Part A. PERSONAL INFORMATION

First name	Gustavo Ramón	
Family name	Plaza Baonza	
Gender (*)	Male	
e-mail	gustavo.plaza@upm.es	
Open Researcher and Contributor ID (ORCID) (*)		0000-0002-5555-5498

A.1. Current position

Position	Profesor Titular de Universidad			
Initial date	17/09/2012			
Institution	Universidad Politécnica de Madrid			
Department/Center	Ciencia de Materiales	ETSI de Caminos, Canales y Puertos & Center for Biomedical Technology		
Country	Spain		Teleph. number	910674306
Key words	Materials science, mechanics of materials, biomaterials, cell mechanics, mechanobiology			

A.2. Previous positions (research activity interuptions, indicate total months)

Period	Position/Institution/Country/Interruption cause
2007-2012	Profesor Contratado Doctor, Universidad Politécnica de Madrid
2003-2007	Profesor Colaborador, Universidad Politécnica de Madrid
2000-2003	PhD student, grant from Universidad Politécnica de Madrid
1997-2000	Structural Engineer. Ingeniería IDOM Internacional

A.3. Education

PhD, Licensed, Graduate	University/Country	Year
Mechanical Engineer (Ingeniero industrial, six-year degree)	Universidad Politécnica de Madrid	1997
Structural Engineer (Ingénieur Centralien–Mécanique, Calcul des Structures)	École Centrale de Nantes (Francia)	1997
Ms Materials Engineering	Universidad Politécnica de Madrid	2003
PhD	Universidad Politécnica de Madrid	2005

Part B. CV SUMMARY

Scopus: 65 documents (Q1: 42, Q2: 16, in Web of Science).
Google Scholar: 2701 times cited, h index: 31, i10 index: 53.

Scientific research: My research has been developed mainly in the fields of biological materials, especially silk fibers, and mechanobiology. (a) In a first stage, I designed and put in place mechanical testing devices under controlled conditions of humidity and temperature that have led to important results in the study of biological fibers, e.g. one of our publications (Plaza et al 2006, 10.1002/polb.20751) is a key reference for spider silk properties in Ansys Granta. The study of fibers and silk-based biomaterials has continued with new techniques, seeking the production of high-performance bio-inspired artificial fibers (e.g. Macromolecules 2009 and 2011, Eur Polym J 2014, Nature Chem Biol 2017). An important effort has been done in the study of the relationships among processing, microstructure and properties (Macromolecules 2007, Biomacromolecules 2012, Soft Matter 2012, Sci Rep 2013), establishing collaborations with medical groups and leading researchers specialized in microstructural studies. (b) I have developed my research in cellular mechanics and mechanobiology collaborating with

researchers in the biomedical field; nowadays I am focused mainly on T cell mechanobiology and immunosenescence (Biophysical J 2019, Soft Matter 2020, Immunology 2022). Studies have included the development and improvement of the pipette aspiration technique for measuring cell mechanical properties (e.g. Phys Rev E 2014, Phys Biol 015, Soft Matter 2015, ABME 2017, Phys Rev E 2017, Biophys J 2019). One of the lineal equations I developed (Soft Matter 2015) based on a previous work may become a standard equation to analyze micropipette-aspiration experiments and it has already received the name of Zhou-Plaza equation (Berardi et al. 2021). I have studied the relationships between cell mechanical behavior or excitation and cytoskeletal and nuclear changes in stem cells (by ultrasound, Stem Cell Rev Rep 2015), *Dictyostelium* cells (Soft Matter 2013, 2015), cancer cells (magnetic forces by nanoparticles, Theranostics 2017, ABME 2017, Small 2020) and T cells (ABME 2017, Soft Matter 2019). The experimental and technological works are completed with the development of numerical models (Phys Rev E 2010, J App Phys 2015, ABME 2017). Our research on mechanical characterization of living cells has resulted in a patent application submitted on December 2022 (see section C4).

Short research stays in Utah State University (USA), National Institute of Advanced Industrial Science and Technology AIST (Japan), University of Toronto (Canada), Universidad de Santiago de Chile (Chile) and Tongji University (China). Between 2015 and 2017, visiting researcher at Tongji University (group of Prof. Yu Cheng) financed by the High-end expert program of the Government of China. In 2021 and 2022 I have collaborated with the same group as online visiting professor at Tongji University. I have continued these collaborations until present.

Social contributions: Co-author of two patents: the first one exploited by a company and the second one submitted on December 2022.

Promoter, lecturer and coordinator of three massive open online courses on the platform MiriadaX: i) "Introduction to BIOmaterials science" (nine editions), ii) "Introduction to biomaterials" (nine editions), iii) "Advanced applications of biomaterials" (one edition until now). The first two courses are now merged in one single course, "Biomaterials" (two editions until now). Results in our publications have been disseminated in general media (TVE La 2 and RNE Radio 5, El País, Abc, etc). Participant in popular-science conferences, including "La noche europea de los investigadores" and "semana de la ciencia", co-author of an article in popular-science magazine "Investigación y Ciencia" (see section C1), author of posts in the blog "Materiales al día" between 2012 and 2018 (https://short.upm.es/hkq26).

