

Estefano Matías **Muñoz Moya**

Ph.D. Biomechanics Student • Early Stage Researcher • Discaall ITN Marie Skłodowska-Curie Actions

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Presentation

I'm the Early Stage Researcher 14 - Ph.D. candidate in the European Project Disc4All MSCA-2020-ITN-ETN GA: 955735. I have a degree in Engineering Sciences with a mention in Mechanical Engineering (2017) and obtained my Master's degree in Mechanical Engineering (2020) from the University of Santiago de Chile. I have dedicated my previous research to two Chilean projects through experimental tests and numerical simulations. My current research focuses on systematizing multiscale modeling of intervertebral disc regularization during degeneration.

Education

Universitat Pompeu Fabra (UPF)

Barcelona, Spain

♦ DOCTORAL DEGREE | IN PROGRESS

Oct. 2021 - **PRESENT**

• Ph.D. Information and Communication Technologies.

Universidad de Santiago de Chile (USACH)

Santiago, Chile

♦ MASTER DEGREE | AWARDED | GPA: 6.9/7.0 | HIGHEST DISTINCTION

2018 - 2020

M.Sc. Mechanical Engineering | Diploma Link

2013 - 2021

- ◇ BACHELOR DEGREE | AWARDED | GPA: 6.2/7.0
 Professional Degree Civil Mechanical Engineering | Diploma Link
- B.Sc. Mechanical Engineering | Diploma Link

Experience

Research Work

♦ JOURNAL REVIEWER

Jul 2024 - PRESENT

♦ Universitat Pompeu Fabra (<u>UPF</u>) | Barcelona, Spain

• CLINICAL BIOMECHANICS (<u>JCLB</u>) | <u>CERTIFICATE LINK</u>

Oct. 2021 - **PRESENT**

 $\texttt{Early Stage Researcher (ESR)} \ | \ \underline{\textbf{Disc4All}} \ | \ \underline{\textbf{Disc4A$

- $\bullet \ \ \text{Project: } \textit{Training network to advance integrated computational simulations in translational medicine, applied to intervertebral disc degeneration.}$
- Numerical computational research on intervertebral discs under disc degeneration.
- ♦ UNIVERSIDAD SANTO TOMÁS (UST) | CENTRE FOR CLIMATE CHANGE RESEARCH AND INNOVATION (CIÍCC) | SANTIAGO, CHILE

Oct. 2018 - Jun. 2021

RESEARCH ASSISTANT | CARBONATLAB | PROJECT PIA-ANID ANILLO ACT 172037 | PI: Nelson A. Lagos

- Project: Interacting structure and function of ecological, mechanical and mineralogical properties of marine calcifiers: Shell carbonates as sources of bio-inspiration (Carbo-Nat-Lab).
- $\bullet \ \ \text{Experimental and numerical computational research on the shell skeleton structure from the Chilean coast, subject to climate change scenarios.}$
- $\diamond \ Universidad \ de \ Santiago \ de \ Chile \ (USACH) \ | \ Lab. \ Biomec\'ancia \ y \ Biomateriales \ (\underline{BioMatLab}) \ | \ Santiago, \ Chile \ (\underline{BioMatLab})$

Oct. 2018 - Jun. 2021

RESEARCH ASSISTANT | PROJECT FONDECYT 1170608F | PI: CLAUDIO M. GARCÍA-HERRERA & DIEGO J. CELENTANO

- Project: Biomechanical Behaviour of Arteries from Chronic Hypoxic Animals: Experiments, Modelling, Numerical Simulation and Validation.
- Biomechanical characterization of arteries to observe adverse effects, such as hypoxia suffered by Chilean mining workers. In collaboration with the veterinary medical center of the University of Chile (FAVET).

Visiting Researcher

♦ TAMPERE UNIVERSITY (TAU), DECISION SUPPORT FOR HEALTH (DSH) | TAMPERE, FINLAND

Jan. 2024 - Mar. 2024

PROJECT: DISC4ALL | DISC4ALL | MSCA-2020-ITN-ETN GA: 955735 | PI: MARK VAN GILS | RECOMMENDATION LETTER: LINK

Linking NFBC data with mechano-transport simulations of Intervertebral Disc (IVD), disc degeneration, and low back pain qualitative levels using
the Disease State Fingerprint (DSF).

