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Associate Professor of Structural Mechanics
Department of Mechanical Engineering
University of Zaragoza
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PERSONAL INFORMATION:

Date of birth: 14 April 1976
Place of birth: Zaragoza (Spain)
Nationality: Spanish

EDUCATION:

PhD Industrial Engineer

KNOWLEDGE AREAS:

Computational mechanics, biomechanics and mechanobiology
Multiscale finite element simulations
Probabilistic numerical methods in mechanics and biomechanics
Fatigue and Damage of Materials and structures

RESEARCH AND DEVELOPMENT ACTIVITIES

2002-2004 Researcher. Regional Government. P008/2001. Computational simulation of fracture bone healing process.

2004-2006 Researcher. European Community. Grid based decision support system for assisting clinical diagnosis and interventions in cardiovascular problems.

2005-2006 Researcher. Regional Government. Computational and experimental characterization of the tribological behaviour of polymers. Industrial and biomechanical applications.

2006-2008 Researcher. European Community. DESSOS- Decision support software for orthopaedic surgery

2006-2008 Researcher. Ministry of Science and Technology DPI2005-05020-c03-03. Biomechanics of the corneal tissue and refractory surgery.

2007-2008 Researcher. Regional Government. Mechanobiology of the tissue regeneration, computational modelling and in vitro testing.

2009-2011 Researcher. Ministry of Science and Technology. Personalised design of surgical treatments and implants based on biomechanical models of the eye.

2009-2010 Researcher. Regional Government. Tissue engineering for the regeneration of the articular cartilage: influence of mechanical factors

2009. Principal researcher. Regional Government. Computational simulation of the mandible biomechanics: its evolution from the hominids.

2008-2011. Researcher. European Commission. Innovative concepts for smart road restraint systems to provide greater safety for vulnerable road users – smart rrs.

2010-2011. Researcher. Ministry of Science and Technology. Computational simulation of the bone regeneration. Optimization mathematical models.

2011. Researcher. Regional Government. Mechanobiology and tissue engineering of articular cartilage.

2011. Principal researcher. University of Zaragoza. I Meeting of the Spanish National Chapter of the European Society of Biomechanics.

2011-2015. Researcher. European Commission. Marie Curie Program. CAD-BONE: Patient- specific predictions for bone treatments

2011-2015. Researcher. European Commission. MPNS COST ActionMP 1005. NAMABIO- From nano to macro biomaterials (design, processing, characterization, modelling) and applications to stem cells regenerative orthopaedic and dental medicine

2011-2014. Principal researcher. Ministry of Science and Technology. Desing and development of a computational tool for the personalised risk fracture prediction in osteoporotic patients (DFO-Design for Osteoporosis).

2012-2017. Researcher. European Commission. Programme “Ideas” - ERC-2012-StG. EU’s Seventh Framework Programme. INSILICO-CELL. Predictive modelling and simulation in mechano-chemo-biology: a computer multi-approach.

2015-2016. Principal researcher. Ministry of Science and Technology. Spanish Network in Biomechanics Research.

2015-2017. Principal researcher. Ministry of Science and Technology. Design and development of a multiscale, in vitro and in vivo platform for the bone fracture prevention using cement augmentation: a pre-clinical tool for osteoporotic fractures prevention.

2017-2020. Researcher. European Commission. Marie Curie Program. ITN. CURABONE

PUBLICATIONS (35 papers in JCR journals and other peer-review journals).

L. Ezquerro-Herrando, M. P. Quilez, M. A. Pérez, J. Albareda-Alberda, B. Seral-García. Range of movement for impingement and dislocation avoidance in total hip replacement predicted by a finite element model. *Med Biol Eng Comput.* 2016

J. Alierta, M. A. Pérez, B. Seral-García, J. M. García-Aznar. Biomechanical assessment and clinical analysis of different intramedullary nailing systems for oblique fractures. *Comput Methods Biomech Biomed Engin,* 2016.

M. P. Quilez, M. A. Pérez, B. Seral-García. Estudio biomecánico de la tibia en el recambio de una artroplastia de rodilla. *Revista de la Sociedad Española de Cirugía Ortopédica y Traumatología,* 2015.

L. Ezquerro-Herrando, B. Seral-García, M. P. Quilez, M. A. Pérez, J. Albareda-Alberda. Inestabilidad de la artroplastia total de cadera: estudio clínico y computacional de sus factores de riesgo. *Revista de la Sociedad Española de Cirugía Ortopédica y Traumatología,* 2015

V. Klika, M. A. Pérez, J. M. García-Aznar, F. Marsik, M. Doblaré. A coupled mechano-biochemical model for bone adaptation. *J Math Biol,* 69, 1383-1429, 2014.

