Annual Report

2017

CIMNE®
GENERATING KNOWLEDGE AND SOLUTIONS
Since 1987
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The International Centre for Numerical Methods in Engineering (CIMNE) was created in April 1987. In 2017, CIMNE celebrated its 30th anniversary.

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 2018) 21 Full Research Professors, 11 Associate Research Professors, 11 Assistant Research Professors, 19 Postdocs, 34 PhD Students, 5 Staff Scientists, 43 Research Engineers, 18 Visiting Researchers and 30 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

On December 2017 CIMNE was incorporated under the auspices of the Department of Territory and Sustainability (DTES) of the Catalonian Government. This circumstance will strengthen 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 several challenging 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 Group Leader. 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 29 members: 6 in Spain and 23 in Latin America: ausas.cimne.com.
The International Association of the Aulas CIMNE (IAAC), created by CIMNE in 2015, aims to coordinating and fostering the activities of the Aulas CIMNE network. More information of IAAC can be found on Alliances Section of this report.
The International Association of the Aulas CIMNE (IAAC), created by CIMNE in 2015, aims to coordinating and fostering the activities of the Aulas CIMNE network.

RESEARCH OUTPUTS
Since 1987 CIMNE researchers have published some 2,500 JCR journal papers, 46 text books, 82 edited books, 250 monographs, 415 RTD reports, 643 technical reports and organized 210 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.
Since 1987 CIMNE researchers have taken part in 1,700 RTD projects (including 10 research projects funded by the European Research Council). In the same period CIMNE managed 2 international MSc courses, 2 PhD programs and organized an average of 2 short courses and 23 seminars annually. Its research staff has supervised 160 PhDs and some 720 MSc students.
Research at CIMNE has lead to many software codes that emanating from CIMNE technology. Details of the companies are given in Section 3.2 and in cimne.com/spin-offs.

CITATION RECORDS
By April, 2018, CIMNE scientists had an h-index of 111 and 57,313 citations (h=111 and some 26,715 citations since 2013); Source: Google Scholar. Scopus records 537 JCR papers and 4,084 citations for the period 2012-17. Several CIMNE researchers are ranked in the first positions of the ranking for Mathematics & Interdisciplinary Applications and others of engineering created by Group for the Dissemination of the h Index (further information of CIMNE benchmarking at index-h.webcndario.com). By February 2018 the Ranking Web of World Research Centres (research.webometrics.info) reports that 1/21 CIMNE researchers are among the 1000/50000 best scientists in Spain in terms of citations (webometrics.info/en/rank/24).

MANAGEMENT OF SCIENTIFIC ORGANIZATIONS
CIMNE is the permanent Secretariat of the following scientific organizations:
• International Association for Computational Mechanics (iacm.info, 1994-2016)
• European Community on Computational Methods in Applied Sciences (ecomas.org)
• Spanish Association for Numerical methods in Engineering (simni.org)
• Pilot Centre of the European Research Community in Flow, Turbulence and Combustion (arcfac.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 2012-17). 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.

The CIMNE Conference Bureau Dpt., acts as a professional organizer of international events of scientific and technical interest to CIMNE

AWARDS TO CIMNE AND ITS SCIENTISTS
Since 1987 CIMNE and its scientists have received some 70 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 or- ganizer of international events of scientific and technical in- terest to CIMNE.
Since 1987 CIMNE has organized some 200 international events. In 2017 CIMNE organized 14 international conferences on different topics related to NME. Soma 20 events are planned for 2018-2020. Further de- tails 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 Ri- ver Dynamics and Hydraulic Engineering (www.flumen.es). On July 2016 CIMNE completed the construction of a new building of 2,270 m2 that hosts the premises of the Flu- men Institute and spaces for CIMNE and UPC researchers. The construction of the building was co-funded by Euro- pean Regional Development Funds. On July 2017 CIENIT (Centre for Innovation in Transport, cienit.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
Dissemination and communication tasks in CIMNE involve various activities to bring the research outcomes to the at- tention of as many relevant people as possible. The Publications Dpt. (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.com) provides free publishing and Open Access services to disseminate the results of scientific and techni- cal work.
CIMNE has implemented an (almost) self-sustainable financial model with limited annual public funding.

A SELF-SUSTAINED ORGANIZATION
CIMNE has implemented an (almost) self-sustainable finan- cial 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 organiza- tions), dissemination activities, revenues from its spin-off companies and an efficient management structure. Since 1987 the self-obtained income obtained each year by CIM- NE has amounted (in average) to 95% of its total annual budget.
I finish these lines by thanking 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
Executive Vicepresident of CIMNE
CIMNE Annual Report # About CIMNE

CIMNE in numbers

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<td>Management Staff</td>
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<td>TOTAL Staff</td>
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Income from projects (2002-2017)


Governing bodies

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

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

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

Mr. Francesc Subirana  
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  
UPC · BarcelonaTech |
|-----------|-------------------|
| Vice-President | Dr. Antonio Gens  
UPC · BarcelonaTech |
| Dr. Daniela Roca  
UPC · BarcelonaTech |
| Dr. Alejandro Josa  
UPC · BarcelonaTech |
| Dr. Juan Miquel  
UPC · BarcelonaTech |
| Dr. Juan Jesús Pérez  
UPC · BarcelonaTech |
| Dr. Esteve Codina  
UPC · BarcelonaTech |
| Ms. Francisca García-Sicilia  
UNESCO |
| Dr. Lluís Ramallo  
UPC · BarcelonaTech |
| Ms. Ana Simon  
AOCOS, Generalitat de Catalunya |

*Information at June 21st, 2018*

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**Chairman**
Dr. Roger Owen  
Swansea University, UK

**Members**
Prof. Javier Bonet  
University of Greenwich, UK

Prof. Manuel Castelo  
Universidade da Coruña, Spain

Prof. Michael Kleiber  
Polish Academy of Sciences, Poland

Dr. Ing. Dietrich Knörrer  
Former EC Officer

Prof. Bernd Kolplin  
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. Bernd Kolplin  
University of Stuttgart, Germany

Prof. Bernhard Schrefler  
University of Padova, Italy

Prof. Mateu Turró  
Technical University of Catalonia, Spain

Prof. Gabriele von Voigt  
Leibniz University, Germany

Prof. Peter Wriggers  
Leibniz University, Germany

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*From left to right - Sitting down:* Dr.-Ing. D. Knörzer (former EC Officer in Aeronautics), Prof. D.R.J. Owen (Swansea Univ., UK), Prof. J. Bonet (Univ. of Greenwich) and Prof. G. von Voigt (Leibniz Univ., Germany). *Standing up:* Prof. E. Oñate (CIMNE, Spain), Prof. M.Turró (Technical Univ. of Catalonia, Spain), Prof. B. Schrefler (Univ. of Padova, Italy), Prof. M. Kleiber (Polish Academy of Sciences, Poland), Prof. H. A. Mang (Technische Universität Wien, Austria), Prof. Ekkehard Ramm (Univ. of Stuttgart, Germany), Prof. M. Papadrakakis (National Technical Univ. of Athens, Greece), Prof. M. Castelo (Univ. of La Coruña, Spain).
About CIMNE # Organization chart

Governing Council
Chair: Conseller del Dpt. de Territori i Sostenibilitat (Generalitat de Catalunya)

Executive Council
Chair: E. Oñate

Scientific Advisory Council
Chair: R. Owen

Director
E. Oñate

Scientific Director
P. Díez

General Manager
A. Font

Research and Tech Development

RTD Areas and Groups

CIVIL ENGINEERING
Fluid Mechanics Group
Leader - R. Codina and S. Idelsohn

Geomechanics Group
Leaders - A. Gens and N. Pinyol

Industrial Processes Group
Leader - E. Oñate

TRANSPORT AREA
Aerospace Engineering Group
Leader - J. Pons

CENIT - Innovation in Transport Group
Leader - S. Saurí

Naval and Marine Engineering Group
Leader - J. García

COMPUTATIONAL AND INFORMATION TECH. AREA

Information and Technology Group
Leader - J. Jiménez

Large-Scale Scientific Computing Group
Leader - S. Badia

Pre and Post-Processing Group
Leader - A. Coll

ENERGY AND ENVIRONMENT AREA
Building, Energy and Environment Group
Leader - J. Cipriano

Risk Assessment Group
Leader - A. Barbat and L. Carreño

ACCOUNTANCY AND FINANCES
Leader - M. Linares

COMMUNICATION
Leader - L. Bermúdez

CONGRESS BUREAU
Leader - C. Vázquez

HUMAN RESOURCES
Leader - M. Linares

POST-GRADUATE TRAINING
Leader - L. Zelionka

PROJECT MANAGEMENT
Leader - S. Pérez

PUBLICATIONS
Leader - M. J. Samper

SYSTEMS
Leader - M. Alonso

Research and Technology Development

FULL RESEARCH PROFESSORS
Carmen Andrade
Carlos Aguilé de Saracibar
Eduardo Alonso
Santiago Badía
Alex Barbat
Gabriel Bugeda
Miguel Corvera
Michele Chiumenti
Ramón Codina
Pedro Díez
Julio García
Antonio Genís
Antonio Huerta
Sergio Hildebrand
Juan Miquel
Xavier Oliver
Sergio Oltra
Sebastián Olivella
Eugenio Oñate
Javier Príncipe
Riccardo Rossi

ASSOCIATE RESEARCH PROFESSORS
Juan Carlos Cante
Josep M. Carbonell
Liliana Carreño
Daniel de Capua
Roberto M. Flores
Alejandro Josa
Antonina Larése
Xavier Martínez
Núria Pinyol
Pavel Ryzhakov
Francisco Zárate

