

CV date	30/12/2022
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Part A. PERSONAL INFORMATION

First and Family name	Begoña Calvo Calzada		
Researcher codes	Open Researcher and Contributor ID (ORCID**)	0000-0001-9713-1813	
	SCOPUS Author ID (*)	7005431681	
	WoS Researcher ID (*)	F-4091-2011	

A.1. Current position

<i>University/Institution</i>	University of Zaragoza		
<i>Department</i>	Department of Mechanical Engineering. Mechanics of Continuum Media and Structural Mechanics. Faculty: School on Engineering and Architecture		
<i>Current position</i>	Full Professor	From	2010
<i>Key words</i>	Behavior of soft biological tissues. Muscle behavior. Ocular system. Hyperelastic models. Advanced computational methods. Non-linear solid mechanics.		

A.2. Education

PhD, Licensed, Graduate	University	Year
PhD in Computational Mechanics	University of Zaragoza	1994
BEng and MEng Mechanical Engineering	University of Zaragoza	1989

A.3. General indicators of quality of scientific production (see instructions)

Scientific production Indicator	Period 2010-20
Six-year research periods	3
Date from last recognized period	31-12-2015
Six-year transfer research periods	1
Thesis supervised	9 (12)
h-index (Web of Science)	32
JCR articles	75 (105)
Total number of citations	1114 (2846)
Average number of citations per year	101 (158)

Part B. CV SUMMARY (max. 3500 characters, including spaces)

Begoña Calvo PhD. (Female). She is currently Full Professor of Structural Mechanics at the Department of Mechanical Engineering at UNIZAR. since 2010. From 1996 to 2010, she was Associate professor. She achieved his Ph.D. in Computational Mechanics at the University of Zaragoza in 2004. She was a visiting scholar at University of Porto (PT).

Prof. Calvo has published more than 100 papers in ISI journals, 200 conference proceedings, different books chapters, reports and oral presentations. He has been responsible for several research projects and transference to the industry and has supervised thirteen PhD Theses. She is currently Coordinator of the Applied Mechanics and Bioengineering Group (T24-20R) of Aragon Government and member of different national and European commissions related to research. She is member of different national and international scientific associations.

Prof. Calvo has coordinated several research topics in the bioengineering field. She is an expert in computational mechanics with special emphasis in numerical modeling of soft biological tissues (muscle and eye tissues). She also has worked in soft tissue modeling, in



inelastic effects of biological tissues, ocular and abdominal diseases and its interaction with medical devices. Last year she focused her research on experimental methods in biomechanics. Her teaching activities include Continuum Mechanics, Strength of Materials, Structural Mechanics and Advanced Numerical Methods, mainly focused on the characterization and simulation of complex materials and processes.