♦ OULU UNIVERSITY (OULU), RESEARCH UNIT OF HEALTH SCIENCES AND TECHNOLOGY (HST) | OULU, FINLAND

Nov. 2022 - Jan. 2023

PROJECT: DISC4ALL | DISC4ALL MSCA-2020-ITN-ETN GA: 955735 | PI: SIMO SAARAKKALA

• Clinical and Psychological data extraction from the Northern Finland Birth Cohorts (NFBC).

Teaching

♦ POMPEU FABRA UNIVERSITY (<u>UPF</u>), INFORMATION AND COMMUNICATIONS TECHNOLOGIES (<u>DTIC</u>) BARCELONA, SPAIN	
• PART-TIME TEACHER: Foundations of Physics PRACTICES.	Apr. 2023 - PRESENT
♦ Universidad de Santiago de Chile (<u>USACH</u>), Departamento de Ingeniería Mecánica (<u>DIMEC</u>) Santiago, Chile	
• Part-time Teacher: Engineering Drawing Theory.	Apr. 2021 - Aug. 2021
• Part-time Teacher: Strength of Materials Laboratory.	Apr. 2021 - Aug. 2021
• Part-time Teacher: Introduction to Mechanical Engineering Theory.	Apr. 2021 - Aug. 2021
• Part-time Teacher: Computational Mechanical Design Theory.	Oct. 2020 - Mar. 2021
• Part-time Teacher: Engineering Drawing Laboratory.	Oct. 2020 - Mar. 2021
• TEACHING ASSISTANCE: Introduction to Mechanical Engineering.	Mar. 2020 - Sep. 2020
• TEACHING ASSISTANCE: Strength of Materials.	Mar. 2019 - Aug. 2019
• TEACHING ASSISTANCE: Applied Mathematics.	Aug. 2018 - Aug. 2019

Publications | https://scholar.google.com/citations?user=930f_CMAAAAJ_

PUBLISHED | FRONTIERS: BIOENGINEERING AND BIOTECHNOLOGY | DOI 10.3389/FBIOE.2025.1651786

First Author | 2025

Jul. 2017 - Jan. 2019

• Influence of Disc Height and Strain-Dependent Solute Diffusivity on Metabolic Transport in Patient-Personalized Intervertebral Disc Models

PUBLISHED | COMPUTER METHODS AND PROGRAMS IN BIOMEDICINE | DOI 10.1016/J.CMPB.2024.108493

Co-Author | 2025

· A porohyperelastic scheme targeted at High-Performance Computing frameworks for the simulation of the intervertebral disc

PUBLISHED | MICCAI: MEDICAL IMAGE COMPUTING AND COMPUTER ASSISTED INTERVENTION | DOI

First Author | 2024

10.1007/978-3-031-72104-5_55

· Pixel2Mechanics: Automated Biomechanical Simulations of High-Resolution Intervertebral Discs from Anisotropic MRIs

Published | Frontiers: Bioengineering and Biotechnology | DOI 10.3389/fbioe.2024.1384599

First Author | 2024

· Unveiling Interactions Between Intervertebral Disc Morphologies and Mechanical Behavior through Personalized Finite Element Modeling

PUBLISHED | ORS: JOR SPINE | DOI 10.1002/JSP2.1294

Co-Author | 2023

· Cartilaginous endplates: A comprehensive review on a neglected structure in intervertebral disc research

PUBLISHED | FRONTIERS: CELL AND DEVELOPMENTAL BIOLOGY | DOI 10.3389/FCELL.2022.924692

Co-Author 2022

• Immuno-Modulatory Effects of Intervertebral Disc Cells

• TEACHING ASSISTANCE: Thermal Systems (Thermodynamics II).

Published | Frontiers: Bioengineering and Biotechnology | DOI 10.3389/FBIOE.2021.813537

Second Author | 2022

• Biomechanical Characterization of Scallop Shells Exposed to Ocean Acidification and Warming

PUBLISHED | NATURE: SCIENTIFIC REPORTS | DOI 10.1038/S41598-021-04414-1

First Author | 2022

• Evaluation of remodeling and geometry on the biomechanical properties of nacreous bivalve shells

Conferences estefano23.github.io/work.html#conferences

30th Congress of the European Society of Biomechanics (ESB 2025), Eidgenössische Technische Hochschule Zürich (ETH).

