Master of Science on Computational Mechanics
  Duration: 2 academic years, 120 ECTS
  cimne.com/mcm

Doctoral Degrees
- Simulation in Engineering and Entrepreneurship Development: SEED
  Duration: PhD studies, 3-4 years period
  cimne.com/emjd-seed

Courses

CIMNE is also been organizing courses and workshops related to its field of expertise:

- 9th GID Convention
  6-8 June, 2018, Barcelona
  Presentation GID v4
  ECCM-ECND 2018, 11-15 June, 2018, Glasgow (UK)
- R+D+i Course to DomusVi Foundation students
  by Ángel Priegue CTO (CIMNE ICT group) / OKO Case of study
  DomusVi, Barcelona, 14 and 21 November 2018
- Ibercursos
  - Online courses held in 2018:
    - Initiation (English/Spanish)
    - Advanced courses (only in Spanish):
      - Dam breaks
      - Water quality
      - Hydraulic works
      - Sediment transport
CIMNE Coffee Talks in 2018

BIM Methodology, problems and reflections for the incorporation of simulations and emerging ICT Technologies
Felipe Muñoz La Rivera, Pontificia Universidad Católica de Valparaíso (Chile) - 24/01/2018

BIM at the construction site
Jeniffer Nogales and Gerardo Chavarri, UPC (Spain) - 07/03/2018

Formfinding and Prestressed Membrane Analysis
Anna Rehr, CIMNE (Spain) - 21/03/2018

Implementation of a VMS Finite Element Solver for compressible Navier-Stokes equations
Elisa Magliozzi, TUM (Spain) - 18/04/2018

Programming constitutive models in Kratos framework
Josep Ma Carbonell, CIMNE/UPC (Spain) - 23/05/2018

Natural Disaster Simulation by Particle Methods
Bodhinanda Chandra, TU Munich (Germany) - 24/05/2018

Advances in Computational Modeling of Fluid-Structure Interaction, Specially Rotordynamics
Mario Storti, CONICET/Universidad Nacional del Litoral (Argentina) - 05/07/2018

Modeling shallow water flows with PFEM2
Miguel Masó, UPC (Spain) - 12/07/2018

Geotechnical and Environmental Coupled Models Involving Unsaturated Soils and Rocks
Sebastià Olivella, UPC · BarcelonaTech, Barcelona (Spain) - 21/01/2018

Computational models for safety in dam engineering
Antonia Larose, UPC · BarcelonaTech/CIMNE, Barcelona (Spain) - 09/03/2018

Nonlinear multi-scale analysis. Proposals for an efficient calculation with which to simulate structural components
Xavi Martinez, UPC · BarcelonaTech/CIMNE, Barcelona (Spain) - 28/05/2018

A three dimensional FEM-DEM technique for predicting the evolution of fracture in geomaterials and concrete
Francisco Zárate, UPC · BarcelonaTech/CIMNE, Barcelona (Spain) - 05/06/2018

How the Nuclear Engineering Inspires the New Cardiovascular Devices through Novel Flow Modelling
Amir Keshmiri, Univ. of Manchester/MACE, Manchester (UK) - 18/06/2018

The shifted boundary method: An embedded approach for computational mechanics
Guglielmo Scovazzi, Duke University, Durham (USA) - 08/10/2018

Reactive transport: numerical issues and challenges
Jesus Carrera, CM3 UPC-CSIC, IDAESA, CSIC, Barcelona (Spain) - 10/10/2018

The shifted boundary method: An embedded approach for computational mechanics
Guglielmo Scovazzi, Duke University, Durham (USA) - 08/10/2018

Reactive transport: numerical issues and challenges
Jesus Carrera, CM3 UPC-CSIC, IDAESA, CSIC, Barcelona (Spain) - 10/10/2018

Basic ideas on the coupling of virtual element and boundary element methods
Gabriel N. Catoca, University of Concepcion/CI2MA, Concepcion (Chile) - 29/10/2018

Validation and Application of Computational Models for Fluid-Structure Interaction In Coastal and Hydraulic Engineering
Chris Kees, Coastal and Hydraulics Laboratory US Army Engineer Research & Development Center (USA) - 05/11/2018