ASSISTANT RESEARCH PROFESSORS
Juan Carlos Cante
Josep M. Carbonell
Liliana Carreño
Daniel de Capua
Roberto M. Flores

LUCÍA BARBU
MANUEL A. CAICEDO
ABEL COLF
JORJID COTILLA
IGNASI DE POUPLANA
NARGES DIALAMIR
ALESSANDRO FRANCHI
ELI GABALDÓN
LAURA GONZÁLEZ
JOAQUÍN IZAZÁBAL
BÁRBARA LÍCAY

POST DOCS
Lucía Barbu
Manuel A. Caicedo
Abel Coll
Jordi Cotilla
Ignasi de Pouplana
Narges Dialamir
Alessandro Franci
Eli Gabaladón
Laura González
Joaquín Izázabal
Bárbara Lícay

RESEARCH ENGINEERS
Ernest Bladé
Marc Busquets
Jesus Carbajosa
Alexis Cist
Jonathan Colom
Martí Coma
André Conde
Xavier Cubillas
Gaia di Carluccio
Josep Doz
Enrique Escolano
Alberto Férez
Óscar Fruítós
Enrique Escolano
Javi Gárate
José Manuel González
Jordi Jiménez
José Santos López
Mercè López
Andreu Martí
Adrià Mendoza
Anna Monnos
Pau Morales
José Luis Oñate
Gilbert Peffer
Domingo Pahalvar
Jorge Sastre
Ángel Diego Priegue
Sara Añez Rueda
Anaíes Ramos
Esther Raveretès
Jaume Roca
Francois Rodero

CIMNE Staff

This is the list of all persons who collaborate with CIMNE at April 11th 2018

ACCOUNTANCY AND FINANCES
Leader - M. C. Linares

COMMUNICATION
Leader - L. Bermúdez

CONGRESS BUREAU
Leader - C. Vázquez

HUMAN RESOURCES
Leader - M. Linares

POST-GRADUATE TRAINING
Leader - L. Zelionka

PROJECT MANAGEMENT
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JOAQUÍN IZAZÁBAL
BÁRBARA LÍCAY

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Manuel A. Caicedo
Abel Coll
Jordi Cotilla
Ignasi de Pouplana
Narges Dialamir
Alessandro Franci
Eli Gabaladón
Laura González
Joaquín Izázabal
Bárbara Lícay

RESEARCH ENGINEERS
Ernest Bladé
Marc Busquets
Jesus Carbajosa
Alexis Cist
Jonathan Colom
Martí Coma
André Conde
Xavier Cubillas
Gaia di Carluccio
Josep Doz
Enrique Escolano
Alberto Férez
Óscar Fruítós
Enrique Escolano
Javi Gárate
José Manuel González
Jordi Jiménez
José Santos López
Mercè López
Andreu Martí
Adrià Mendoza
Anna Monnos
Pau Morales
José Luis Oñate
Gilbert Peffer
Domingo Pahalvar
Jorge Sastre
Ángel Diego Priegue
Sara Añez Rueda
Anaíes Ramos
Esther Raveretès
Jaume Roca
Francois Rodero
## About CIMNE # CIMNE Staff

### Research and Technology Development

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<td>Ferran Arrufat</td>
<td>Alberto Cardona</td>
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<td>Ramón Barbeza</td>
<td>Alejandro Cosmo</td>
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<td>Miguel Ángel Celguerta</td>
<td>José Ignacio Torres</td>
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<td></td>
<td>Javier Cipriano</td>
<td>Javier Tous</td>
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<td>Agustín Cuadrado</td>
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<td>Alejandro Fracchia</td>
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<td>José Jurado</td>
<td>Claudio Zinggerling</td>
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<td>Pavlína Karagianni</td>
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<td>Alexander Karkoulias</td>
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<td>Peirman Khatibian</td>
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<td>Miguel Ángel Manica</td>
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<td>Miguel Maso</td>
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<td>Vioreta Maitia</td>
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<td>Arilddey Mesa</td>
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<td>Ashraf Moaven</td>
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<td>Lluís Monforte</td>
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<td></td>
<td>Laura Moreno</td>
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### Administration

<table>
<thead>
<tr>
<th>DIRECTOR</th>
<th>COM/MUNICATION</th>
<th>PROJECT MANAGEMENT</th>
</tr>
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<tbody>
<tr>
<td>Eugenio O’Reilly</td>
<td>Laura Bermúdez</td>
<td>Sandra Pérez (Head of Unit)</td>
</tr>
<tr>
<td>GENERAL MANAGER</td>
<td>CONGRESS BUREAU</td>
<td>Daniel Quadrait</td>
</tr>
<tr>
<td>Anna Font</td>
<td>Cristina Vizayay (Head of Unit)</td>
<td>Marina de la Cruz</td>
</tr>
<tr>
<td>SCIENTIFIC DIRECTOR</td>
<td>Laia Aranda</td>
<td>Francisco de la Rosa</td>
</tr>
<tr>
<td>Pedro Díez</td>
<td>Alessio Bazzanella</td>
<td>Jon Rodriguez</td>
</tr>
<tr>
<td>Protection staff in CIMNE is formed by highly qualified professionals who address the increasing needs of researchers and scientific personnel in the centre.</td>
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<tr>
<td>ACCOUNTANCY AND FINANCES</td>
<td>Merce Linarès (Head of Unit)</td>
<td>Merce Abierch</td>
</tr>
<tr>
<td>Mr. Carmen Linarès (Head of Unit)</td>
<td>Irene Latone</td>
<td>Léa Zielonka (Head of Unit)</td>
</tr>
<tr>
<td>HUMAN RESOURCES</td>
<td>Pasi Sampers</td>
<td>Tenesa Peralba</td>
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<tr>
<td>SECRETARY</td>
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<td>Technology Branches</td>
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<tr>
<td>Irene Latone</td>
<td></td>
<td>Francisco García-Sicilia</td>
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<td>Teresa Penalba</td>
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</tbody>
</table>
Where we are

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

Bo 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

Headquarters

C1 Building at Campus Nord UPC Barcelona

B0 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 29 Aulas CIMNE (Joint Labs with universities all around the world).
CIMNE - Terrassa

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 (Bee-Group).

**Director:** J. Cipriano

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

CIMNE - Castelldefels

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
CIMNE Building C3
C/Esteve Terradas, 5
08860 Castelldefels, Barcelona, Spain
+34 93 413 41 86

CIMNE - Madrid

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 - Ibiza

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 2º
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.

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

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 coordinates the USA activities.

CIMNE-Latin America (Santa Fe, Argentina)

The formal establishment of CIMNE in Latin America has been initiated by creating a Foundation to foster the activity of CIMNE in that region.

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.

**Selected RTD Projects**

**COMP-DES-MAT**: Advanced tools for computational design of engineering materials.

FP7 - Ideas - EC
01/02/2013 - 31/01/2018

**CIMNE BEE DATA URUGUAY**: Contrato para la prestación de los servicios CIMNE BEE DATA en modo SAAS
UTE Uruguay, Uruguay — 08/03/2016 - 08/05/2017

www.cimne.com/usa

www.cimne.com/fcl
Where we are

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 29 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: 29 AULAS CIMNE
Aula CIMNE – CiMne (Mexico)
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 UIC – CiMne (Venezuela)
Universidad de Carabobo
Director: David Ojeda
Created on: April 2009
Activity: Applications of numerical methods to civil engineering failure analysis.

Aula ULA – CiMne (Cuba)
Universidad Centromerican “José Simón Cañas” UCA
Director: Mauricio Pohl
Created on: February 2010
Activity: Civil engineering applications and multi objective optimization and applications.

Aula UCG – CiMne (Guatemala)
Universidad Mariano Gálvez
Director: Rolando Torres
Created on: February 2011
Activity: Development of computer models for application in civil engineering.

Aula OC – CiMne (Venezuela)
Universidad de los Andes
Director: Juan Carlos Melé
Created on: October 2008
Activity: Applications of numerical methods to civil engineering problems.

Aula UC – CiMne (Venezuela)
Universidad Central Experimental “Eudaldo A. Mendoza” UCEA
Director: Cordero A. Mendoza
Created on: October 2008
Activity: Applications of numerical methods to civil engineering problems.

Aula UCEA – CiMne (Spain)
UPC - BarcelonaTech Temasss
Director: Roberto Flores; Oscar Frutós
Created on: April 2007
Activity: Industrial and aeronautical engineering.

Aula ESEAA – CiMne (Spain)
UPC - BarcelonaTech Temasss
Director: Roberto Flores; Oscar Frutós
Created on: April 2007
Activity: Modelling and analysis of structures and grounds to the application of numerical methods.

Aula UCEA – CiMne (Spain)
Universidad de Leida
Director: Jordi Cipriano
Created on: July 2004
Activity: Numerical methods applied to the physics of buildings and renewable energy.

Aula UCS – CiMne (Spain)
Universidad Politécnica de Madrid
Director: Rafael Morín; Miguel Ángel Toledo
Created on: May 2010
Activity: Applications of numerical methods in civil engineering.

Aula UN – CiMne (Spain)
Escuela Técnica Superior de Ingeniería de Madrid
Director: Daniel Di Capua
Created on: July 2001
Activity: Development of numerical methods in industrial and civil engineering.