- A. Alberich-Bayarri, L. Martí-Bonmati, R. Sanz-Requena, J. Sánchez-González, V. Hervás-Briz, G. García-Martí, M. A. Pérez. Reproducibilidad y Exactitud en la Cuantificación Morfométrica y Mecánica del Hueso Trabecular a partir de Imágenes de RM de 3 Teslas. *Radiología*, 56(1), 27-34, 2014.
- K. Mohaghegh, M. A. Pérez, J. M. García-Aznar. Accelerating Numerical Simulation of Strain-Adaptive Bone Remodeling Predictions. *Comput Method Appl Mech*, 273, 255-272, 2014.
- M. A. Pérez, P. A. Vendittoli, M. Lavigne, N. Nuño. Bone remodeling in the resurfaced femoral head: Effect of cement mantle thickness and interface characteristics. *Med Eng Phys*, 36(2), 185-195, 2014.
- N. Garijo, J. R. Fernández, M. A. Pérez, J. M. García-Aznar. Numerical stability and convergence analysis of bone remodeling. *Comput Method Appl Mech*, 271, 253-268, 2014.
- N. Garijo, J. Martínez, J. M. García-Aznar, M. A. Pérez. Computational evaluation of different numerical tools for the prediction of proximal femur loads from bone morphology. *Comput Method Appl Mech*, 268, 437-450, 2014.
- J. Alierta, M.A. Pérez, J.M. García-Aznar. An interface finite element model can be used to predict healing outcome of bone fractures. *J Mech Behav Biomed Mater*, 29, 328-338, 2014.
- M.A. Pérez, B. Seral-García. A finite element analysis of the vibration behaviour of a cementless hip system. *Comput Methods Biomech Biomed Engin*, 16(9), 1022-1031, 2013.
- M.A. Pérez. Life prediction of different commercial dental implants as influenced by uncertainties in their fatigue material properties and loading conditions. *Comput Methods Programs Biomed*, 108(3), 1277-1286, 2012.
- S. Santander, C. Alcaine, M.A. Pérez, A. Cortina, C. Prozzi, J. Lyahyai, C. Rodellar, M. Doblaré, I. Ochoa. In Vitro Osteoinduction Human Mesenchymal Stem Cells in Biomimetic Surface Modified Titanium Alloy Implants. *Dent Mater J*, 31(5), 843-850, 2012.
- N. Garijo, R. Manzano, R. Osta, M.A. Pérez. Stochastic cellular automata model of cell migration, proliferation and differentiation: Validation with in vitro cultures of muscle satellite cells. *J Theor Biol*, 314, 1-9, 2012.
- M.A. Pérez, J. A. Bea, M. Doblaré, J. C. Prados-Frutos. Stress transfer properties of different commercial dental implants: a finite element study. *Comput Methods Biomech Biomed Engin*, 15(3), 263-273, 2012.
- A. Alberich-Bayarri, L. Martí-Bonmati, M. A. Pérez, R. Sanz-Requena, J.J. Lerma-Garrido, G. García-Martí, D. Moratal. Assessment of 2D and 3D Fractal Dimension Measurements of Trabecular Bone from High-Spatial Resolution Magnetic Resonance Images at 3 Tesla. *Med Phys*, 37(9), 4930-4937, 2010.
- M. A. Pérez, J. Palacios. Comparative finite element analysis of the debonding process in different concepts of cemented hip implants. *Ann Biomed Eng*, 38(6), 2093-2106, 2010.
- M.A. Pérez, N. Nuño, A. Madrala, J.M. García-Aznar, M. Doblaré. Computational modelling of bone cement polymerization: Temperature and residual stresses. *Comput Biol Med*, 39(9), 751-759, 2009.
- M.A. Pérez, P. Fornells, J.M. García-Aznar, M. Doblaré. Comparative analysis of bone remodelling models with respect to CT-Based finite element models of bone. *Comput Methods Biomech Biomed Engin*. 13(1), 71-80, 2010.
- J.M. García-Aznar, M. J. Gómez-Benito, M.A. Pérez, M. Doblaré. Mechanobiological models for bone tissue. Applications to implant design. *Biomechanics of hard tissues. Modelling, testing and materials*. Ed. Wiley. 2009
- J. M. García-Aznar, M.A. Pérez, P. Moreo. Modelling of interfaces in Biomechanics and Mechanobiology. *Comput Model Eng Sci* 48(3), 271-301, 2009.
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M.A. Pérez, J.M. García-Aznar, M. Doblaré. Does increased bone-cement interface strength have negative consequences for bulk cement integrity? – a finite element study. *Ann Biomed Eng*, 37 (3), 454-466, 2009.