Soil crushing via DEM
Marcos Arroyo, UPC (Spain) - 14/11/2018

Hybrid optimization methods
Jordi Pons, CIMNE (Spain) - 05/12/2018

Computational tools for acoustic metamaterials design
David Roca, UPC/CIMNE (Spain) - 26/09/2018

Study of the containment building of a nuclear power plant. An international benchmark
Sergio Jiménez, CIMNE (Spain) - 03/10/2018

Turbulent fluid flows a different approach
Sergio Idelsohn, CIMNE (Spain) - 18/10/2018

Advances in Constitutive Laws in the Structural Mechanics Application in Kratos
Alejandro Cornejo, CIMNE (Spain) - 31/10/2018

The Bonded DEM. Strength and weakness
Miguel Ángel Celigueta, CIMNE (Spain) - 21/11/2018

Urban Systems Efficiency, Sustainability and Resiliency
Tianzhen Hong, Deputy Head of the Building Technology Department of Lawrence Berkeley National Laboratory (USA) - 23/11/2018

Plastic damage constitutive model with variable dilatancy for concrete
Mauro Poliotti École Nationale de Ponts et Chausées (France) - 28/11/2018

Validation and Application of Computational Models for Fluid-Structure Interaction In Coastal and Hydraulic Engineering
Chris Kees, Coastal and Hydraulics Laboratory US Army Engineer Research & Development Center (USA) - 05/11/2018

Soil crushing via DEM
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Hybrid optimization methods
Jordi Pons, CIMNE (Spain) - 05/12/2018

CIMNE Seminars in 2018

Geotechnical and Environmental Coupled Models Involving Unsaturated Soils and Rocks
Sebastià Olivella, UPC · BarcelonaTech, Barcelona (Spain) - 21/01/2018

Computational models for safety in dam engineering
Antonia Larose, UPC · BarcelonaTech/CIMNE, Barcelona (Spain) - 09/03/2018

Nonlinear multi-scale analysis. Proposals for an efficient calculation with which to simulate structural components
Xavi Martinez, UPC · BarcelonaTech/CIMNE, Barcelona (Spain) - 28/05/2018

A three dimensional FEM-DEM technique for predicting the evolution of fracture in geomaterials and concrete
Francisco Zárate, UPC · BarcelonaTech/CIMNE, Barcelona (Spain) - 05/06/2018

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Amir Keshmiri, Univ. of Manchester/MACE, Manchester (UK) - 18/06/2018

The shifted boundary method: An embedded approach for computational mechanics
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Soil crushing via DEM
Marcos Arroyo, UPC (Spain) - 14/11/2018

Hybrid optimization methods
Jordi Pons, CIMNE (Spain) - 05/12/2018

Geotechnical and Environmental Coupled Models Involving Unsaturated Soils and Rocks
Sebastià Olivella, UPC · BarcelonaTech, Barcelona (Spain) - 21/01/2018

Computational models for safety in dam engineering
Antonia Larose, UPC · BarcelonaTech/CIMNE, Barcelona (Spain) - 09/03/2018

Nonlinear multi-scale analysis. Proposals for an efficient calculation with which to simulate structural components
Xavi Martinez, UPC · BarcelonaTech/CIMNE, Barcelona (Spain) - 28/05/2018

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Soil crushing via DEM
Marcos Arroyo, UPC (Spain) - 14/11/2018

Hybrid optimization methods
Jordi Pons, CIMNE (Spain) - 05/12/2018
We list below the conferences organised by the CIMNE Congress Bureau in 2018.

*NP: Number of participants

**ECCM - ECFD 2018**
VI European Conference on Computational Mechanics & VII European Conference on Computational Fluid Dynamics
11-15 June, 2018, Glasgow, UK

**MACM 2018**
21st American Conference on Mechanics
8-11 October, 2018, Salt Lake City, Utah, USA

**IAMU 2018**
19th International General Assembly - AGA 2018
17-19 Oct., 2018, Barcelona, Spain

**Nordic Association for Computational Mechanics - NSCM-31**
25-26 October 2018, Umeå, Sweden

**SAAEI 2018**
25th Annual Seminar on Automation, Industrial Electronics and Instrumentation / 4-6 July, 2018, Barcelona, Spain

**EUCEET 2018**
4th International Conference on Civil Engineering Education: Challenges for the Third Millennium
5-8 Sept. 2018, Barcelona, Spain

**CATALUNYA futurverd**
Book presentation: "Catalunya Futur Verd"
27 de November, 2018, La Pedrera, Barcelona

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We also organise activities in other fields such as mathematics, education, etc.