ETH, Zürich, Switzerland

International | Speaker Presentation | Certificate Link | Student Award TOP 3

Jul. 2025

• FULLY COUPLED MULTI-SPECIES MECHANO-TRANSPORT SIMULATIONS IN THE INTERVERTEBRAL DISC.

33rd European Orthopaedic Research Society (EORS 2025), Congress Centre Davos.

Davos, Switzerland

 $International \ | \ Speaker \ \& \ Poster \ Presentation \ | \ \underline{Certificate \ Link}$

May. 2025

- Podium: Automated Biomechanical Simulations of High-Resolution Intervertebral Discs from Anisotropic MRIs.
- Poster: Intervertebral Disc State Fingerprint to classify degeneration and low back pain in the Northern Finland Birth Cohort 1966.

51st International Society for the Study of the Lumbar Spine (ISSLS 2025), Emory University.

Emory U., Atlanta, USA

International | Speaker Presentation | Certificate Link

May. 2025

Intervertebral Disc State Fingerprint to classify degeneration and low back pain in the Northern Finland Birth Cohort 1966

VPHi Conference (VPHi 2024), University of Stuttgart.

US, Stuttgart, Germany

International | Speaker Presentation | Certificate Link

Sep. 2024

 $\bullet \ \ {\sf Pixel 2 Mechanics: Automated \ Biomechanical \ Simulations \ of \ High-Resolution \ Intervertebral \ Discs \ from \ Anisotropic \ MRIs.}$

50th International Society for the Study of the Lumbar Spine (ISSLS 2024), Quark Hotel.

Milano, Italy

INTERNATIONAL | SPEAKER PRESENTATION | CERTIFICATE LINK

May. 2024

 Unveiling the interaction between IVD local morphologies and mechanical behavior through a novel morphing process: A step towards personalized medicine.

31st European Orthopaedic Research Society (EORS 2023), Minho University.

UM, Porto, Portugal

Sep. 2023

 $International \ | \ Speaker \ \& \ Poster \ Presentation \ | \ \underline{Certificate \ Link} \ | \ \underline{Poster \ Link}$

• Mining of biomechanical and geometry data of IVD FE simulations.

28° Congress of the European Society of Biomechanics (ESB 2023), Maastricht Congress Center.

UM, Maastricht, The Netherlands

Jul. 2023

International | Speaker Presentation | Certificate Link

· A cohort of patient-specific and virtual finite element models of intervertebral discs and model validation

18th International Symposium on Computer Methods in Biomechanics and Biomedical Engineering (CMBBE 2023), Arts et Métiers Institute of Technology.

IAM, Paris, France

INTERNATIONAL | SPEAKER PRESENTATION | CERTIFICATE LINK

May. 2023

• A cohort of patient-specific and virtual finite element models of intervertebral discs

XI Capítulo Español: Sociedad Europea de Biomecánica (ESB-ESP 2022), Universidad de Zaragoza.

UNIZAR, Zaragoza, Spain

Oct 2022

Spain | Speaker Presentation | Certificate Link

TERRITE CON EV

 GENERACIÓN DE UNA COHORTE DE MODELOS DE ELEMENTOS FINITOS DE DISCOS INTERVERTEBRALES ESPECÍFICO DE PACIENTES, CON EX-TENSIÓN A COHORTE VIRTUAL.

VPHi Conference (VPHi 2022), Universidade do Porto.

UPORTO, Porto, Portugal

International | Poster Presentation | Certificate Link | Poster Link

Sep. 2022

TOWARDS A REPOSITORY OF PATIENT-SPECIFIC INTERVERTEBRAL DISC FINITE ELEMENT MODELS.

27° Congress of the European Society of Biomechanics (ESB 2022), Universidade do Porto.

UPORTO, Porto, Portugal

International | Speaker Presentation | Certificate Link | Podium Certificate Link

• TOWARDS A REPOSITORY OF PATIENT-SPECIFIC INTERVERTEBRAL DISC FINITE ELEMENT MODELS.

Jun. 2022

1st Taulí Health symposium - ARTIFICIAL INTELLIGENCE, Investigación e Innovación Parc Taulí.