Aula EEB – CiMne (Spain)
Escuela Técnica Superior de Ingeniería de Barcelona
Director: Daniel Di Capua
Created on: July 2001
Activity: Development of numerical methods in industrial and civil engineering.

Aula FIB – CiMne (Spain)
Universidad Politécnica de Madrid
Director: Ramiro de la Torre
Created on: March 2002
Activity: Applications of numerical methods to problems related to marine engineering.

China

For over 10 years, CIMNE has been collaborating with research organizations and universities 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 Establishement.

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 relevant activities with China in 2017 have been:

- **TCAINMaND**: TriContinental Alliance in Numerical Methods applied to Natural Disasters
  FPT - People - EC - Coordinated by CIMNE
  01/01/2014 - 31/12/2017

- **IMAGE**: Innovative Methodologies and technologies for reducing Aircraft noise Generation and Emission.
  H2020-MG-2015 - Coordinated by Chalmers
  01/01/2016 - 31/03/2019

- **ECO-COMPASS**: Ecological and Multifunctional Composites for Application in Aircraft Interior and Secondary Structures
  H2020-MG-2015 - Coordinated by DLR
  01/04/2016 - 31/03/2019
All the research carried out at CIMNE is developed around 10 research lines, which cover several challenging topics:

<table>
<thead>
<tr>
<th>Research Line</th>
<th>Description</th>
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<tbody>
<tr>
<td>1. Algorithms for Multiphysics Problems</td>
<td>Numerical methods for complex coupled problems such as fluid-structure interaction, aero-acoustics, electromagnetics, magneto-hydrodynamics and atmospheric/thermal flows, etc.</td>
</tr>
<tr>
<td>2. Computational Fluid Dynamics</td>
<td>Numerical methods for incompressible and compressible flows. Applications to internal and external flows, free-surface flows, multiphase flows in porous media, aerodynamics and acoustics.</td>
</tr>
<tr>
<td>3. Computational Geomechanics</td>
<td>FEM and particle-based procedures for linear and nonlinear analysis of solids and structures. Applications to most engineering fields.</td>
</tr>
<tr>
<td>4. Mathematical and Computational Modelling</td>
<td>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.</td>
</tr>
<tr>
<td>6. Computational Solid and Structural Mechanics</td>
<td>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.</td>
</tr>
<tr>
<td>7. Optimization</td>
<td>Robust optimization procedures for shape and material design and process optimization in civil, mechanical, aerospace and naval engineering.</td>
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</table>

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

<table>
<thead>
<tr>
<th>Research Lines (RL)</th>
<th>RTD Areas and Groups</th>
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<tbody>
<tr>
<td>1. Algorithms for Multiphysics Problems</td>
<td>Civil and Mechanical Engineering Area</td>
</tr>
<tr>
<td>2. Computational Fluid Dynamics</td>
<td>Fluid Mechanics Group</td>
</tr>
<tr>
<td>3. Computational Geomechanics</td>
<td>Geomechanics Group</td>
</tr>
<tr>
<td>4. Mathematical and Computational Modelling</td>
<td>Structural Mechanics Group</td>
</tr>
<tr>
<td>6. Computational Solid and Structural Mechanics</td>
<td>Risk Assessment Group</td>
</tr>
<tr>
<td>7. Optimization</td>
<td>Transport Group</td>
</tr>
<tr>
<td>10. Transport System Analysis</td>
<td>Transport Group</td>
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</tbody>
</table>

Researchers are appointed to research groups which are related to relevant engineering areas. In 2017, CIMNE had twelve research groups organized in four different research areas: Civil and Mechanical Engineering, Energy and Environment, Computational and Information Technologies and Transport. The following table shows the different Research Lines (RL) and their corresponding RTD Areas and Groups that cover a wide range of research fields. Researchers are appointed to research groups which are related to relevant engineering areas. In 2017, CIMNE had twelve research groups organized in four different research areas: Civil and Mechanical Engineering, Energy and Environment, Computational and Information Technologies and Transport.
1. COMPUTATIONAL FLUID DYNAMICS (CFD)

Research topics

- Stabilized finite element methods for problems involving waves, viscoelastic flows, compressible flows, shallow water flows, magnetohydrodynamics 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.
- FEM and particle methods for fluid flow and air flow in lungs.
  PIs: R. Rossi and E. Soudah.
- Multiscale modeling of turbulence.
  PI: S. Idelsohn.

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.
  PI: R. Codina and J. Baiges.
  PI: R. Codina.
- Reduced order models (ROM): Domain decomposition, fluid-structure interaction, thermally coupled flows.
  PIs: R. Codina and S. Idelsohn.

On-going RTD Projects

- Particle-based and discrete element methods for geomechanics.
  PI: R. Codina.
- FEM for coupled problems in geotechnical engineering.
  PIs: A. Alonso and N. Pinyol.
- Reactive transport, emerging contaminants (ECs) and associated risk.
  PI: X. Sanchez-Vila

Research topics

- Advanced modelling and laboratory testing of soils and rocks.
  PI: X. Alonso.
- Unsaturated Soil Mechanics
  PI: N. Pinyol.

Staff

- Ramon Codina (Leader)
- Sergio Idelsohn (Leader)
- Joan Baiges
- Inocencio Casteañar
- Camilo A. Bayona
- Laura Moreno
- Eduardo Soudah
- Samuel Parada
- Arnao Pont
- Ricardo Reyes
- Alex Tello
- Laura Soudah

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.

www.cimne.com/fluid-mechanics

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The Fluid Mechanics Group focuses 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-solute structure interaction problems.

www.cimne.com/geomechanics

Research topics

- Advanced computational GEOMECHANICS
  PIs: A. Alonso and N. Pinyol.

Staff

- Eduardo Alonso (Leader)
- Antonio Gens (Leader)
- Natalia Pinyol (Leader)
- Matias Alonso
- Mauro Alvarado
- Ramon Barboza
- Jose A. Canas
- Javier Casasnovas
- Jaime Chapal
- Agustín Cuadrado
- Gala Di Carluccio
- Alessandra Di Mariano
- Alessandro Fraccica
- Raul Gimenez
- Laura González
- Richard Higuchi
- Alejandro Josa

The research achievements of the Geomechanics Group focus on geotechnical Engineering for a low carbon future.

www.cimne.com/geomechanics

Research topics

- Advanced modelling and laboratory testing of soils and rocks.
  PIs: A. Alonso and N. Pinyol

Staff

- Eduard Alonso (Leader)
- Natalia Pinyol (Leader)
- Matias Alonso
- Mauro Alvarado
- Ramon Barboza
- Jose A. Canas
- Javier Casasnovas
- Jaime Chapal
- Agustín Cuadrado
- Gala Di Carluccio
- Alessandra Di Mariano
- Alessandro Fraccica
- Raul Gimenez
- Laura González
- Richard Higuchi
- Alejandro Josa

www.cimne.com/geomechanics

Ongoing projects

- TERRE - Training Engineers and Researchers to Retraining in Geotechnical Engineering for a Low Carbon Future
  Coordinator: University of Strathclyde

www.cimne.com/geomechanics

- Reactive transport, emerging contaminants (ECs) and associated risk.
  PI: X. Sanchez-Vila

www.cimne.com/geomechanics

Ongoing projects

- TERRE - Training Engineers and Researchers to Retraining in Geotechnical Engineering for a Low Carbon Future
  Coordinator: University of Strathclyde

www.cimne.com/geomechanics

- Reactive transport, emerging contaminants (ECs) and associated risk.
  PI: X. Sanchez-Vila

www.cimne.com/geomechanics

Ongoing projects

- TERRE - Training Engineers and Researchers to Retraining in Geotechnical Engineering for a Low Carbon Future
  Coordinator: University of Strathclyde

www.cimne.com/geomechanics

- Reactive transport, emerging contaminants (ECs) and associated risk.
  PI: X. Sanchez-Vila
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 simulation software for specific industrial applications, including adaptations for users with disabilities.

In addition, 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 RAILGRUP (www.railgrup.net).

Research topics

1. ALGORITHMS FOR MULTIPHYSCS PROBLEMS

- FEM and particle methods for analysis of industrial forming processes (casting, mold filling, sheet metal stamping, 3D printing, friction stir welding, etc.).

- Numerical methods for coupled thermal-mechanical problems for constructions and mechanical components.

2. OPTIMIZATION


On-going RTD Projects

Coordinator: SINTEF - 01/05/2015 - 31/08/2018

Coordinator: University of Birmingham 01/04/2016 - 31/03/2019

StampackXXI - Desarrollo de un nuevo código para simulación de procesos de conformado de piezas laminadas - MEM - Retos Colaboración Proyectos ID
Coordinator: Quantech - 01/10/2016 - 31/03/2019

SIMSSLAM - Simulation of metal Solidification in Additive Manufacturing processes - EC - H2020 (2014-2020) - MScA - Maria Sklodowska-Curie actions
Coordinator: CIMNE - 15/03/2017 - 14/03/2019

Structural Mechanics Group

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 recognised.

Research topics

1. ALGORITHMS FOR MULTIPHYSCS PROBLEMS

- FEM and particle-based methods for fluid-soil-structure interaction. NM for the oil and gas industry.

- Constitutive models for metallic and frictional materials with the DEM and coupled DEM-FEM procedures.


- Multi-scale FEM analysis of materials. Optimum material design.

- Material models for discrete element methods (DEM).

