Silvia Hervás Raluy

PhD in Biomedical Engineering

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Education

University of Zaragoza   *Zaragoza, Spain*
PhD Biomedical Engineering   *2018 - 2023*
- Thesis: Insights into tumour growth and metastasis: a computational modelling approach
- Advisors: Prof. Dr.-Ing. José Manuel García Aznar and Prof. Dr.-Ing. María José Gómez Benito
- Grade: Sobresaliente cum laude (summa cum laude)

University of Zaragoza   *Zaragoza*
MSc in Biomedical Engineering   *2017 - 2018*
- Thesis: Mechanics and modeling of actin polimerization: the effects on cell motility

University of Zaragoza   *Zaragoza*
BSc in Mechanical Engineering   *2013 - 2017*
- Thesis: 3D finite element analysis of migration under conditions of mechanical confinement

Professional Experience

11/2023-Today	**Postdoctoral researcher at the Multiscale in Mechanical and Biomedical Engineering,** University of Zaragoza, Spain
09/2018-10/2023	**Research Associate at the Multiscale in Mechanical and Biomedical Engineering,** University of Zaragoza, Spain
09/2021-04/2022	**Visiting Student and Research Collaborator at the Institute for Computational Mechanics,** Technical University of Munich, Germany
10/2017-05/2018	**Research Assistant at the Multiscale in Mechanical and Biomedical Engineering,** University of Zaragoza, Spain
09/2016-12/2016	**Undergraduate Research Assistant at the Multiscale in Mechanical and Biomedical Engineering,** University of Zaragoza, Spain

Awards, Fellowships, & Grants

06/2022	**Best Biomedical contribution,** Institute of Research of Aragon
09/2021-04/2022	**Research Stay Grant,** Fundacion Ibercaja CAI
01/2022-04/2022	**Research Stay Grant,** Erasmus +
09/2021-12/2021	**Short-Term Grant,** German Academic Exchange Service (DAAD)
2019-2023	**Research Fellowship,** Government of Aragon
2017	**Best Mechanical Engineering BCs Thesis,** Aragon Mechanical Engineers Society

Publications

Published

Borau, C., Wertheim K. Y., **Hervas-Raluy, S.**, Sainz-DeMena, D., Walker, D., Chisholm, R., Richmond, P., Varella, V., Viceconti, M., Montero, A., Gregori-Puigjané, E., Mestres, J., Kasztelnik, M., Garcia-Aznar, J. M. *A multiscale orchestrated computational framework to reveal emergent phenomena in neuroblastoma.* Computer Methods and Programs in Biomedicine 241 (2023): 107742

Juste-Lanas, Y., **Hervas-Raluy, S.**, Garcia-Aznar, J. M., Gonzalez-Loyola, A. *Fluid flow to mimic organ function in 3D in vitro models.* APL bioengineering 7.3 (2023)

Hervas-Raluy, S., Wirthl, B., Guerrero, P.E., Robalo Rei, G., Nitzler, J., Coronado, E., Font de Mora Sainz, J., Schrefler, B. A., Gomez-Benito, M.J., Garcia-Aznar, J.M., Wall, W. A. *Tumour growth: An approach to calibrate parameters of a multiphase porous media model based on in vitro observations of Neuroblastoma spheroid growth in a hydrogel microenvironment.* Computers in Biology and Medicine 159 (2023): 106895

Pérez-Benito, A., Huerta-López, C., Alegre-Cebollada, J., García-Aznar, J.M., **Hervas-Raluy, S.** *Computational modelling of the mechanical behaviour of protein-based hydrogels.* Journal of the mechanical behavior of biomedical materials 138 (2023): 105661.

Merino-Casallo, F., Gomez-Benito, M. J., **Hervas-Raluy, S.**, Garcia-Aznar, J. M. *Unravelling cell migration: defining movement from the cell surface.* Cell Adhesion and Migration 16.1 (2022): 25-64

Quintela, B. D, M., **Hervas-Raluy, S.**, Garcia-Aznar, J. M., Walker, D., Wertheim K. Y., Viceconti, M. *A Theoretical Analysis of the Scale Separation in a Model to Predict Solid Tumour Growth.* Journal of Theoretical Biology 547 (2022): 111173

Juste-Lanas, Y., Guerrero, P. E., Camacho-Gomez, D., **Hervas-Raluy, S.**, Garcia-Aznar, J. M., Gomez-Benito, M. J. *Confined Cell Migration and Asymmetric Hydraulic Environments to Evaluate the Metastatic Potential of Cancer Cells.* ASME. Journal of Biomechanical Engineering 144.7 (2022): 074502