I3PT, Catalunya, Spain

 ${\sf International} \ | \ {\sf Spectator} \ | \ {\sf \underline{Certificate}} \ {\sf \underline{Link}}$

Al for Health and Wellness

UPF, Barcelona, Spain

INTERNATIONAL | POSTER PRESENTATION | CERTIFICATE LINK | POSTER LINK

May. 2022

• TOWARDS A REPOSITORY OF PATIENT-SPECIFIC INTERVERTEBRAL DISC FINITE ELEMENT MODELS.

IX International Conference on Computational Bioengineering (ICCB 2022), ULisboa.

6th Barcelona VPH Summer School (VPH SC 2022), Universitat Pompeu Fabra.

ULisboa, Lisboa, Portugal

International | Speaker Presentation | Certificate Link

Apr. 2022

• TOWARDS A REPOSITORY OF PATIENT-SPECIFIC INTERVERTEBRAL DISC FINITE ELEMENT MODELS.

X Capítulo Español: Sociedad Europea de Biomecánica (ESB-ESP 2021), Universidad de Granada.

UGR, Granada, Spain

 $\mathsf{Spain} \, | \, \mathsf{Speaker} \, \mathsf{Presentation} \, | \, \underline{\mathsf{Certificate} \, \mathsf{Link}}$

Oct. 2021

 COMPORTAMIENTO BIOMECÁNICO DE LAS CONCHAS DE LOS MEJILLONES: DEGRADACIÓN DURANTE LA REMODELACIÓN DE LAS PROPIEDADES MECÁNICAS Y SISTEMA DE DEFENSA.

XL Congreso de Ciencias del Mar, Universidad de Magallanes, <u>SCHCM</u>.

UMAG, Magallanes, Chile, Virtual

CHILE | SPEAKER PRESENTATION | CERTIFICATE LINK

May. 2021

COMPORTAMIENTO MECÁNICO SIMÉTRICO DE LA RESISTENCIA DE LAS CONCHAS DEL MEJILLÓN PERUMYTILUS PURPURATUS.

11° World Biomaterials Congress (WBC 2020), University of Glasgow, <u>IUSBSE</u>.

Glas, Glasgow, Scotland, Virtual

International | Poster Presentation | Certificate Link | Poster Link

Dec. 2020

MECHANICAL BEHAVIOR SYMMETRY OF MUSSEL SHELLS AND NUMERICAL METHOD FOR BIOMATERIAL ORTHOTROPY DIRECTIONS.

2° Congreso de Estudiantes de Postgrado USACH (USACH 2020), Universidad de Santiago de Chile.

USACH, Santiago, Chile, Virtual

CHILE | SPEAKER PRESENTATION | CERTIFICATE LINK

Nov. 2020

PERUMYTILUS PURPURATUS: SIMETRÍA DE VALVAS Y CARACTERIZACIÓN DE DIRECCIÓN ORTÓTROPA.

Congreso Chileno de Biomecánica y Biomateriales (CBIO 2020), Universidad de Santiago de Chile.

Congreso Internacional de Metalurgia y Materiales (CONAMET 2019), Universidad Austral de Chile.

USACH, Santiago, Chile, Virtual

CHILE | SPEAKER PRESENTATION | ORGANIZER | CERTIFICATE LINK

Oct. 2020

• PERUMYTILUS PURPURATUS: SIMETRÍA DE VALVAS Y CARACTERIZACIÓN DE DIRECCIÓN ORTÓTROPA.

UACH, Valdivia, Chile

INTERNATIONAL | SPEAKER PRESENTATION | CERTIFICATE LINK

Nov. 2019

ANÁLISIS DE LA RESPUESTA BIOMECÁNICA DE PERUMYTILUS PURPURATUS ANTE ESCENARIOS DE CAMBIO CLIMÁTICO.

1º Congreso de Estudiantes de Postgrado USACH (USACH 2019), Universidad de Santiago de Chile.

CHILE | SPEAKER PRESENTATION | CERTIFICATE LINK

MODELOS CONSTITUTIVOS DE CRECIMIENTO APLICADOS A LA CONCHA DEL PERUMYTILUS PURPURATUS.

Aug. 2019

25° Congress of the European Society of Biomechanics (ESB 2019), TU Wien.