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**Photo:** IAMU Congress Meeting (WTC, BCN) / 17-19 October 2018

**Photo:** Delegates at IAMU Congress (WTC, BCN) 17-19 October 2018
Upcoming conferences organized by CIMNE (2019-2020)

We list below the conferences that CIMNE will organise in 2019 and 2020. For further details visit congress.cimne.com

**MARINE 2019**
VIII Conference on Computational Methods in Marine Engineering
13-15 May, 2019, Göteborg, Sweden

**ADMOS 2019**
International Conference on Adaptive Modeling and Simulation
27-29 May, 2019, El Campello, Spain

**COUPLED 2019**
VIII International Conference on Coupled Problems in Science and Engineering
5-7 June, 2019, Sitges, Spain

**EMuS 2019**
European Conference on Multifunctional Structures
11 - 12 June, 2019, Barcelona, Spain

**CFRAC 2019**
VI International Conference on Computational Modeling of Fracture and Failure of Materials and Structures
12-14 June, 2019, Braunschweig, Germany

**SMART 2019**
IX ECCOMAS Thematic Conference on Smart Structures and Materials
8 - 12 July, 2019, Paris, France

**COMPLAS 2019**
XV International Conference on Computational Plasticity
3-5 Sept., 2019, Barcelona, Spain

**SIM-AM 2019**
II International Conference on Simulation for Additive Manufacturing
11-13 September 2019, Pavia, Italy

**IGA 2019**
International Conference on Isogeometric Analysis
18-20 Sept., 2019, Munich, Germany

**MUSLOC 2019**
Multi-scale analysis of slopes under climate change. A cross-disciplinary workshop
19 - 20 September 2019, Barcelona, Spain

**FORM AND FORCE 2019**
IAS 60th Anniversary Symposium & 9th Int. Conference on Textile Composites and Inflatable Structures
7-10 Oct. 2019, Barcelona, Spain

**PADRI 2019**
Platform for Aircraft Drag Reduction Innovation
16 - 17 October 2019, Barcelona, Spain

**ECOMAS CONGRESS 2020 & WCCM XIV**
14th World Congress on Computational Mechanics and 8th European Congress on Computational Methods in Applied Sciences and Engineering
19 - 24 July 2020, Paris, France

**DBMC2020**
15th International Conference on Durability of Building Materials and Components 2020
30 June - 3 July 2020, Barcelona, Spain

**PARTICLES 2019**
VI International Conference on Particle-Based Methods
28-30 Oct., 2019, Barcelona, Spain

**CM3**
International workshop on Digital Technologies in Transport
11 - 12 November 2019, Barcelona, Spain

**SAHC2020**
12th International Conference On Structural Analysis of Historical Constructions
16 - 18 September 2020, Barcelona
Awards

Chronology of the prizes awarded to CIMNE

Below we briefly review some of the awards granted to the research centre along its history.

SPECIAL MENTION TO THE CIUTAT DE BARCELONA AWARD 1999
The city of Barcelona awarded CIMNE a Special Mention to the Ciutat de Barcelona Award 1999 in the category of Technological Research for the work carried out by Drs. P. Roca, M. Cervera and E. Oñate on the modelling and structural analysis of the Barcelona Cathedral

NARCÍS DE MONTURIOL PLATE AWARD TO THE SCIENTIFIC AND TECHNOLOGICAL MERIT 1999
On November 3rd, 1999, the Generalitat de Catalunya granted to CIMNE the Narcís de Monturiol Plate Award for Scientific and Technological Merit:
• For its contribution to the development of new methods for analysis and design for products and processes in engineering.
• For fostering the cooperation between industry and university research groups.
• For the organization of training activities and the promotion of science and technology at an international level.