Part C. RELEVANT MERITS 2010-2022

C.1. Publications

1. I. Cabeza-Gil, B. Calvo. Predicting the biomechanical stability of IOLs inside the postcataract capsular bag with a finite element model. *Computer Methods and Programs in Biomedicine*, 221, 106868, 2022. DOI:10.1016/j.cmpb.2022.106868
2. I. Cabeza-Gil, I. Rios-Ruiz, B. Calvo. Experimental evaluation of the injection force exerted in intraocular lens delivery with syringe-type injectors. *Journal of the Mechanical Behavior of Biomedical Materials*, 124, 104793, 2021. FI (2021): 4.042 (Q2: 48/98 Engineering, Biomedical) <https://doi.org/10.1016/j.jmbbm.2021.104793>
3. I. Cabeza-Gil; Grasa, J.; Calvo, B. A numerical investigation of changes in lens shape during accommodation. *SCIENTIFIC REPORTS*. 11, pp. 9639 [12 pp.]. 2021. DOI: 10.1038/s41598-021-89145-z
4. I. Cabeza-Gil, I. Ruiz-Ríos, B. Calvo. Customised selection of the haptic design in C-loop intraocular lenses based on deep learning. *Annals of Biomedical Engineering*, 48, pages2988–3002, 2020. FI: 3.934 (Q2: 31/90 Engineering, Biomedical) DOI: 10.1007/s10439-020-02636-4
5. M Karami; B. Calvo; H Zohoor, K Firrozbakhsh; J. Grasa. Assessing the role of Ca²⁺ in skeletal muscle fatigue using a multi-scale continuum model. *Journal of Theoretical Biology*, 2019, 461, pp: 76-83. FI: 2.327, (Q2: 17/ 59 Mathem & Comput Biology)
6. R. Simón-Allué, A Orillés, B. Calvo. Mechanical behavior of surgical meshes for abdominal wall repair: in vivo versus biaxial characterization. *Journal of the Mechanical Behavior of Biomedical Materials*, 2018, 82, pp: 102-111. FI: 3.485, (Q1: 18/80 Eng, Biomedical).
7. M. A. Ariza-Gracia, A. Orillés, J. A. Cristóbal, José F. Rodríguez, B. Calvo A numerical-experimental protocol to characterize corneal tissue with an application to predict astigmatic keratotomy surgery. *Journal of the Mechanical Behavior of Biomedical Materials*, *Journal of the Mechanical Behavior of Biomedical Materials*, 74, 2, Pages 304-314, 2017. FI: 3.239, (Q1: 18/78 Engineering, Biomedical).
8. M. A. Ariza-Gracia, S. Redondo, David P. Piñero, B. Calvo, José F. Rodríguez. A predictive tool for determining patient specific mechanical properties of human corneal tissue. *Computer Methods in Applied Mechanics and Engineering*, 317, pp. 226 - 24, 2017. FI: 4.441, (Q1: 5/85) Engineering, Multidisciplinary).
9. MA. Ariza-Gracia, J. Zurita, David P. Piñero, B. Calvo, JF. Rodríguez. Automated Patient-Specific Methodology for Numerical Determination of Biomechanical Corneal Response. *Annals of Biomedical Engineering*, 44(5), pp: 1753-72, 2016. FI: 3.221 (Q1: 18/77) Engineering, Biomedical.
10. J. Grasa, M. Sierra, N. Lauzeral, M.J. Muñoz, J. Miana-Mena, B. Calvo. Active behavior of abdominal wall muscles. Experimental results and numerical model formulation. *Journal of the Mechanical Behavior of Biomedical Materials*, 2016; 61:444-54. FI: 3.11 (Q2: 20/78 Engineering, Biomedical).
11. M.A. Ariza-Gracia, David P. Piñero, J. Zurita, JF. Rodriguez, B. Calvo. Coupled Biomechanical Response of the Cornea Assessed by Non-Contact Tonometry. A simulation study. *Plos One*, 10(3), pp:1-15, 2015. FI: 3.057 (Q1: 11/63 multidisciplinary sciences)
12. Hernández-Gascón B, Grasa J, Calvo B, Rodríguez JF. A 3D electro-mechanical continuum model for simulating skeletal muscle contraction. *J. Theor Biol.* 335: 108-118. 2013. FI: 2.303 (Q1: 10/52 Computational Mathematical)
13. J. Grasa, M. Sierra, R. Osta, M.J. Muñoz, F. Soteras, B. Calvo. J. Miana-Mena. On simulating sustained isometric muscle fatigue. A phenomenological model considering different fiber metabolisms. *Biomechanics and Modeling in Mechanobiology*, 2014; 13(6): 1373-85. FI: 3.145 (Q1: 17/76 Engineering, Biomedical)