International | 2 Speaker Presentations | Certificate Link | Podium Certificate Link

TU Wien, Vienna, Austria Jul. 2019

USACH, Santiago, Chile

- BIOMECHANICAL BEHAVIOUR ON SHELL CHARACTERISTICS (PERUMYTILUS PURPURATUS) ALONG THE CHILEAN COAST.
- NUMERICAL ANALYSIS OF THE BIOMECHANICAL RESPONSE OF OYSTER SHELLS SUBJECTED TO CLIMATE CHANGE SCENARIOS.

Courses.

8th Barcelona VPH Summer School (VPH SC 2025), Universitat Pompeu Fabra (UPF).

Barcelona, Spain

Training program | Teacher | Certificate Link

Jun. 2025

· Patient-specific ntervertebral disc modeling for fully coupled multi-species mechano-transport simulations from clinical MRI.

The Human Digital Twin Summer School Barcelona, Universitat Pompeu Fabra (UPF).

Barcelona, Spain

Training program | Teacher | Certificate Link

Mar. 2024

· HandsOn: Patient-specific intervertebral disc modelling for biological stratification with clinical data.

7th Barcelona VPH Summer School (VPH SC 2023), Universitat Pompeu Fabra (UPF).

Barcelona, Spain

TRAINING PROGRAM | POSTER | POSTER LINK

May. 2023

• Poster: Towards a repository of patient-specific intervertebral discs finite element models.

6th Barcelona VPH Summer School (VPH SC 2022), Universitat Pompeu Fabra (UPF).

Barcelona, Spain

TRAINING PROGRAM | TEACHER & POSTER | CERTIFICATE LINK | POSTER LINK

May. 2022

HandsOn: Surrogate modeling of IVD simulation under physiological sports loading conditions.

5th Barcelona VPH Summer School: Stratification of patients with complex phenotypes

Universitat Pompeu Fabra, Virtual

TRAINING PROGRAM | STUDENT | CERTIFICATE LINK

• Transversal training of in silico medicine. Dictated by BCN MedTech, Virtual Physiological Human Institute (VPHi), and QUAES Foundation.

Structure, form, and function of calcifying organisms

CIMARO UNAB, Valparaíso, Chile

POSTGRADUATE COURSE | STUDENT | CERTIFICATE LINK

• Dictated by the academics Ph. D. Antonio Checa (Universidad de Granada, Spain) and Ph. D. Fabio Labra (Universidad Santo Tomás, Chile).

Memberships

Virtual Physiological Human institute (VPHi)

Europe

STUDENT MEMBER | CERTIFICATE LINK

Sep. 2022 - PRESENT

• Membership UPF

European Society of Biomechanics (ESB)

Europe

STUDENT MEMBER | CERTIFICATE LINK

Jul. 2020 - **PRESENT**

• Membership ID: 3263

STEM Preeschoolar USACH-DIMEC (Science, Technology, Engineering, and Mathematics)

Santiago, Chile

MEMBER | CERTIFICATE LINK

Oct. 2019 - Sep. 2021

• Scientific popularization for preschool children with a gender perspective.

30th Congress of the European Society of Biomechanics (ESB 2025), Eidgenössische Technische Hochschule Zürich (ETH).

ETH, Zürich, Switzerland

STUDENT AWARD - TOP 3 | CERTIFICATE LINK

Jul. 2025

Presentation: FULLY COUPLED MULTI-SPECIES MECHANO-TRANSPORT SIMULATIONS IN THE INTERVERTEBRAL DISC.

8th Barcelona VPH Summer School (VPH SC 2025), Universitat Pompeu Fabra (UPF).

Barcelona, Spain

BEST HANDSON | CERTIFICATE LINK

Jun 2025

· HandsOn: Patient-specific ntervertebral disc modeling for fully coupled multi-species mechano-transport simulations from clinical MRI.

JOR Spine - Wiley, Orthopaedic Research Society.

Published online

TOP CITED ARTICLE | CERTIFICATE LINK

Mar. 2025

• Top 10 most-cited papers published in 2023: Cartilaginous endplates: A comprehensive review on a neglected structure in intervertebral disc research | DOI 10.1002/jsp2.1294

6th Barcelona VPH Summer School (VPH SC 2022), Universitat Pompeu Fabra (UPF).

BEST HANDSON | CERTIFICATE LINK

HandsOn: Surrogate modeling of IVD simulation under physiological sports loading conditions.