2002 IST PRIZE TO THE BEST PRODUCT OF THE INFORMATION SOCIETY TECHNOLOGIES, EUROPEAN COMMISSION (EC)
The EC granted the IST Award to the pre/post processor system GI
d developed at CIMNE.

CIUTAT DE BARCELONA 2002 AWARD IN TECHNOLOGICAL RESEARCH
On February 17th, 2003, the Ciutat de Barcelona Award in Technological Research was awarded to the CIMNE research team formed by Eugenio Oñate, Ramon Ribó, Enrique Escolano, Miquel Pasenau and Jorge Suit Pérez. The prize recognized the development of the pre/postprocessor GID. This simulation software is an innovative and user-friendly graphic interface that allows the geometric modelling and visualization of the results of numerical simulations.

AWARD DURAN I FARRELL FOR RESEARCH AND TECHNOLOGY UNIVERSITAT POLITÈCNICA DE CATALUNYA, 2004
The Award was delivered to CIMNE scientists Dr. Oñate and Dr. García for their work entitled: "Development of a new finite element code for the hydrodynamic study of vessels. Applications to the design of sailing ships for the America Cup race”.

CUBAN NATIONAL PRIZE 2016 TO THE SCIENTIFIC RESEARCH RESULT BY THE CUBAN ACADEMY OF SCIENCES
This award is a recognition of the research work entitled "Development of advanced technologies for the generation and packaging of particles focused on the methods of discrete elements”.

The research was carried out by the Central University "Las Villas" of Cuba (UCLV) and the CIMNE within the Aula UCLV-CIMNE. It also involved the collaboration of the universities of Leuven (KU Leuven, Belgium), and Brasilia (UnB, Brazil), as well as foreign and local institutions.

FIMA ‘TECHNICAL NOVELTY’ AWARD 2018
The Centrifugal Spreading Simulation Software, SpreadDEM, developed by CIMNE, has been awarded by the 40th International Fair of Agricultural Machinery (FIMA) with the "Technical Novelty" award in the category of “Agricultural Management Solution”. With this award, the Fair recognizes the companies that present devices and systems with direct application in agriculture and rural areas, which bring remarkable innovation to the sector.

Awards and honours to CIMNE Scientists in 2018

1. JOAN BAIGES
Juan Carlos Simó Prize 2018, SEMNI, 2018.

2. RAMON CODINA
Ludwig Prandtl Medal for outstanding and sustained contributions in the field of Computational Fluid Dynamics, ECCOMAS, 2018.

3. JOAQUÍN IRAZÁBAL

4&5. ORIOL LLOBERAS & XAVIER OLIVER

6. EUGENIO OÑATE
Award for the contribution to the development of the Discrete Elements Method (DEM), Academy of Sciences of Cuba (Cuba), 2018.

7. NÚRIA PINYOL
Selected Speaker for the 2nd Hutchinson Conference, Hong Kong, 2018.

8. EDUARDO SOUDAH
Best paper award, EECSS’18 (Madrid, Spain), 2018.
CIMNE in the media 2018

BUILD AIR H75
ORIGINAL TITLES: "Buildair H75: el hangar hinchable más grande del mundo es español" / "Buildair H75, nuevo récord en hangares hinchables"
TITLES IN ENGLISH: Buildair H75: the largest inflatable hangar in the world is Spanish / Buildair H75, new record in inflatable hangars
SOURCE: TICbeat NCYT
PUBLICATION DATE: June-July 2018

CHIRAJARA BRIDGE
SUMMARY: CIMNE experts prepared a technical report on the collapse of the Chirajara bridge (Colombia) at the request of the Prosecutor’s Office
SOURCE: El espectador, RCN Radio, La FM, Eje 21
PUBLICATION DATE: March-May 2018

AXA RESEARCH FUND
ORIGINAL TITLES: "AXA Research Fund destina 50 millones a proyectos de ciencia para los próximos 5 años y selecciona 5 proyectos en España" / "AXA Research Fund allocates 50 million to science projects for the next 5 years and selects 5 projects in Spain"
TITLES IN ENGLISH: AXA Research Fund allocates 50 million to science projects for the next 5 years and selects 5 projects in Spain
SOURCE: Bolsamania
PUBLICATION DATE: 29/06/2018