Garcia-Aznar J.M., Nasello G., **Hervas-Raluy S.**, Perez M.A., Gomez-Benito M.J. *Multiscale modeling of bone tissue mechanobiology.* 151 (2021): 116032

Hervas-Raluy S., Gomez-Benito M. J., Borau-Zamora C., Condor M., Garcia-Aznar J. M. *A new 3D finite element-based approach for computing cell surface tractions assuming nonlinear conditions.* PLoS ONE 16.4 (2021): e0249018

Hervas-Raluy S., Garcia-Aznar J. M., Gomez-Benito M. J. *Modelling actin polymerization: the effect on confined cell migration.* Biomechanics and Modeling in Mechanobiology 18 (2019): 1177-1187

IN REVIEW

Hervas-Raluy S., Sainz-DeMena, D., Gomez-Benito M. J., Garcia-Aznar J. M. *Image-based biomarkers for engineering neuroblastoma patient-specific computational models* Engineering with Computers (under review)

Presentations

10th International Conference on Computational Bioengineering (ICCB). Oral presentation: *Insights into the Biomechanics and Clinical Implications of Neuroblastoma Tumour Evolution Modelling*. Vienna (Austria), September 20-22, 2023.

10th GACM Colloquium on Computational Mechanics. Oral presentation: *Modeling neuroblastoma tumour evolution: biomechanical insights and clinical implications*. Vienna (Austria), September 10-13, 2023.

11th European Solid Mechanics Conference (ESMC). Oral presentation: *Analysis of Neuroblastoma tumour evolution through a Finite Element based model*. Galway (Ireland), July 4-8, 2022.

7th International Conference on Computational & Mathematical Biomedical Engineering (CMBE). Oral presentation: *Combining experiments and computational simulations to unravel the mechanics of spheroid tumour growth*. Milan (Italy), June 27-29, 2022.

11th Conference of Young Researchers of the Engineering Research Institute of Aragon. Poster presentation: *In-silico based clinical decision support tool for paediatric cancer*. Zaragoza (Spain), June 16, 2022.

16th International Conference on Computational Plasticity. Fundamentals and Applications (COMPLAS). Oral presentation: *Computer-based modeling and simulation of neuroblastoma growth*. Barcelona (Spain), hybrid (in the context of the COVID-19 pandemic), September 7-9, 2021.

Multiscale Mechanochemistry & Mechanobiology from molecular mechanisms to smart materials. Poster presentation: *May the force be with cells*. Virtual Conference, August 23-25, 2021.

9th Conference of Young Researchers of the Engineering Research Institute of Aragon. Oral presentation: *Are the cells stronger than we think?*. Zaragoza (Spain), hybrid (in the context of the COVID-19 pandemic), December 11, 2020.

6th Conference on Virtual Physiological Human (VPH). Oral presentation: *Iterative methodology for solving cell traction forces inverse problem under finite strains*. Paris (France), online (in the context of the COVID-19 pandemic), August 24-28, 2020.

9th Meeting of the National Chapter of the Spanish Society of Biomechanics (ESB). Oral presentation: *Recovery of cell traction forces*. Las Palmas de Gran Canaria (Spain), October 24-25, 2019.

25th Congress of the European Society of Biomechanics. Poster presentation: *Finite element model of actin polimerization during confined cell migration*. July 7-10, 2019, Vienna (Austria)

5th Conference on Virtual Physiological Human (VPH). Oral presentation: *Finite element analysis of individual cell migration under conditions of mechanical confinement*. Zaragoza (Spain), September 5-7, 2018.

Teaching Experience

Spring 2022	**Prostheses and implants design**, Teaching Assistant
Spring 2022	**Cell mechanics and mechanobiology**, Teaching Assistant
Spring 2021	**Prostheses and implants design**, Teaching Assistant
Spring 2021	**Cell mechanics and mechanobiology**, Teaching Assistant
Fall 2020	**Continuum Mechanics**, Teaching Assistant
Spring 2020	**Prostheses and implants design**, Teaching Assistant
Spring 2020	**Musculoskeletal tissue modelling**, Teaching Assistant
Spring 2020	**Strength of Materials**, Teaching Assistant

Mentoring

2023-2024	**Sergio Ibor Castel**, In silico modelling of in vivo studies: analysis and exploration of tumour growth
2020-2021	**Nerea Olivera Jurjo**, Study by finite element of cell motility in different channels
2020-2021	**Angela Perez Benito**, Computational characterization of the mechanical behaviour of protein hydrogels based on the finite element method
2016-2017	**First semester students**,
2015-2016	**First semester students**,