On-going RTD Projects

Coordinator: SINTEF - 01/05/2015 - 31/08/2018

Coordinator: University of Birmingham 01/04/2016 - 31/03/2019

StampackXXI - Desarrollo de un nuevo código para simulación de procesos de conformado de piezas laminadas - MEM - Retos Colaboración Proyectos ID
Coordinator: Quantech - 01/10/2016 - 31/03/2019

SIMSSLAM - Simulation of metal Solidification in Additive Manufacturing processes - EC - H2020 (2014-2020) - MScA - Maria Sklodowska-Curie actions
Coordinator: CIMNE - 15/03/2017 - 14/03/2019

www.cimne.com/industrial-processes

www.cimne.com/structural-mechanics
On-going RTD Projects

ACOMBO - Desarrollo de un código de cálculo para el análisis termo-termo-deformacional complejo de las presas bóveda
Coordinator: JGCIA - 01/09/2015 - 31/12/2018

MINECO - Retos Colaboración: Proyectos I+D

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

CALA - Mejora de la seguridad hidrogeológica e incremento de la capacidad de embalse de presas de fábrica mediante la implantación de CAnales Laterales MEC - Retos Colaboración Proyectos I+D
Coordinator: CITECHSA - 01/09/2016 - 31/08/2019

COMETAD - Desarrollo de técnicas computacionales y experimentales para el análisis y el diseño de polimeros retardantes al fuego
Coordinator: COMP-DES-MAT - Advanced tools for computational design of engineering materials
EC - FP7 (2007-2013) - IDEAS - 01/01/2015 - 31/12/2017

DSSeRA - Desarrollo de un Sistema de Apoyo a las Decisiones basado en Técnicas de Inteligencia Artificial para el manejo rutinario de la Artritis Reumatoide
Coordinator: Hospital de la Princesa 01/01/2015 - 31/12/2017

DRAGY - Drag Reduction in Turbulent Boundary Layer via Flow Control
Coordinator: CIMNE - 01/04/2016 - 31/03/2019

e-CAERO 2 - European Collaborative Dissemination of Aeronautical research and applications 2
Coordinator: CIMNE - 01/12/2014 - 30/11/2017

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

ECOVENT - Nueva sistema de ventilación para túneles en construcción por métodos convencionales. eficaz y eficiente energéticamente, minimizando la emisión de contaminantes gaseosos y particulados
MINECO - Retos Colaboración: Proyectos I+D
Coordinator: OSSA - 01/03/2015 - 31/12/2017

ELASTIC-FLOW - Aumento de la eficacia en procesos de mezcla y transmisión de calor utilizando fluidos viscoelásticos en regímenes laminar y turbulento
MINECO - Retos Colaboración: Proyectos I+D
Coordinator: OSSA - 01/03/2015 - 31/12/2018

HIRMA - Desarrollo y validación de una aplicación para la determinación del hidrograma de riego de presas de materiales sueltos a partir de la configuración geométrico particular
MEIC - Retos Colaboración: Proyectos I+D
Coordinator: INCLAM - 01/05/2016 - 31/08/2019

IMPRESSON - 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

MONICAB - Desarrollo de herramientas para la modelación numérica del efecto de la contaminación del balasto con arena en sistemas de alta velocidad
MINECO - Proyectos de I+D: Retos de la Sociedad 2015
Coordinator: CIMNE - 01/01/2015 - 31/12/2017

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

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

OMICC - Optimización multi-escala y multi-objetivo de estructuras de laminados compuestos
MINECO - Retos Investigación: Proyectos de I+D
Coordinator: CIMNE - 01/01/2015 - 31/12/2017

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

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

SimPhoNy - Simulation framework for multi-scale phenomena in micro- and nanosystems
EC - H2020 (2014-2020) - ERC (PoC)
Coordinator: Fraunhofer - 01/03/2014 - 31/05/2017

T-MAPPP - Training in Multiscale Analysis of multi-Phase phenomena in micro- and nanosystems
University of Edimburgh - 01/03/2014 - 28/02/2018

Structural Mechanics Group

DACARTEC − 01/06/2016 - 31/12/2018

DIMAP - Desarrollo de un código de diseño de acopio de bloques formados por bloques en forma de cuña durante el aliviadero de presas
MEIC - Retos Colaboración: Proyectos I+D
Coordinator: OSSA - 01/03/2015 - 31/12/2017

ECO-COMPASS - Ecological and Multifunctional Composites for Application in Aircraft Interior and Secondary Structures
Coordinator: CIMNE - 01/12/2014 - 30/11/2017

IMPRESSON - 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

MONICAB - Desarrollo de herramientas para la modelación numérica del efecto de la contaminación del balasto con arena en sistemas de alta velocidad
MINECO - Proyectos de I+D: Retos de la Sociedad 2015
Coordinator: CIMNE - 01/01/2015 - 31/12/2017

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

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

OMICC - Optimización multi-escala y multi-objetivo de estructuras de laminados compuestos
MINECO - Retos Investigación: Proyectos de I+D
Coordinator: CIMNE - 01/01/2015 - 31/12/2017

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

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

SimPhoNy - Simulation framework for multi-scale phenomena in micro- and nanosystems
EC - H2020 (2014-2020) - ERC (PoC)
Coordinator: Fraunhofer - 01/03/2014 - 31/05/2017

T-MAPPP - Training in Multiscale Analysis of multi-Phase Particulate Processes
University of Edimburgh - 01/03/2014 - 28/02/2018
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 GAIA building of the UPC Campus in Terrassa and the other in the EUROTRADE building (C/Pere de Cabrera,16.2° 2, 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
Eloi Gabaldón
Benedetto Grillone
Jaime E. Martí
Gerard Mor
José Santos López
Jaume Palmer
Daniel Pérez

Research topics
1. COMPUTATION AND INFORMATION TECHNOLOGIES
- Big Data Analytics For Energy Efficiency in Buildings: 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
- Small & Medium Scale Bio-Digesters: A comprehensive work about design, implementation and installation of domestic and industrial bio-digesters, adapting to simple technologies in cold climates. More than 2000 bio digesters have been installed in Latin America.
- Energy Positive Living: 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
- Demand Response in Buildings: Developing technologies to maximize the flexibility of the electricity network while optimizing the use of Renewable Energy Sources in urban environments.
- Energy Empowerment & User Behaviour: 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
  AECD
  Coordinator: ISF
  01/09/2017 - 31/03/2020

- FLEXEDINET - Gestió activa intel·ligent d’energia en edificis terciaris: mercat, usuaris, càrregues i manteniment
  ACCIó - Projectes col·laboratius recerca industrial i/o innovació
  Coordinator: RSM Gassó CIMNE Energy, S.L.
  01/07/2016 - 31/12/2017

- 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
  ACCIó - Projectes col·laboratius recerca industrial i/o innovació
  Coordinator: COMSA EMTE, S.L.
  01/06/2016 - 31/12/2018

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 70.
Research Groups # Energy and Environment Area

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.

www.cimne.com/risk-assessment

More recently, contributions have been made in the fields of probabilistic modelling of hazard and risk, economic evaluations for risk transfer and financial protection.

On-going RTD Projects

E-ZUANA - Evaluación de la vulnerabilidad y al riesgo de Zonas Urbanas expuestas a Amenazas Naturales y Antropicos
MINECO - Retos Investigación: Proyectos de I+D+I
Coordinator: CIMNE
30/12/2016 - 29/12/2019

Staff
Alex Barbat (Leader)
M. Liliana Carreño (Leader)
Lucía G. Barbu
Ignasi de Pouplana
Antonia Larrea
Barbara Llacy
Julio M. Martí
Sergio H. Oller
Cecilia Soriano

Large-scale Scientific Computing Group

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.

www.cimne.com/large-scale

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 electromagntetical, thermal, and solid and fluid mechanics problems

On-going RTD Projects

CLOUDFLOW - Computational Cloud Services and Workflows for Agile Engineering
EC - FP7 (2007-2013)
Coordinator: STAM _ 01/07/2013-30/04/2017

EFES - Algoritmos de elementos finitos para exaescala y su implementación en código libre
PLAN ESTATAL (2013-16) - MINECO
Coordinator: CIMNE
01/01/2015 - 31/12/2018

EUROFUSION
Coordinator: EURATOM
01/01/2014 - 31/12/2018

NUWASim - On a Nuclear Waste Deep Repository Simulator
EC - ERC-2016-PoC
Coordinator: CIMNE
01/12/2015 - 30/04/2018

Staff
Santiago Badia (Leader)
Pere A. Martorell
Jesús Borilla
Eric Nieva
Manuel A. Caicedo
Marc Olm
Alberto F. Martín
Javier Príncipe
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 large amount of data in a 3D environment.
- Advanced visualization techniques for stereoscopic and realistic visualization.

Technology transfer
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.

Further information at www.gidhome.com

On-going RTD Projects
ACASIAS - Advanced Concepts for Aero-Structures with Integrated Antennas and Sensors
Coordinator: NLR
01/06/2017 - 31/05/2020

Staff
Abel Coll (Leader)
Enrique Escolano
Javi Galate
Adrià Melendo
Anna Monros
Miguel A. Pasenau
Jorge S. Pérez
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 technology in engineering and applied sciences.