Training and teaching: Advisor of three PhD students: Blanca González (thesis defended on December 2021; presently she is assistant professor), Adriana L Torres and Aldo Abarca (currently students). Project evaluation consultant for various universities and agencies: Univ. Carlos III de Madrid, Univ. de Santiago de Chile, CFCA-Lithuania, FONDECYT-Chile, etc. From September 2022, member of the Ethics Committee of Universidad Politécnica de Madrid.

Teaching activity developed in the Bs and Ms degrees in Materials Engineering, Civil Engineering and Biomedical Engineering. Courses in the fields of physics, polymers and biomaterials. I have been director of 44 final-year projects. From January 2017 to June 2019, in charge of international relations for Materials Engineering. From June 2019 to April 2022, Vice Dean for Students and University Extension, including being responsible of external academic practices.

Part C. RELEVANT MERITS *(sorted by typology)*

C.1. Publications *(see instructions)*

Publications in JCR journals (list of selected publications, *corresponding authors)

- B González*, H Kobayashi, A Abarca, M Córcoles, M González, M de la Fuente, G Guinea, M, GR Plaza* 2022. *Aging is accompanied by T-cell stiffening and reduced interstitial migration through dysfunctional nuclear organization*. **Immunology**, 167, 622-639, DOI: 10.1111/imm.13559
- B González-Bermúdez, H Kobayashi, A Navarrete, C Nyblad, M González, M De la Fuente, G Fuentes, G Guinea, C García, GR Plaza* 2020. *Single-cell biophysical study reveals*

deformability and internal ordering relationship in T cells. **Soft Matter**, 16, 5669-5678 DOI: 10.1039/D0SM00648C

- M Chen, J Wu, P Ning, …, G Plaza (7th/13), …, Yu Cheng* 2020. *Remote Control of Mechanical Forces via Mitochondrial-Targeted Magnetic Nanospinners for Efficient Cancer Treatment*. **Small** 16:1905424. DOI: 10.1002/smll.201905424
- B González-Bermúdez, GV Guinea, GR Plaza* 2019. *Advances in micropipette aspiration: applications in cell biomechanics, models and extended studies*. **Biophysical Journal**, 116: 587-594 DOI: 10.1016/j.bpj.2019.01.004 *Biophysical perspective* (invited article).
- G Esteban-Manzanares, B González-Bermúdez, J Cruces, M De la Fuente, Q Li, GV Guinea, J Pérez-Rigueiro, M Elices, GR Plaza* 2017. *Improved Measurement of Elastic Properties of Cells by Micropipette Aspiration and Its Application to Lymphocytes*. **Annals of Biomedical Engineering**, 45: 1375-1385. DOI: 10.1007/s10439-017-1795-7
- M Andersson, Q Jia, A Abella, X Lee, M Landreh, P Purhonen, H Hebert, M Tenje, CV Robinson, Q Meng, GR Plaza, J Johansson, A Rising* 2017. *Biomimetic spinning of artificial spider silk from a chimeric minispidroin*. **Nature Chemical Biology**, 13: 262–264, 2017 DOI: 10.1038/nchembio.2269 Selected for the front cover, commented in *Nature* (https://doi.org/10.1038/541137b).
- Y Shen, C Wu, TQP Uyeda, GR Plaza*, Bin Liu, Yu Han, Maciej S Lesniak, Yu Cheng*. *Elongated Nanoparticle Aggregates in Cancer Cells for Mechanical Destruction with Low Frequency Rotating Magnetic Field*. **Theranostics**, 7: 1735-1748, 2017. DOI: 10.7150.thno.18352
- A Bernal, LM Pérez, B De Lucas, N San Martín, A Kadow, GR Plaza, K Raum, BG Gálvez*. *Low-Intensity Pulsed Ultrasound Improves the Functional Properties of Cardiac Mesoangioblasts*. **Stem Cell Reviews and Reports**, 11: 852-865, 2015.
- GR Plaza*, TQP Uyeda, Z Mirzaei, CA Simmons. *Study of the influence of actin-binding proteins using linear analyses of cell deformability*. **Soft Matter** 11, 5435-5446, 2015.
- GR Plaza*, TQP Uyeda. *Contraction speed of the actomyosin cytoskeleton in the absence of the cell membrane*. **Soft Matter** 9, 4390-4400. 2013. Selected for the front cover.
- GR Plaza*, J Pérez-Rigueiro, C Rieckel, GB Perea, F Agulló-Rueda, M Burghammer, GV Guinea, M Elices. *Relationship between microstructure and mechanical properties in spider silk fibers: identification of two regimes in the microstructural changes*. **Soft Matter** 8: 6015-6026. 2012.