NAVAL ENGINEERING
ORIGINAL TITLES: "Ingeniería Naval: buena formación con amplias posibilidades laborales"
TITLES IN ENGLISH: Naval engineering: good training with wide job opportunities
SOURCE: La opinión de Murcia
PUBLICATION DATE: 13/06/2018

ENERGY EFFICIENCY ECUADOR
ORIGINAL TITLES: "INER, CIMNE, Inergy y BEE Group implantan el Sistema de Información Energética SIE en Edificios de Ecuador"
TITLES IN ENGLISH: INER, CIMNE, Inergy and BEE Group implement the SIE Energy Information System in Buildings of Ecuador
SOURCE: Casadomo.com
PUBLICATION DATE: 30/01/2018

MARS: ESA/CIMNE
ORIGINAL TITLES: "Un’altra sonda e il drone su Marte, la missione guidata dalla Campania"
TITLES IN ENGLISH: Another probe and the drone on Mars, the mission led by Campania
SOURCE: Il Mattino
PUBLICATION DATE: 08/06/2018

MARS: ESA/CIMNE
ORIGINAL TITLES: "Un’altra sonda e il drone su Marte, la missione guidata dalla Campania"
TITLES IN ENGLISH: Another probe and the drone on Mars, the mission led by Campania
SOURCE: Il Mattino
PUBLICATION DATE: 08/06/2018
**CIMNE in the media**

**CIMNE Annual Report # Dissemination**

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**CIMNE CONSULTANCY**

- **ORIGINAL TITLE:** “Navarra adjudica a Geoconsult el estudio independiente de seguridad de Yesa por 222.537 €”
  - **TITLE IN ENGLISH:** Navarra awards Geoconsult Yesa’s independent security study for € 222,537
  - **SOURCE:** Noticias de Navarra, EuropaPress
  - **PUBLICATION DATE:** 10/2018

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**JAMU / CIMNE CONGRESS BUREAU**

- **ORIGINAL TITLE:** “Debaten sobre cómo hacer sostenible el transporte marítimo en el mundo”
  - **TITLE IN ENGLISH:** Debate about how to make maritime transport sustainable in the world
  - **SOURCE:** ABC / La Vanguardia
  - **PUBLICATION DATE:** 17/10/2018

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**ADD2MAN**

- **ORIGINAL TITLE:** “Tres nuevas tecnologías de impresión 3D en la feria IN(3D)USTRY”
  - **TITLE IN ENGLISH:** Three new printing 3D technologies in the IN(3D)USTRY fair
  - **SOURCE:** TecnoNews
  - **PUBLICATION DATE:** 16/10/2018

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**EURECAT / CIMNE**

- **ORIGINAL TITLE:** “Música sense gravetat”
  - **TITLE IN ENGLISH:** Music without gravity
  - **SOURCE:** Via empresa
  - **PUBLICATION DATE:** 13/06/2018

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**FLEXICOOP**

- **ORIGINAL TITLE:** “El proyecto europeo Flexcoop promueve la gestión activa de la demanda entre prosumidores domésticos”
  - **TITLE IN ENGLISH:** The European project Flexcoop promotes the active management of demand among domestic prosumers
  - **SOURCE:** Smartgridsinfo
  - **PUBLICATION DATE:** 15/06/2018

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**DRON VICTORIA**

- **ORIGINAL TITLE:** “Ferri muestra su embarcación no tripulada Victoria”
  - **TITLE IN ENGLISH:** Ferri shows its unmanned vessel Victoria
  - **SOURCE:** La defensa
  - **PUBLICATION DATE:** 06/06/2018

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  - **SOURCE:** TecnoNews
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**AULA UCI CUBA**

- **SUMMARY:** Creation of the joint lab UCI Cuba.
  - **SOURCE:** Juventud Rebelde, ACN, CubaSí
  - **PUBLICATION DATE:** 09/2018

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  - **PUBLICATION DATE:** 09/2018
CIMNE carries out an intensive activity through social media, with special attention to Twitter, where the centre has more than 1,000 followers. Below we highlight some of the 2018 tweets to explain CIMNE’s activities through the networks.