**Research topics**

1. **COMPUTATION AND INFORMATION TECHNOLOGIES**
   - Decision Support Systems
   - Smart Management Systems
   - Internet of Things
   - App Technology
   - Embedded ICT Systems
   - Internet Tools
   - GIS (2D/3D)

2. **DATA SCIENCE AND ARTIFICIAL INTELLIGENCE**
   - WSN Deployments
   - BDT Technology
   - Blockchain
   - Machine Learning
   - Virtual and Augmented Reality
   - Data Science and Artificial Intelligence

3. **APPLICATIONS**
   - Decision Support Systems
   - Smart Management Systems
   - Internet of Things
   - App Technology
   - Embedded ICT Systems
   - Internet Tools
   - GIS (2D/3D)

**Staff**

- Jordi Jiménez (Leader)
- Pedro A. Arnau
- A. Cid
- A. Mere
- F. Mora
- Luis Orate
- G. Puffer
- Á. Priegue
- J. Tous
- C. Tena
- J. Valero
- C. Valero
- G. Zingeler

**Information and Communication Technology Group**

- Development of monitoring systems for efficient and smart irrigation

**On-going RTD Projects**

- GAINN4MOS - Sustainable LNG Operations for Ports and Shipping - EC - CEF Programme 2014-2020 - MAP
  
  **Coordinator**: Valencia Port
  
  ***01/01/2015 - 31/07/2017***

- GAINN4SHIP INNOVATION - LNG Technologies and Innovation for Maritime Transport

  **EC - CEF Programme 2014-2020 - MAP**

  **Coordinator**: Valencia Port
  
  ***01/01/2015 - 30/06/2019***

- IMPRESiON - Desarrollo de una herramienta para el tratamiento de imágenes de presas tomadas mediante drones y su integración en el sistema de auxiludación de la presa - MEIC - Retos Colaboración: Proy. I+D

  **Coordinator**: TECOPY
  
  ***01/10/2015 - 31/12/2018***

- IPISO - Implementación de un prototipo pre-industrial de desalinización en un entorno operacional

  **PLAN ESTATAL (2013-16) - MINECO**

  **Coordinator**: FWN - 01/02/2015 - 31/07/2017

- MODELGES - Modelos flexibles adaptados a sensores embebidos para la gestión de infraestructuras

  **MINECO - Retos Colaboración: Proy. I+D**

  **Coordinator**: COPASA - 01/10/2015 - 31/12/2017

- PICASSO - Preventing Incident and Accident by Safer Ships on the Oceans

  **EC - CEF Programme 2014-2020**

  **Coordinator**: Sasemar
  
  ***01/05/2016 - 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***

- Scitools.eu - Enhancing the Responsible and Sustainable Expansion of the Science Shops Ecosystem in Europe

  **H2020 (2014-2020) - EC**

  **Coordinator**: SYNYO
  
  ***01/09/2017 - 29/02/2020***

- SCiShops.eu - Enhancing the Responsible and Sustainable Expansion of the Science Shops Ecosystem in Europe

  **H2020 (2014-2020) - EC**

  **Coordinator**: SYNYO
  
  ***01/09/2017 - 29/02/2020***

- STM Validation Project

  **EC - CEF Programme 2014-2020**

  **Coordinator**: Swedish Maritime Administration
  
  ***01/01/2015 - 31/12/2018***

- RCMS - Rethinking Container Management Systems

  **H2020 (2014-2020) - EC**

  **Coordinator**: Circle
  
  ***01/05/2015 - 31/07/2017***

- 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 - 31/10/2019***

- ULISES - Desarrollo de una plataforma autónoma para vigilancia y defensa en entornos offshore

  **MINECO - Retos Colaboración: Proy. I+D**

  **Coordinator**: Industrias Ferri
  
  ***28/01/2014 - 31/07/2017***

**www.cimne.com/ict**
The Centre for Innovation in Transport (CENIT) has been incorporated in 2017 to CIMNE as a new research group in the area of transport.

With the integration of CENIT in CIMNE, synergies in research, development and technology transfer on the transport field is enhanced. This contributes to provide solutions on the transport and mobility area of interest to society from a cross-cutting point of view.

1. TRANSPORT SYSTEM ANALYSIS (PI: S. Saurí)
   - Urban Mobility
     - Public Transport
     - Travel Behavior
     - Transport Economics
     - Urban Freight Distribution
     - Electromobility and Traffic Modelling
   - Port Logistics and Maritime Transport
     - Demand Analysis
     - Operational Research at Terminals Port Management
     - Port Management
   - Transport Infrastructure Management
     - Transport Economics Public
     - Private partnership

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. (PI: S. Saurí)

Staff:
- Sergi Saurí (Leader)
- Alícia Pons
- Miriam Benítez
- Sara A. Puignau
- Marc Busquets
- Ester Rovellós
- Germán de Molho
- Jaume Roca
- Miquel Iranzo
- Francisco Rodero
- Pau Morsales
- Francisca Rosell
- Domingo Peñalver
- Jose Ignacio Torres

On-going RTD Projects

**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

**NOVELOG - New cooperative business models and guidance for sustainable city logistics infrastructures (TRA 15P027)**
- Coordinator: CERTH
- 01/06/2015 - 31/05/2018

**ELIPTIC - Electrification of public transport in cities**
- Coordinator: FHB - 01/06/2015 - 31/05/2018

**GrowSmarter - Transforming cities for a smart, sustainable Europe (TRA 14P024)**
- Coordinator: STOCKHOLMS STAD
- 01/01/2015 - 31/12/2019

**REGASEA - Estrategias regulatorias para fomentar el transporte sostenible a través del Short Sea Shipping (TRA 16P043)**
- Coordinator: CENIT − 30/12/2016 - 29/12/2019
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 and E. Ortega

2. **Optimization**
   - Optimization algorithms for robust optimal design, shape optimization and material design in aeronautics. PI: G. Bugeda

### Staff

- Jordi Pons (Leader)
- Gabriel Bugeda
- Martí Coma
- Roberto M. Flores
- Jacques Périaux
- Enrique Ortega

### On-going RTD Projects

- **AVINT - Estratègies de mecanitzat i predicció de la rugositat per a una integritat superficial optima**
  - ACCIO - RIS3CAT
  - Coordinator: CTM - 01/07/2017 - 30/06/2020

- **DRAGY - Drag Reduction In Turbulent Boundary Layer via Flow Control**
  - Coordinator: CIMNE - 01/04/2016 - 31/03/2019

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

- **IMAGE - Innovative Methodologies and Technologies for reducing Aircraft noise Generation and Emission**
  - Coordinator: Chalmers - 01/04/2016 - 31/03/2019

- **e-CAERO 2**
  - European Collaborative Dissemination of Aeronautical research and applications 2
  - Coordinator: CIMNE - 01/12/2014 - 30/11/2017
CIMNE has a large experience in conducting RTD projects in naval and marine engineering.

The main activities of the Naval and Marine Engineering 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
- Health structural monitoring

Research topics

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

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

Staff
Julio García (Leader)
Daniel di Capua
Jesus 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

GAINN4SHIP INNOVATION - LNG Technologies and Innovation for Maritime Transport for the Promotion of Sustainability, Multimodality and the Efficiency of the Network
EC - CEF Programme 2014-2020
Coordinator: Valencia Port
01/01/2015 - 30/06/2019

GAINN4MOS - Gainn4mos Sustainable LNG Operations for Ports and Shipping – Innovative Pilot Actions
EC - CEF Programme 2014-2020
Coordinator: Valencia Port
01/01/2015 - 31/07/2017

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 vino
MEIC - Retos Colaboración: Proyectos I+D
Coordinator: COMPASS Ing. y Sistemas, S.A.
01/07/2016 - 31/12/2018
CIMNE is ranked in the 52th position in terms of visibility in Spain, according to Webometrics ranking. In the world ranking, CIMNE is in the 1458th position in a list of 7953 research centers worldwide in production and scientific activities.

Sorted by the number of papers and citations for each academic domain, CIMNE is positioned at number 427 in the world (based on the database of Google Scholar Citations -GSC-).

In February 2018, Webometrics (www.webometrics.info) has published a list of the most cited Spanish scientists. The study, based on citations from Google Scholar, includes 105 researchers of CIMNE among the 48,011 most cited scientists of Spain.

Also, we note the presence of five CIMNE scientists in the top 1,000 list:

- **Prof. Eugenio Oñate** has the 217th position in the list with an h-index of 65 and 17983 citations.
- **Prof. Antonio Gens**, the 961th position.
- **Prof. Prof. Antonio Huerta**, the 217th position in the list with an h-index of 65 and 17983 citations.
- **Prof. Ramon Codina**, the 961th position.

RANKING OF CIMNE SCIENTISTS IN SPAIN (WEBOMETRICS.INFO)

<table>
<thead>
<tr>
<th>RANK</th>
<th>NAME</th>
<th>H-INDEX</th>
<th>CITATIONS</th>
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<tr>
<td>217</td>
<td>Eugenio Oñate</td>
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<td>Antonio Gens</td>
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<td>Eduardo Alonso</td>
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<td>Javier Oliver</td>
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<td>Sergio Idiart</td>
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<td>Alex H Barbat</td>
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<td>Sergio Oliva</td>
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<td>2824</td>
<td>Sebastian Oliveira</td>
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<td>Marino Amigo</td>
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<td>Enrique Romero</td>
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<td>Santiago Bedoya</td>
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<td>5009</td>
<td>Melba Nesci</td>
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<td>5470</td>
<td>Carlos Aguilera de Seara</td>
<td>24</td>
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<tr>
<td>5818</td>
<td>Michela Chiumenti</td>
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<td>5864</td>
<td>Pedro Diaz</td>
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<td>Guiléd Burgado</td>
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<td>10692</td>
<td>Julio Garcia Espejeda</td>
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<td>Marta Llibre Carmencho</td>
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<td>14075</td>
<td>Lusa Páez</td>
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<td>Cecilia Soriano</td>
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<td>Xavier Martínez</td>
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<td>Omar Salomon</td>
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<td>Fernando Salazar</td>
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<td>Enricu Ortega</td>
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<td>25614</td>
<td>Bora Servin Cresi</td>
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</table>

Also, we note the presence of five CIMNE scientists in the top 1,000 list:

- **Prof. Eugenio Oñate** has the 217th position in the list with an h-index of 65 and 17983 citations.
- **Prof. Antonio Gens**, the 961th position.
- **Prof. Professor Antonio Huerta**, the 217th position in the list with an h-index of 65 and 17983 citations.
- **Prof. Ramon Codina**, the 961th position.