M.A. Pérez, P. Moreo, J.M. García-Aznar, M. Doblaré. Computational simulation of dental implant osseointegration through resonance frequency analysis. *J Biomech*, 41 (2), 316-325, 2008

M. J. Gómez-Benito, P. Moreo, M.A. Pérez, O. Paseta, J.M. García-Aznar, C. Barrios, M. Doblaré. A damage model for the growth plate. Application to the Prediction of Slipped Capital Epiphysis. *J Biomech*, 40, 3305-3313, 2007

P. Moreo, M.A. Pérez, J.M. García-Aznar, M. Doblaré, Modelling the mechanical behaviour of living bony interfaces, *Comput Method Appl M*, 196, 3300-3314, 2007

M.A. Pérez, P. J. Prendergast. Random-walk models of cells dispersal included in mechano-biological simulations of tissues differentiation. *J Biomech*, 40(10), 2244-2253, 2007

M.A. Pérez, J.M. García-Aznar, M. Doblaré, B. Seral, F. Seral. A comparative FEA of the debonding process in different concepts of cemented hip implants. *Med Eng Phys*, 28, 525-533, 2006

P. Moreo, M.A. Pérez, J.M. García-Aznar, M. Doblaré. Modelling the mixed-mode failure of cement-bone interfaces, *Eng Fract Mech*, 73, 1379-1395, 2006

B. Seral, M.A. Pérez, F. Seral, J.M. García-Aznar, M. Doblaré. Modelo de interfaz cemento-vátago en artroplastias totales de cadera. Estudio de la superficie con elementos finitos. *Revista De Ortopedia Y Traumatología*, 50(2), 137-143, 2006.

M.A. Pérez, J. Grasa, J.M. García-Aznar, J. A. Bea, M. Doblaré. Probabilistic analysis of the influence of bonding degree of the stem-cement interfaces in the performance of cemented hip prosthesis. *J Biomech*, 39, 1859-1872, 2006

M.A. Pérez, J.M. García-Aznar, M. Doblaré. Simulación del deterioro del cemento y sus interfaces en prótesis de cadera. *Revista Internacional De Metodos Numericos Para El Calculo Y Diseño En Ingeniería*, 22(2), 119-139, 2006

B. Seral, J.M. García-Aznar, M. Doblaré, M.A. Pérez, F. Seral. Periprosthetic bone remodelling. A finite element study of the influence of the implant design, *Journal of Applied Biomaterial & Biomechanics*, 3(2), 117-127, 2005

M.A. Pérez, J.M. García-Aznar, M. Doblaré. Analysis of the debonding of the stem-cement interface in intramedullary fixation using a non-linear fracture mechanics approach, *Eng Fract Mech*, 72 (8), 1125-1147, 2005

J. Grasa, M.A. Pérez, J. A. Bea, J.M. García-Aznar, M. Doblaré. A probabilistic damage model for acrylic cements. Application to the life prediction of cemented hip implants. *Int J Fatigue*, 27(8): 891-904, 2005

Summary of the publications index:

Total Articles in Publication List: 35

Sum of the Times Cited: 258

Average Citations per Article: 10.75

h-index: 10

INTERNATIONAL and NATIONAL CONGRESS PROCEEDINGS

More than 100 communications in international and national conferences

THESIS SUPERVISOR

Angel Alberich-Bayarri. In vivo morphometric and mechanical characterization of trabecular bone from high resolution magnetic resonante imaging. Universitat Politècnica Valencia. 18/11/2010

Jesús Alierta Nicodemus. Damage modeling and fracture regeneration : application to the design of implants. University of Zaragoza – Army Politechnique School. 09/05/2014

Mónica Remacha Andrés. Patient-specific modelling of the human proximal femur : application to the fracture risk prediction. University of Zaragoza. 14/12/2015

Noelia Garijo Millán. Bone remodeling simulations: challenges, problems and applications. University of Zaragoza. 18/02/2016

RESEARCH STANCES

Ecole de Technologie Superieure

Universidad de québec, Montreal (Canada), 2008, 12 weeks

Estudio experimental y numérico de la evolución de las tensiones residuales en el cemento utilizado en las prótesis de cadera cementadas

Centre for Bioengineering of the Trinity College

Dublín , Irland, 2004, 24 weeks

Desarrollo de un modelo de osteointegración para prótesis no cementadas

Materialise, NV, Belgium

Leuven, Belgium 2014-2015, 16 weeks

Research stay within the European Project CADBONE

OTHER ACTIVITIES

Council member of the European Society of Biomechanics (ESB) since July 2012, since July 2014 ESB-Secretary General.

President of the Spanish National Chapter of the European Society of Biomechanics (ESB) (2011-2013).

Program Manager of the Master of Biomedical Engineering of the University of Zaragoza, Zaragoza (Spain).

Deputy Director of the School of Engineering of the University of Zaragoza, Zaragoza, Spain.

Reviewer of research projects for the Spanish Ministry of Science and Economy.

Reviewer of research projects for the Spanish Agency of Projects Evaluation

Reviewer of research projects for the European Commission within different programs

Member of the experts panel within the "Academia" program of the National Agency for Quality Assessment and Accreditation of Spain, ANECA.

Regular reviewer of different JCR journals: Plos One, Computer in Biology and Medicine, Journal of Biomechanics, Applied bionics and biomechanics, Applied Mathematics and Computation, ASME Journal of Biomedical Engineering, Computers Methods and Programs in Biomedicine, Journal of the mechanical Behavior of Biomedical Materials, Journal of Biomaterials applications, Journal of Engineering and Technology Research, Journal of Materials Science Materials in medicine, Medical and Biological and Engineering and Computing, Medical Engineering and Physics, Neurocomputing, etc.