14. B. Hernández-Gascón, E. Peña, H. Melero, G. Pascual, M. Doblaré, M. P. Ginebra, J.M. Bellón, B. Calvo. Mechanical behaviour of synthetic surgical meshes. Finite element simulation of the herniated abdominal wall. *Acta Biomaterialia*, 2011, 7, pp: 3905-3913. FI: 4.88 (Q1: 3/70 Engineering, Biomedical)
15. J. Grasa, A. Ramírez, R. Osta, M.J. Muñoz, F. Soteras, B. Calvo. A 3D active-passive numerical skeletal muscle model incorporating initial tissue strains. Validation with experimental results on rat tibialis anterior muscle *Biomechanics and Modeling in Mechanobiology*, 2011, 10:779–787. FI: 3.162 (Q1: 10/69 Engineering, Biomedical)
16. A. Ramírez, J. Grasa, A. Alonso, F. Soteras, R. Osta, M.J. Muñoz, B. Calvo. Active response of skeletal muscle: In Vivo experimental results and model formulation. *J. of Theoretical Biology*, 2010, 267(4): 546-553. FI: 2.371(Q2: 10/3 7 Computational biology)

C.2. Research projects

1. OBERON/ Opto-Biomechanical Eye Research Network (G.A. No. 956720). Unión Europea. From: 01/01/2021 - 31/12/2024. PI UZ: : B. Calvo. UZ: 501.809,76 €.
2. Nuevas tecnologías de calentamiento y control aplicado a electrodomésticos para mejorar la experiencia de usuario (ARQUE)-GRUPO AMB. RTC-2017-5965-6. PI: Miguel Ángel Martínez. MINISTERIO DE ECONOMÍA Y COMPETITIVIDAD. From: 01/04/2018 - 30/09/2021. 131.463,41 €
3. Modelado personalizado in-silico del globo ocular. Ayuda al diseño y planificación de tratamientos oftalmológicos. MINECO. DPI2017-84047-R. From: 01/01/2018 to: 31/12/2021. PI: Begoña Calvo and Jorge Grasa. 121.000 €
4. Respuesta del tejido corneal al tratamiento del cross-linking. Aplicación al tratamiento del queratocono. CICYT. DPI2014-54981R. From: 01/01/2015 to: 31/12/2017. PI: Begoña Calvo and Jorge Grasa. 130.000 €
5. FP7-SME-2013-606634-POPCORN. Development of corneal biomechanical model. Dynamic topographical characterization based on 3D plenoptic imaging. PI: David Piñero. Unión Europea. From: 01/09/2013 to: 30/03/2016. 1000000 €, UZ: 216.000 €.
6. Modelado biomecánico del tejido músculo-esquelético abdominal. CICYT. DPI2011-27939-C02-01. From: 01/01/2012 to: 31/12/2014. PI: Begoña Calvo. 108.000 €

C.3. Contracts, technological or transfer merits

1. Application of artificial intelligence techniques to food cooking.. Company: BSH Electrodomésticos. From: 01/03/2022, to: 28/02/2024. PI: Begoña Calvo. 60.000 €
2. IOL FE ANALYSIS. Internacional. PI: María Begoña Calvo. Company: CARL ZEISS MEDITEC AG. From: 08/01/2020, to: 08/04/2020. 9.000 €
3. Numerical simulation of induction cooking. Company: BSH Electrodomésticos. From 01/10/2020 to: 01/10/2021. IP: Begoña Calvo. 52.656,86 €
4. Advances in the design of smart pots for induction cooking. Company: BSH Electrodomésticos. From: 01/07/2016, to: 01/07/2018. PI: Begoña Calvo. 35.376€
5. Numerical-experimental analysis of the deformations in vessels on induction plates. BSH Electrodomésticos. From: 20/05/2015, to: 20/05/2016. PI: Begoña Calvo. 35.376,81 €
6. Development of a working methodology for the simulation of stiffness loss in elastomeric parts after fatigue. Company Cikautxo, S. Coop. PI: Begoña Calvo y Manuel Doblaré. From: 01/07/2010, to: 01/07/2011. 40.000 €