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- **Prof. Eugenio Oñate** has the 217th position in the list with an h-index of 65 and 17983 citations.
- **Prof. Antonio Gens**, the 961th position.
CIMNE Annual Report # Research

Publications

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 2017.

Journals


Monographs


Research reports


Papers in Journals


75% of the papers have been published in Q1 Journals.
Papers in scientific journals


A.H. Non-linear static procedures applied to high-rise residential buildings,


Papers in scientific journals


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 from 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:

Ideas (scientific advances) usually originate in university environments, where many professionals study, investigate and discover new areas of knowledge. The idea matures until it produces tangible results (theses, papers, computer programs, physical devices, etc.) that have to be filed and protected.

Results evolve until they reach the level of a prototype (a software code, a system, a device, etc.). The transit of a result to a prototype demands an organization, efficient and capable staff and resources. What it is desirable is that the idea follows its route on specialized institutions, adjacent to the university, such as CIMNE, with the mission of transforming knowledge into tangible things (prototypes).

The prototype develops into a product within a company. The cycle follows with the marketing of the product and ends up with the reinvestment of part of the revenues in the development of new ideas.
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)

**DIPO**

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

**ENGINEERING SYSTEMS AND HARDWARE**

**INFATABILE STRUCTURES**

**OKO**

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)

**WATER-PS**

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


**EDUCATIONAL SOFTWARE**

**COOPERATIVE 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)

**FRAKTALIS**

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 manage, share and interact with them. Developed and marketed by Lynxos 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)

**DECISION SUPPORT SYSTEMS**

**BEACHING**

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

**RMOP**

Integrated platform for robust multi-objective optimization in engineering. Developed by CIMNE. [tls.cimne.com/RMOP](http://tls.cimne.com/RMOP)

**MAT-FEM**

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

**EDUCATIONAL SOFTWARE**

**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)

**Collaborative work platforms educational software**

**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)

**Fraktalis**

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 manage, share and interact with them. Developed and marketed by Lynxos 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)

**Beaching**

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

**Mat-Fem**

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

**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)
<table>
<thead>
<tr>
<th>DECISION SUPPORT SYSTEMS</th>
<th>SIMULATION SOFTWARE FOR INDUSTRIAL PROCESSES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GIS+</strong></td>
<td><strong>WELDPACK</strong></td>
</tr>
<tr>
<td>Web-based Interactive Geographic Information System. Developed by CIMNE.</td>
<td>Welding processes software. Developed by CIMNE.</td>
</tr>
<tr>
<td><strong>SIE</strong></td>
<td><strong>STAMPACK</strong></td>
</tr>
<tr>
<td><strong>ROEM</strong></td>
<td><strong>CLICK2CAST</strong></td>
</tr>
<tr>
<td>Information system for assessment of the environmental quality in reservoirs and lakes. Developed by CIMNE.</td>
<td>Software for fast simulation of casting processes. Developed by Quantech ATZ in cooperation with CIMNE. Marketed by Altair since 2015.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>E-TESTING</strong></th>
<th><strong>SCUT</strong></th>
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</thead>
<tbody>
<tr>
<td><strong>FLOOD</strong></td>
<td><strong>ADD2MAN</strong></td>
</tr>
<tr>
<td>Web-based platform for e-management of experimental tests. Developed by CIMNE and Appius.</td>
<td>Software able to simulate cutting processes for the metal manufacturing industry. Developed by CIMNE.</td>
</tr>
<tr>
<td><strong>RAMFLOOD</strong></td>
<td><strong>FORGEPACK</strong></td>
</tr>
<tr>
<td>Artificial neuronal network package. Developed by CIMNE.</td>
<td><strong>FORGEPACK</strong></td>
</tr>
<tr>
<td><strong>RAMWASS</strong></td>
<td><strong>MACHPACK</strong></td>
</tr>
<tr>
<td>Decision support system (DSS) for risk assessment and managing of floods. Developed by CIMNE and Flumen.</td>
<td>Software able to simulate machining manufacturing processes. Developed by CIMNE.</td>
</tr>
<tr>
<td><strong>BEE DATA</strong></td>
<td><strong>SpreadDEM</strong></td>
</tr>
<tr>
<td>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 Ienergy.</td>
<td>Simulation software for the study of the particle flow on centrifugal fertilizer spreaders. Developed and marketed by CIMNE.</td>
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</table>

<table>
<thead>
<tr>
<th><strong>WSNP</strong></th>
<th><strong>CIMNE Products</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>An integrated platform for e-monitoring using wireless sensor network technology. Developed by CIMNE.</td>
<td><strong>WELDPACK</strong></td>
</tr>
<tr>
<td><strong>RAMWASS</strong></td>
<td><strong>STAMPACK</strong></td>
</tr>
<tr>
<td>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.</td>
<td><strong>STAMPACK</strong></td>
</tr>
<tr>
<td><strong>BEE DATA</strong></td>
<td><strong>CLICK2CAST</strong></td>
</tr>
<tr>
<td>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 Ienergy.</td>
<td><strong>CLICK2CAST</strong></td>
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<th><strong>CIMNE Products</strong></th>
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<tr>
<td><strong>WEBPACK</strong></td>
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<tr>
<td>Welding processes software.</td>
<td><strong>WEBPACK</strong></td>
</tr>
<tr>
<td>Developed by CIMNE.</td>
<td><strong>WEBPACK</strong></td>
</tr>
<tr>
<td><strong>STAMPACK</strong></td>
<td><strong>STAMPACK</strong></td>
</tr>
<tr>
<td>Software for sheet metal forming processes. Developed by Quantech ATZ, SA and CIMNE. Marketed by Quantech ATZ, SA since 1999.</td>
<td><strong>STAMPACK</strong></td>
</tr>
<tr>
<td><strong>CLICK2CAST</strong></td>
<td><strong>CLICK2CAST</strong></td>
</tr>
<tr>
<td>Software for fast simulation of casting processes. Developed by Quantech ATZ in cooperation with CIMNE. Marketed by Altair since 2015.</td>
<td><strong>CLICK2CAST</strong></td>
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</table>
### CiMNE Products

#### SIMULATION SOFTWARE FOR MULTIPHYSICS

<table>
<thead>
<tr>
<th>Product</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td><strong>KRATOS</strong></td>
<td>Object-oriented software platform for the development and application of finite element codes for multidisciplinary applications. Developed by CIMNE.</td>
</tr>
<tr>
<td><strong>ERMES</strong></td>
<td>Computational electromagnetics using advanced finite element methods. Developed by CIMNE.</td>
</tr>
<tr>
<td><strong>PFIRE</strong></td>
<td>Analysis of propagation of fire and its effect on the burning and melting of objects. Developed by CIMNE.</td>
</tr>
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</table>

#### SIMULATION SOFTWARE FOR FLUID DYNAMICS

<table>
<thead>
<tr>
<th>Product</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td><strong>TDYN</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>SEAFEM</strong></td>
<td>Hydrodynamics and seakeeping analysis of ships and marine structures. App for wind tower generators in the sea. Developed by Compass Ingeniería y Sistemas, SA. and CIMNE. Marketed by Compass since 2011.</td>
</tr>
<tr>
<td><strong>PFLOW</strong></td>
<td>Analysis of fluid dynamics and fluid-structure-thermal interaction problems into the Particle Finite Element Method (PFEM). Developed by CIMNE.</td>
</tr>
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</table>

#### SIMULATION SOFTWARE FOR STRUCTURAL ENGINEERING

<table>
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<tr>
<th>Product</th>
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</thead>
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<tr>
<td><strong>RAMSERIES</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>DEMPACK</strong></td>
<td>Analysis of granular systems and multifacturing problems in geomechanics and industrial processes using discrete and finite element methods. Developed by CIMNE.</td>
</tr>
<tr>
<td><strong>COMET</strong></td>
<td>Finite element code for nonlinear analysis of thermomechanical problems in solid and structural mechanics accounting for frictional contact situations. Developed by CIMNE.</td>
</tr>
</tbody>
</table>

#### BIOMECHANICS & HEALTH

<table>
<thead>
<tr>
<th>Product</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HEALTH APP</strong></td>
<td>App to control eating disorders. Developed by HealthApp in cooperation with CIMNE. Marketed by HealthApp SL since 2014.</td>
</tr>
<tr>
<td><strong>BODYgid</strong></td>
<td>Multiscale representation and analysis of the human body. Developed by CIMNE.</td>
</tr>
</tbody>
</table>

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**VISIT CIMNE PRODUCTS AT CIMNE.COM/PRODUCTS**
Spin-off companies

**CiMne Annual Report # Innovation and Technology Transfer**

**CiMne Tecnología, SA**
Created in 2011
[cimnetecnologia.com](http://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](http://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.

**BUILDair Ingeniería y Arquitectura, SA**
Created in 2001
[buildair.com](http://buildair.com)

Inflatables structures for engineering and architecture applications. CIEMNE Tecnología SA owns 2.51% of BUILDair.