European Union to study in Universitat Pompeu Fabra (UPF).

SCHOLARSHIP | CERTIFICATE LINK

• Full Ph.D. scholarship. EARLY STAGE RESEARCHER DISC4ALL ITN MARIE SKŁODOWSKA-CURIE ACTIONS

Government of Chile to study in University of Santiago de Chile (USACH).

SCHOLARSHIP | CERTIFICATE LINK

• Full Master scholarship. BECA ARANCEL

Government of Chile to study in University of Santiago de Chile (USACH).

SCHOLARSHIP | CERTIFICATE LINK

• Full Undergraduate scholarship. BECA BICENTENARIO

Barcelona, Spain

Barcelona, Spain

May. 2022

Oct. 2013 - 2021

Santiago, Chile

Oct. 2018 - 2020

Santiago, Chile

Oct. 2013 - 2021

Science Popularization

Science Festival - Festival de la Ciencia (FECI of PAR Explora RM Sur Poniente), Universidad de Chile

EXPERT SCIENTIFIC COLLABORATOR | CERTIFICATE LINK

• Science experiments for children.

Science Festival - 10° Feria Científica USACH, Universidad de Santiago de Chile

EXPERT SCIENTIFIC COLLABORATOR | CERTIFICATE LINK

• Exhibition of biomechanical tests for children.

Exhibition - Mollusca, espiral del cambio - CiiCC, Museo de Historia Natural de Valparaíso (MHNV)

EXPERT SCIENTIFIC COLLABORATOR | CERTIFICATE LINK

• Exhibition of the consequences of climate change in the oceans.

Exhibition - XII Fiesta de la ciencia y la tecnología (PAR Explora RM Sur Oriente), Universidad de Chile

EXPERT SCIENTIFIC COLLABORATOR | CERTIFICATE LINK

· Exhibition of the mechanical properties of the mollusk shells subject to climate change scenarios.

UCHILE, Virtual

Nov. 2020

USACH, Santiago, Chile

Oct. 2019

MHNV, Valparaíso, Chile

Oct. 2019

PARQUEMET, Santiago, Chile

Oct. 2018



Full name: Estefano Matías Muñoz Moya

BASIC INFORMATION

- Nationality: Spain & Chile European & American Passport
- Birth: 23th of September of 1994 | Santiago, RM, Republic of Chile
- email: estefano.munoz.moya@gmail.com
- Lenguages: Native Spanish | Advanced English

PROGRAMMING LENGUAGES AND SOFTWARE USAGE

- Programming lenguages: : Fortran | Python | Matlab/Octave | C/C++ | HTML |
- Software usage: In-House FEM Softwares | AutoCAD | Abaqus | Solidworks | Ansys | Inventor | Mathcad | Fusion360 | SAM | Latex | Arduino | Ubuntu | EDEM | GiD | InVesalius | Office (Word, PowerPoint, Excel, Project) |

References

Ph. D. Jérôme Noailly | ResearchGate Link, Principal investigator, ESR supervision, and project coordinator of Disc4All - Universitat Pompeu Fabra (UPF). email: jerome.noailly@upf.edu

Ph. D. Gemma Piella | ResearchGate Link, She lead the research areas of Medical Image Analysis and Machine Learning for Personalised Medicine in BCN Medical Technologies. She is also the coordinator of the Master of Computational Biomedical Engineering - Universitat Pompeu Fabra (UPF). email: gemma.piella@upf.edu

Ph. D. Mark van Gils | ResearchGate Link | Recommendation Letter, Principal investigator, Decision Support for Health supervision - Tampere University (TAU). email: mark.vangils@tuni.fi

Ph. D. Claudio M. García-Herrera | ResearchGate Link, Director of the Mechanical Engineering Department, Associated Professor, and Researcher - University of Santiago de Chile (USACH). email: claudio.garcia@usach.cl

Ph. D. Nelson A. Lagos | ResearchGate Link, Director of the Centre for Climate Change Research and Innovation (CiiCC), Associated Professor, and Researcher - Santo Tomás University (UST). email: nlagoss@santotomas.cl

Ph. D. Diego J. Celentano | ResearchGate Link, Full Professor and Researcher of Mechanical and Metallurgical Engineering Department, Pontifical Catholic University of Chile (PUC Chile). email: dcelentano@ing.puc.cl