C.4. Patents

1. D. P. Piñero, Á. Tolosa, N. Alcon, M. A. Ariza, J. F. Rodríguez, B. Calvo. Sistema de caracterización 3D de la respuesta mecánica del tejido de la córnea y procedimiento de medida con dicho sistema. P201431731.España, date: 03/03/2015. Entidad Titular: Alicante Oftalmológica S. L. Explotación: OFTALMAR

C.5. PhD Advised



1. Modelado biomecánico de los componentes refractivos del ojo humano y tratamientos refractivos asociados. Elena Lanchares Sancho. Co- advised: Manuel Doblaré. 19/11/2010
2. Knee implant positioning optimization. Orestis Tziovaras. Co-advised: Pascual Martin 19/01/2011
3. Modelado y simulación del tejido músculo-esquelético. Validación experimental con el músculo tibial anterior de rata. Angélica María Ramírez Rodríguez. Co- director: Jorge Grasa Orus. 8/07/2011
4. Análisis del comportamiento hidro-mecánico de acuíferos salinos profundos durante el almacenamiento geológico de CO₂. Juan Alonso Aperte. Co- advised: Vicente Navarro (Universidad de Castilla la Mancha). 22/12/2011
5. Mechanical modelling of the abdominal wall and biomaterials for hernia surgery. Belén Hernández Gascón. Co-director: Estefanía Peña Baquedano. 22/2/2013
6. Bayesian Sequential Non-Rigid Structure From Motion. Antonio Agudo Martínez. Co- advised: José María Martínez Montiel. 8/05/2015.
7. Towards the in vivo mechanical characterization of abdominal wall in an animal model. Application to the mesh hernia repair. Raquel Simón Allué. Co-advised: José María Martínez Montiel. 15/12/2016
8. Skeletal muscle fatigue, a mechanical characterization approach. Development of animal and computational models. Marta Sierra. Co- adviseds: Javier Miana Mena y Jorge Grasa. 31/03/2017.
9. Corneal Collagen Crosslinking: Development of New In Vivo Methods for the Mechanical Characterization and Assessment as Treatment of Acanthamoeba Keratitis. Ángel L. Orillés Gonzalo- Co- advised: José Ángel Cristóbal Bescós. 23/05/2017.
10. Methods for Characterising Patient-Specific Corneal Biomechanics. Miguel Ángel Ariza Gracia. Co-advised José Félix Rodríguez Matas. 08/09/2017.
11. Computational planning tools in ophthalmology: Intrastromal corneal ring surgery. Julio Flecha. . Co-advised Miguel Ángel Ariza Gracia. 17/03/2021
12. A Numerical Exploration of the Crystalline Lens: from Presbyopia to Cataracts and Intraocular Lenses. Iulen Cabeza Gil. Universidad de Zaragoza. 24/06/2022

C.6. I+D Management

1. Gestión del programa nacionales I+D+i. Coordinadora adjunta de la Agencia Nacional de Evaluación y Prospectiva (ANEP) en el Área de Ingeniería mecánica, naval y aeronáutica (IME). 2008- 2011
2. Acción I+D del Dpto. de Ciencia, Tecnología y Universidad del Gobierno de Aragón. Evaluación de Becas de Investigación de la fundación IBERCAJA. Abril 2008, Abril 2009, Abril 2010, Abril 2011
3. Miembro del comité de evaluación del Programa de Ayudas predoctorales y posdoctorales del Gobierno Vasco. Área de Ingeniería Mecánica Naval y Aeronáutica. Dirección Gral. de Investigación y Gestión del Plan Nacional de I+D+i. Ministerio de Economía y Competitividad. Fecha: Año 2016, 2017, 2018
4. Miembro de la comisión de expertos del Programa Ramón y Cajal y Juan de la Cierva. Área de Ingeniería Mecánica Naval y Aeronáutica. Dirección Gral. de Investigación y Gestión del Plan Nacional de I+D+i. Ministerio de Economía y Competitividad. Fecha: Año 2015, Año 2017