**BEEDATA ANALYTICS, SL**
Created in 2017
[beedataanalytics.com](http://beedataanalytics.com)
ICT services based on mass analytical data treatment to users and business intelligence for companies and institutions. CIEMNE Tecnología owns 49.36% of Beedata Analytics, SL.

**SOLUCIONES INTEGRALES DE FORMACIÓN Y GESTIÓN STRUCTURALIA, SA**
Created in 2001
[structuralia.com](http://structuralia.com)
Training and consulting activities in the civil engineering via Internet. It was sold in 2011 to KAPLAN (The Washington Post Group).

**INGENIA AIE**
Created in 2006
EXG formed by several companies and CIEMNE. 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](http://quantech.es)
Computational methods and information technology systems in engineering. 100% owned by CIEMNE Tecnología SA.

**COMPUTATIONAL AND INFORMATION TECHNOLOGIES, SA**
Created in 2012
[citechsa.com](http://citechsa.com)
Computational methods and information technology systems in engineering. 100% owned by CIEMNE Tecnología SA.

**FRESH WATER NATURE, SL**
Created in 2013
[ineracybcn.com](http://ineracybcn.com)
Solutions for obtaining fresh water from desalination and distillation of waste water. The company is 92.99% owned by CiMNE Tecnología SA.

**PORTABLE MULTIMEDIA SOLUTIONS, SL**
Created in 2013
[portablemultimediasolutions.com](http://portablemultimediasolutions.com)
Mobile pavilions with multimedia technology for leisure, sport and events. 17.01% owned by CIEMNE Tecnología SA.

**PNEUMATIC STRUCTURES TECHNOLOGIES, SL**
Created in 2015
[ps-technologies.com](http://ps-technologies.com)
Pneumatic structures for a wide range of engineering problems. 10% owned by CIEMNE Tecnología SA.

**INLOC ROBOTICS, SL**
Created in 2014
[inlocrobotics.com](http://inlocrobotics.com)
Positioning and navigation solutions for mobile robots in buried environments. CIEMNE Tecnología owns 7.73% of INLOC Robotics since October 2015.

**LUYOS SYSTEMS, SL**
Created in 2012
[lyuos.com](http://lyuos.com)
Software and systems for the Internet of Things. CIEMNE Tecnología SA owns 4.77% of Luyos Technologies SL.

**SCiPEDIA, SL**
Created in 2015
[scipedia.com](http://scipedia.com)
Free publishing and open access for scientific publications. CIEMNE Tecnología owns 16.67% of Scipedia, SL.

**PSTech**
Created in 2012
[beaching.com](http://beaching.com)
Information systems for leisure sectors (tourism, music...). 100% owned by CIEMNE Tecnología SA.

**INLOC ROBOTICS, SL**
Created in 2014
[inlocrobotics.com](http://inlocrobotics.com)
Positioning and navigation solutions for mobile robots in buried environments. CIEMNE Tecnología owns 7.73% of INLOC Robotics since October 2015.

**HEALTHAPP, SL**
Created in 2013
[bcnhealthapp.com](http://bcnhealthapp.com)
Software for treatments of eating disorders. It improves the links therapist/patient. 18.52% owned by CIEMNE Tecnología SA.

**LyNcoS TECHNOLOGIES, SL**
Created in 2012
[lyncos.com](http://lyncos.com)
Software and systems for the Internet of Things. CIEMNE Tecnología SA owns 4.77% of Lyncos Technologies, SL.

**TECNOLOGÍAS AVANZADAS PARA EL OCIO, SL - Created in 2012**
[beaching.com](http://beaching.com)
Information systems for leisure sectors (tourism, music...). 100% owned by CIEMNE Tecnología SA.

**VISIT CiMne COMPanies at CIMNE.COM/COMPANIES**
CiMne, leader in research on computational engineering, has established relevant alliances with international institutions and companies since its creation in 1987.

ALLIANCES

In 1989, UNESCO and UPC · BarcelonaTech reached an agreement to create the first UNESCO chair in the world: the UNESCO Chair of Numerical Methods in Engineering.

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.

Prof. O. C. Zienkiewicz held the UNESCO Chair since its creation in 1989 until his death on January 2nd, 2009. Since 2009, the UNESCO Chair of Numerical Methods in Engineering is held by Dr. Jacques Périaux. He is a recognized expert in the field of numerical methods applied to aerospace engineering. Dr. Périaux’s 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.

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.

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.

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. 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.

Dr. Jacques Périaux
In 2012, the Government of Catalunya created the FLUMEN Institute for River Dynamics and Hydrologic Engineering as a partnership between CIMNE and UPC · BarcelonaTech.

FLUMEN Institute is the outcome of merging the prestigious Flumen RTD group existing since 2005 at the School of Civil Engineering of UPC · BarcelonaTech and CIMNE, bringing together the numerical and experimental expertise of Flumen RTD group in hydraulics with the broad experience of CIMNE on numerical methods, computer simulation and integration of decision support systems.

The objectives of FLUMEN are the promotion of RTD and technology transfer activities in the field of river dynamics and hydrologic engineering. The Flumen Institute is directed by Prof. J. Dolz.

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

In 1989, CIMNE contributed to the creation of the Spanish Society for Numerical Methods in Engineering (SEMNI).

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.

In July 2017, the 13th SEMNI Congress (CMN 2017) was held at Campus de la Vera, in Valencia (Spain). This jointly event SEMNI-APMTAC (Portuguese Association) was a forum for the discussion of relevant scientific and technical developments in computational mechanics, numerical methods and engineering applications.
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 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 on Computational Mechanics (ECCM) and the Mechanics and Science (ECM) and the Mechanics Conference on Computational Solid and Structural Mechanics (ECCM). 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 in Paris, France, on 19-24 July 2020. These series of ECCOMAS global meetings are complemented with more focused thematic conferences on state-of-the-art topics in computational sciences and engineering.

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.

The International Association for Computational Mechanics (IACM) and the United States Association for Computational Mechanics (USACM), in cooperation with the Columbia University and the University of Texas, are organizing jointly the 13th World Congress on Computational Mechanics (WCCM XIII) and 2nd Panamerican Congress on Computational Mechanics (PANACM II) in New York City (EEUU), which will be held from 22 to 27 July, 2018.

IACM publishes a biannual bulletin and supports the organization of special interest conferences, IACM Symposia and courses in various fields of computational mechanics.
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.

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**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
[cmne.com/mumni](http://cmne.com/mumni)

Master of Science on Computational Mechanics
Duration: 2 academic years, 120 ECTS
[cmne.com/mcm](http://cmne.com/mcm)

**Doctoral Degrees**

Simulation in Engineering and Entrepreneurship Development - SEED
Duration: PhD studies, 3-4 years period
[cmne.com/emjd-seed](http://cmne.com/emjd-seed)

**Courses**

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

JORNADA I: Un compromís vintcentista per a una nova territorialitat (Bases culturals)
La Pedrera, Barcelona, Spain, 22/03/2017

JORNADA II: Cap a un nou model de desenvolupament basat en l'eficiència ambiental (Bases biofísiques)
La Pedrera, Barcelona, Spain, 26/04/2017

III Seminario Internacional - Red TELESCOPI
Barcelona, Spain, 17/05/2017-19/05/2017

JORNADA III: Una estratègia de país per fer compatible la vocació global amb la vinculació local (Bases polítiques)
La Pedrera, Barcelona, Spain, 18/05/2017

6th Interdisciplinary Workshop on Rockfall Protection
Barcelona, Spain, 22/05/2017-24/05/2017

JTC1 Workshop
Barcelona, Spain, 24/05/2017-26/05/2017

COMPLAS Course
Barcelona, Spain, 03/09/2017-04/09/2017

**Ibercursos**

Online courses held in 2017:
- IBER Basic Course
- Advanced course dam break and rafts
- Advanced course on water quality
- Hydraulic modelling for structures
- Sediment transport

[www.cmne.com/courses](http://www.cmne.com/courses)
An introduction to Virtual Reality Technologies and possible applications in Architecture and Engineering
Arnau Rigol, Soraya Araujo, Óscar De Coss, David Arroyo and Marc Martínez; UPC · BarcelonaTech, Barcelona, Spain — 21/02/2017

Can we “automatically” write an Element?
Dr. Riccardo Rossi, UPC · BarcelonaTech, Barcelona, Spain — 08/03/2017

CIMNE Intellectual Property Model: Application to the GiD Case
Dr. Abel Coll, CIMNE, Barcelona, Spain — 22/03/2017

Computational Modeling of Flow Diverting Devices in Intracranial Aneurysms
Marcelo Raschi, CIMNE, Barcelona, Spain — 04/04/2017

Numerical simulation of metal forming processes for the evaluation of microstructures and the optimization of the process
Emilio Salsi, CIMNE, Barcelona, Spain — 03/05/2017

Numerical simulation of problems in large displacement and large deformation regime with an implicit Material Point Method
Ilaria Iconeta, CIMNE, Barcelona, Spain — 17/05/2017

The role of the Orthogonal Sub-Grid Scales - Variational Multi-Scale (OSGS-VMS) method in describing the Bumps "turbulence" phenomena
Camilo Bayona, CIMNE, Barcelona, Spain — 31/05/2017

New developments in Computational Aeroacoustics for the simulation of human phonation using the Variational Multiscale Method
Arnau Pont, CIMNE, Barcelona, Spain — 14/06/2017