Participation in research projects

PRIMAGE: PRedictive In-silico Multiscale Analytics to support cancer personalized diaGnosis and prognosis, Empowered by imaging biomarkers   *Horizon2020*

PI: Dr. Luis Marti Bonmati   *Mar. 2019 - Sep. 2023*

- This project proposes an open cloud-based platform to support decision making in the clinical management of two paediatric cancers, Neuroblastoma (NB), the most frequent solid cancer of early childhood, and the Diffuse Intrinsic Pontine Glioma (DIPG) the leading cause of brain tumour-related death in children. PRIMAGE platform implements the latest advancement of in-silico imaging biomarkers and modelling of tumour growth towards a personalised diagnosis, prognosis and therapies follow-up.
- **Contributions**:
  Development of continuous model for analysing tumour evolution.
  Design and implementation of a tissue-scale tumour model later included in a full multiscale NB model.

IMAGO: Image Analysis Online Services for in-vitro experiments   *ERC-2016-PoC*

PI: Prof. Dr.-Ing. José Manuel García Aznar   *Sep. 2018 - Feb. 2019*

- IMAGO presents the development of a tool for image analysis focused on, but not limited to, the quantification of cell behavior under different conditions. Indeed, IMAGO goes further by providing, when applicable, an image-based finite element analysis (FEA).
- **Contributions**:
  Development of a finite element model to analyse the traction forces exerted by an individual cell during the Traction Force Microscopy experiment.

INSILICO-CELL: Predictive modelling and simulation in mechano-chemo-biology: a computer multi-approach

ERC-2012-StG

PI: Prof. Dr.-Ing. José Manuel García Aznar

Sep. 2016 - May. 2018

- This project combines in silico and in vitro models to investigate how environmental conditions drive cell behaviour, how individual cell behaviour generates multicellular patterns, how cells respond to the multicellular environment, how cells are able to generate new tissues and how cell-matrix interactions affect these processes.
- **Contributions**:
  Development of a finite element model to analyse individual cancer cell migration in confined environments.
  Design of microfluidic devices to recreate confined cell migration, CFD test simulations.

Skills

LANGUAGES Spanish (mother tongue), English (fluent), German (elementary)

SOCIAL SKILLS

Ability to work cooperatively and communicating within a team to achieve shared goals.
Good listener and always open to dialogue and constructive criticism.
Leadership and team building skills.

COMMUNICATION SKILLS

Good at both oral and written communication, with a nice grade of clarity and effectiveness.
Ability to elaborate visual material to accompany lectures or spoken presentations.
Ability to clearly express opinions and provide advice.
Ability to coordinate a fluid and effective communication within interdisciplinary teams.

ORGANISATIONAL SKILLS

Ability to organise work and teams of coworkers.
Good at planning and scheduling in order to meet deadlines efficiently.

TECHNICAL SKILLS

- LATEX, Microsoft Office.

- Operating systems: Windows, Linux.

- Programming languages (sorted by proficiency): Python, BASH, FORTRAN, MATLAB, C/C++.

- Finite Element software: ABAQUS, ANSYS.

- Technical design: AutoCAD.

- Visualization: ParaView, Adobe Photoshop, Adobe Illustrator.

Outreach & Professional Development

PARTICIPATION IN CONFERENCES COMMITTEES

10/2022	**Meeting of the Spanish ESB National Chapter**, Responsible for the web-based conference management software system (Easychair), abstract submission and review procedures, conference poster design, abstract book and technical support in the conference rooms.	*University of Zaragoza*
09/2018	**5th International Conference Virtual Physiological Human (VPH)**, Part of the organising committee, helping with the reception of participants and technical support in the conference rooms.	*University of Zaragoza*

Reviewer in Scientific Journals

Computers in Biology and Medicine
Scientific Reports
PLOS ONE
Biomechanics and Modeling in Mechanobiology

Membership in Academic Institutions

European Society of Biomechanics (ESB)
Virtual Physiological Human (VPH)
German Association of Computational Mechanics (GACM)

Courses

Introduction to artificial intelligence applied to medical imaging
International workshop on bone mechanics and tissue engineering
Graphic design and creativity: posters as a tool for dissemination
Pedagogical training course for new university teachers
Academic English

Workshops and dissemination

Date		
13/2/2023	**Article in newspaper**, Cancer: models that predict how your tumour will evolve (Cáncer: modelos que predicen cómo evolucionará tu tumor)	*Heraldo de Aragón*
22/06/2021	**Workshop: PRIMAGE Platform functionalities & Multiscale modelling of tumour growth**, Multiscale modelling of tumour growth	*Online*
09/01/2019	**Podcast in the regional radio**, Computer engineering to study paediatric tumours	*Aragon Radio*