Other significant publications

- M Elices, GV Guinea, J Pérez-Rigueiro, GR Plaza. *Usos médicos de la seda*. **Investigación y Ciencia** 419: 28-35. 2011 (Spanish edition of *Scientific American*).

Two book chapters, including:

- G.V. Guinea, M. Elices, J. Pérez-Rigueiro, G.R. Plaza. *Structure and properties of spider and silkworm silk for tisssue scaffolds*, pp. 185-218. Book: **Advances in Silk Science and Technology**. Editor: Arindam Basu. Woodhead Publishing, 2015.

C.2. Congress, indicating the modality of their participation (invited conference, oral presentation, poster)

Selected invited talks:

- GR Plaza. "New Developments of an Old Technique: Micropipette Aspiration". Invited presentation. 4th International Conference on Applied Biochemistry and Biotechnology (ABB 2021). Bohai University, China, online August 8th-11th, 2021.
- GR Plaza. "*Relationships between microstructure and mechanical behavior in proteins and cells*". Plenary talk. Congreso Chileno de Biomecánica y Biomateriales CBIO2020, Universidad de Santiago de Chile, virtual, 29-30 October 2020.
- GR Plaza, GV Guinea, J Perez-Rigueiro, M Elices. *New insights into the microstructure and mechanics of silk*s. Silk conference (participation by invitation), Fudan University, 10/2014. Shanghai, China.
- GR Plaza, GV Guinea, J Perez-Rigueiro, M Elices. *Relationship between mechanical properties and microstructure in silk fibers by XRD, micro-Raman and AFM*. Nombre del

congreso: Silk Conference (participation by invitation). Tufts European Center. 03/2012. Talloires, Francia.

- GV Guinea, J Perez-Rigueiro, M Elices, GR Plaza. *Variability and Control of Mechanical Properties of Silk Fibers*. Congress: "Silk: is it all spin?" (participation by invitation), New York Academy of Sciences. 07/2011.

Congress organisation activities in recent years: member of the organizing comitee of NPU–UPM Workshosp on Advanced Materials and Devices (Xi'an 2018, Madrid 2019). Member of the technical program committee of International Conference on Biomedical Engineering and Biotechnology (2013, 2014, 2015).

C.3. Research projects

(participant in 24 projects/grants from 2003; five items listed)

- *Plataforma científico-tecnológica para el pronóstico, diagnóstico y seguimiento de la enfermedad covid19-Covidtech-CM*. IP: Gustavo V. Guinea. Convocatoria: React-EU Comunidad de Madrid. Budget 1,638,000 €. 01/02/2020 - 30/12/2022.
- *Nuevas Tecnologías Aplicadas al Estudio de Nanomáquinas Biológicas Tec4Bio-CM*. IP: Fernando Moreno, CSIC. Six research groups. IP of the group at UPM: Gustavo R. Plaza. Consejería de Educación e Investigación C.A. Madrid. P2018/NMT-4443. 01/01/2019 – 31/04/2023. Budget for UPM: 126,400 € (total: 809,600 €).
- *Deformabilidad de linfocitos T como biomarcador mecánico de inmunosenescencia y desarrollo de tecnología para su aplicación clínica*. IP: Gustavo R. Plaza. Six researchers. Ministerio de Economía y Competitividad. MAT2016-76847-R. 31/12/2016 – 30/12/2019. Budget: 50,000 €.
- *3D Printing Study of Nanocrystals / Copolymer Scaffolding Materials and Their Biocompatibility*. IP: Gustavo R. Plaza. Convocatoria de Ayudas para Proyectos Semilla de Investigación Internacional en Asia. Programa Propio de I+D +i de la UPM 2020. budget 5000€ for 2020.
- Three contracts for a Research Assistant. IP and tutor: Gustavo R. Plaza. Comunidad Autónoma de Madrid (PEJ15/IND/AI-0078, Blanca González 01/01/2016 – 31/12/2018, 45,000€; PEJ-2018-AI/IND-9951, Miguel Córcoles 01/03/2019 – 28/02/2021(31/05/2021), 45,000 €; PEJ-2020-AI/IND-19008, Cristina Díaz, 01/03/2021 – 28/02/2023, 45,000 €). Total for the three contracts: 135,000 €.

C.4. Contracts, technological or transfer merits

Patents:

- Authors: GR Plaza, B González, GV Guinea, J Pérez, FJ Rojo, R Daza. Spanish Patent and Trademark Office nr.º P202231111, application date: 27/12/2022. Title: *Dispositivo y método para realizar ensayos mecánicos sobre muestras micrométricas*.
- Authors: J Pérez, GV Guinea, ME Elices, GR Plaza, R Madurga, A Gañán. Title: *Method for producing elongated structures such as fibers from polymer solutions by straining flow spinning*. Prioriy: 18/12/2015; Spain: application 16809446 15/12/2016, publication 2758176 04/05/2020; USA, nr. 11180868, recognized 23.11.2021; European Patent Office: application nr 15382646.18/12/2017, publication nr. 3181738 21/06/2017. Patent exploted by the company Silk Biomed.