Details of the taxation of projects financed by the Catalan, Spanish and European administrations
Marta Santos and José Antonio Buendía (InDi-TeC), Madrid, Spain — 28/06/2017

Augmented and virtual reality applied to the Construction sector
Oscar de Coss and Sara Rebollo, CIMNE, Barcelona, Spain — 12/07/2017

FEM applications based on automatic reconstruction of 3D centerlines from 2D projections
MC Fernando Cervantes Sánchez, Centro Investigación de Matemáticas de México (CIMAT), Guanajuato, México — 10/10/2017

Working on octrees
MC Jorge López Ruiz, Centro Investigación de Matemáticas de México (CIMAT), Guanajuato, México — 28/11/2017
We list below the conferences organised by CIMNE in 2017. For further details visit congress.cimne.com

<table>
<thead>
<tr>
<th>Conference Name</th>
<th>Date</th>
<th>Location</th>
<th>NP</th>
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<tr>
<td>IX Simposio Nacional sobre Taludes y Laderas Inestables</td>
<td>27-30 June 2017</td>
<td>Santander, Spain</td>
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<tr>
<td>JTC1 Workshop</td>
<td>24-26 May 2017</td>
<td>Barcelona, Spain</td>
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<td>24-26 May 2017</td>
<td>Barcelona, Spain</td>
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<tr>
<td>V International Conference on Particle-based Methods - Particles 2017</td>
<td>26-28 Sept. 2017</td>
<td>Hannover, Germany</td>
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<tr>
<td>International Conference on Textile Composites and Inflatable Structures - Structural Membranes 2017</td>
<td>9-11 October 2017</td>
<td>Munich, Germany</td>
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<tr>
<td>CM3-2017 - Computation and Big Data in Transport</td>
<td>22-24 November 2017</td>
<td>Brussels, Belgium</td>
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<tr>
<td>Platform for Aircraft Drag Reduction Innovation - PADRI 2017</td>
<td>29 November - 1 December 2017</td>
<td>Barcelona, Spain</td>
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CIMNE Annual Report # Dissemination

Upcoming Conferences (2018 -2019)

We list below the conferences that CIMNE will organise in 2018 and 2019. For further details visit congress.cimne.com

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

**SAAEI 2018**
24th 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

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

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

**ADIOS 2019**
International Conference on Adaptive Modeling and Simulation
29-31 May, 2019, El Campello, Spain

**COUPLED 2019**
VIII International Conference on Coupled Problems in Science and Engineering
3-5 June, 2019, Ermelo, Spain

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

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

**IGA 2019**
International Conference on Isogeometric Analysis
16-20 Sept., 2019, Munich, Germany

**FORM AND FORCE**
2019
IASS 60th Anniversary Symposium & 5th Intl. Conference on Textile Composites and Inflatable Structures
7-10 Oct, 2019, Barcelona, Spain

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

Images of the FEF Congress, held in Rome from 5 to 7 April 2017
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 1998
The city of Barcelona awarded CIMNE a Special Mention to the Ciutat de Barcelona Award 1998 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 GID developed at CIMNE.

CIUTAT DE BARCELONA 2002 AWARD IN TECHNOLOGICAL RESEARCH
On February 11th, 2000, the Ciutat de Barcelona Award in Technological Research was awarded to the CIMNE research team formed by Eugenio Oñate, Ramon Ribe, Enrique Escolano, Miquel Pasenau and Jorge Sulti 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 POLÍTÈCNICA 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.

Recent Awards and honours to CIMNE Scientists

1. EDUARDO ALONSO
Baker Medal for the paper “Thermo-poro-mechanical analysis of landslides: from creeping behavior to catastrophic failure”, by the British Institution of Civil Engineers (ICE), 2017.

2. CARMEN ANDRADE
ACHE Award, by the Scientific-Technical Association for Structural Concrete (Spain), 2017.

3. ANTONIO GENS

4. NÚRIA PINYOL
Telford Gold Medal for the paper “The material point method for unsaturated soils”, by the British Institution of Civil Engineers (ICE), 2016.

5. FERNANDO SALAZAR
Innovation Challenge, Verbund (Austria), 2017.

6. PAVEL RYZHAKOV

Most innovative contribution in the thematic area “Analysis and modelling” in the IX Simposio Nacional sobre Taludes y Laderas Instables” (IX National Symposium on Slopes and Unstable Slopes) (27-30 June 2017, Santander, Spain) to the contribution “Mechanisms controlling the landslide velocity” authored by Núria M. Pinyol, M. Rosaria Scoppettuolo (Università degli Studi di Salerno) and Prof. Eduardo E. Alonso.

See full list of CIMNE Awardees in cimne.com/awards
The International Centre for Numerical Methods in Engineering (CIMNE) has celebrated on 5th September, 2017, an event to commemorate its 30 years of history.

The event, that brought together 400 people and took place in the Vertex Building of North Campus of the UPC · BarcelonaTech, had the participation of Mr. Ferran Falcó, General Secretary of the Department for Territory and Sustainability of the Generalitat de Catalunya.

Mr. Falcó highlighted that “these 30 years of celebration are important because they represent the start and the consolidation of a country project. The trajectory of CIMNE represents the values that we want to project to the world: ideas for a better world and knowledge at the service of society.”

The event also counted with the participation of other authorities of the Technical University and the Generalitat of Catalonia. The Deputy Director General for Research at the Department of Empresa and Knowledge, Ms. Iolanda Font de Rubinat, stated: “The centre needs new investments to recover the levels achieved before the crisis. On the part of the Generalitat, we will do our best to achieve this goal and we will offer CIMNE our cooperation and support.”

The Vice Rector of the Technical University of Catalonia, Prof. Fernando Onías, highlighted the success of CIMNE, the oldest research centre of the UPC. The Director of the School of Civil Engineering, Prof. Pedro Díez, stressed the fact of “CIMNE is more than a research centre”; and the Director of CIMNE, Prof. Eugenio Oñate, said: “We have the challenge ahead to make CIMNE a sustainable organization and this will imply taking all the knowledge accumulated over 30 years for the purpose of increasing the welfare of our citizens.”
**CiMne Annual Report # Dissemination**

## CiMne in the media

**CiMne in the media**

- **Diario Medico**
  - ORIGINAL TITLE: "Millorant el control del claveguera"
  - TITLE IN ENGLISH: Improving control of the sewer system.
  - SOURCE: La Vanguardia
  - PUBLICATION DATE: 19/02/2017

- **VHeart SN**
  - ORIGINAL TITLE: "Un ‘corazón virtual’, objetivo de la red ‘V-Heart SN’"
  - TITLE IN ENGLISH: "An ‘virtual heart’, objective of the network ‘V-Heart SN’"
  - SOURCE: El Periódico
  - PUBLICATION DATE: 20/06/2017

- **Faro de Vigo**
  - ORIGINAL TITLE: "La primera embarcación ‘no tripulada’ de España se pone a prueba en la ría viguesa"
  - TITLE IN ENGLISH: The first ‘unmanned’ boat in Spain is tested in the Vigo estuary.
  - SOURCE: Faro de Vigo
  - PUBLICATION DATE: 23/02/2017

- **BIM Table**
  - ORIGINAL TITLE: "Construmat. Casos sostenibles"
  - TITLE IN ENGLISH: Construmat. Sustainable homes.
  - SOURCE: TV3
  - PUBLICATION DATE: 05/2017

- **Fibreship**
  - ORIGINAL TITLE: "Material reciclado para buques de guerra"
  - TITLE IN ENGLISH: Recycled material for war ships.
  - SOURCE: Baz
  - PUBLICATION DATE: 20/06/2017

- **Emergency bridges**
  - ORIGINAL TITLE: "Puentes de urgencia"
  - TITLE IN ENGLISH: Emergency bridges.
  - SOURCE: El Periódico
  - PUBLICATION DATE: 20/06/2017

**CiMne in the media**

- **La Vanguardia**
  - ORIGINAL TITLE: "Investigadores españoles aúnan fuerzas para crear un ‘corazón virtual’"
  - TITLE IN ENGLISH: "Spanish researchers unite forces to create a ‘virtual heart’"
  - SOURCE: El Periódico
  - PUBLICATION DATE: 23/02/2017

- **Faro de Vigo**
  - ORIGINAL TITLE: "La ingeniería española a la cabeza de Fibreship en el Horizonte 2020"
  - TITLE IN ENGLISH: "Spanish engineering at the head of Fibreship in Horizon 2020"
  - SOURCE: Sector Marítimo
  - PUBLICATION DATE: 19/06/2017
CIMNE in the media

@2017 IN TWEETS

CIMNE carries out an intensive activity through social media, with special attention to Twitter, where the centre has more than 860 followers. Below we highlight some of the 2017 tweets to explain CIMNE’s activities through the networks.

RT @iCERCA El prof. Otadeu @cimne fent la glossa d’homenatge al Prof. Benjamin Suarez als UPC i ESC.

RT iCERCA Els project partners al @cimne van a produir biogas a la abat Furthermore in Quito, Ecuador.

RT @joseprull Visitem el @cimne a @la_UPC. Eina clau per a la provisió de coneixement i solucions en l’àmbit, entre d’altres, de les infraestructures.

RT @icerca Celebrant els 30 anys de @cimne @iCERCA N’esperem minim 30 mes!

Dr. C. Soriano representing the UNESCO chair on Numerical Methods for Eng. in Mobilizing UNESCO Science Chairs for policy action towards 2030.

International Centre for Numerical Methods in Engineering

Generating knowledge and solutions since 1987

www.cimne.com