Oscar Luis Cruz González

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Nationality: Cuban **Date of Birth:** February 22, 1993.

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Contents

About

I am a **Mathematician** with a Doctor of Philosophy (PhD) degree in **Solid Mechanics** completed on October 2021 at Aix-Marseille University, in France. After my PhD, I worked as a **Postdoctoral Research Associate** at the Institute Jean le Rond d'Alembert of Sorbonne University. Nowadays, I am conducting a **Postdoctoral Research Project** at the laboratories IRPHÉ and AMSE of Aix-Marseille University, winner of the A*MIDEX 2021 Interdisciplinarity call for projects. 🔵 🔵 🔵 🔵 🔵 🔵

Research in a nutshell
During my PhD in Solid Mechanics, I worked on the effective characterization of hierarchical composite materials with viscoelastic constituents via a three-scale asymptotic homogenization approach. Moreover, I studied the influence of imperfect viscoelastic interfaces on the overall behavior of the composites.

As a Postdoc in d'Alembert, I continued my research in the field of composite materials. I worked on the characterization of short fiber composites using advanced micromechanical models. The goal of this project was to determine the best calibration of mean-field models such as IDD, and Ponte-Castañeda and Willis (PCW) from an image or statistical descriptors of a microstructure.

The main goal of the research project at IRPHÉ and AMSE is to employ deep learning techniques to replace numerical CFD models in order to predict the early evolution of thoracic aortic pathologies.

Achievements in numbers:
· 10 articles · 2 chapters in books · 6 conference proceedings · 23 conferences, congresses and seminars

Teaching
As a lecturer, I have developed skills in teaching method and Mathematics education. Furthermore, during

my PhD, I attended several training courses on scientific research communication, teaching through digital-isation and public speaking.

Topics of interest
· Micromechanical models · AI for Engineering · Deep Learning · Modeling of biological and bio-inspired materials

Experience

Aug 2023 - Present Marseille, France	**Postdoctoral Research Associate** Aix-Marseille University. Laboratory IRPHE (UMR7342, Bio-mechanics team). 🔗 AMSE (UMR7316, Econometrics and Statistics team). 🔗
Nov 2021 - Nov 2022 Paris, France	**Postdoctoral Research Associate** Sorbonne University, UFR d'ingénierie. Institute Jean le Rond d'Alembert (UMR 7190, MISES team). 🔗
Oct 2018 - Sept 2021 Marseille, France	**Research PhD Student** Aix-Marseille University, ED353. Laboratoire de Mécanique et d'Acoustique (UMR 7031, Materials and Structures team). 🔗
Sept 2016 - Jul 2018 Matanzas, Cuba	**Lecturer and Research Assistant** (ATER in France) University of Matanzas. Faculty of Pedagogical Sciences. Mathematics Department. - Lectures on Probability and Statistics, Calculus I, II and Numeric Mathematics. - Development of skills in teaching methods and mathematics education.

Education

Oct 2018 - Sept 2021 Marseille, France	**Aix-Marseille University**. L'Ecole Doctorale Sciences pour l'Ingénieur : Mécanique, Physique, Micro et Nanoélectronique / ED 353. - Research unit of CNRS: Laboratoire de Mécanique et d'Acoustique (UMR 7031). - Degree: Doctor of Philosophy (PhD), Solid Mechanics. "Modeling of linear viscoelastic composite materials with hierarchical structure and imperfect interfaces via a three-scale asymptotic homogenization approach." 🔗 Supervisor: Frederic Lebon Co-supervisor: Reinaldo Rodríguez Ramos

Sept 2016 - Jul 2018	**University of Havana**. Faculty of Mathematics and Computer Sciences.
Havana, Cuba	- Degree: Master of Science (MSc), Mathematics. Mention in Differential equations and Mechanics.
	"Homogenization of linear, non-ageing, viscoelastic composites with generalized periodicity"

| **Sept 2012 - Jul 2016** | **University of Havana**. Faculty of Mathematics and Computer Sciences. |
| Havana, Cuba | - Degree: Bachelor of Science (BSc), Mathematics. |

Honors & Awards

- Prix de thèse d'Aix-Marseille Université 2022 / Aix-Marseille University Thesis Award 2022. Issued by Aix-Marseille University on April 11th, 2023 in Marseille. 🔗

Research & Publications

Articles

1. **O.L. Cruz-González**, R. Cornaggia, S. Dartois, R. Brenner. *Calibration of the interaction direct derivative (IDD) and Ponte-Castañeda and Willis (PCW) models to estimate the effective properties of 2D composites*. **Submitted to** Journal of the Mechanics and Physics of Solids.

2. **O.L. Cruz-González**, R. Rodríguez-Ramos, F. Lebon, F.J. Sabina (**2022**). *Modeling of imperfect viscoelastic interfaces in composite materials*. Coatings, 12(5), 705. 🔗

3. T. Dora Pallicitya, **O.L. Cruz-González**, J.A. Otero, R. Rodríguez-Ramos (**2022**). *Effective Behavior of Viscoelastic Composites: Comparison of Laplace-Carson and Time Domain Mean-Field Approach*. Archive of Applied Mechanics. 🔗

4. **O.L. Cruz-González**, A. Ramírez-Torres, R. Rodríguez-Ramos, R. Penta, F. Lebon (**2022**). *Hierarchical heterogeneous one-dimensional problem in linear viscoelastic media*. European Journal of Mechanics - A/Solids. 🔗

5. **O.L. Cruz-González**, A. Ramírez-Torres, R. Rodríguez-Ramos, J.A. Otero, R. Penta, F. Lebon (**2021**). *Effective behavior of long and short fiber-reinforced viscoelastic composites*. Applications in Engineering Science 6, 100037. ⬇ 🔗

6. **O.L. Cruz-González**, R. Rodríguez-Ramos, J.A. Otero, A. Ramírez-Torres, R. Penta, F. Lebon (**2020**). *On the effective behavior of viscoelastic composites in three dimensions*. International Journal of Engineering Science 157, 103377. 🔗

7. J.A. Otero, R. Rodríguez-Ramos, R. Guinovart-Díaz, **O.L. Cruz-González**, F.J. Sabina, H. Berger, T. Böhlke (**2020**). *Asymptotic and numerical homogenization methods applied to fibrous viscoelastic composites using Prony's series*. Acta Mechanica volume 231, 2761–2771. 🔗

8. **O.L. Cruz-González**, A. Ramírez-Torres, R. Rodríguez-Ramos, R. Penta, J. Bravo-Castillero, R. Guinovart-Díaz, J. Merodio, F.J. Sabina, F. Lebon (**2020**). *A hierarchical asymptotic homogenization approach for viscoelastic composites*. Mechanics of Advanced Materials and Structures. ⬇ 🔗

9. R. Rodríguez-Ramos, J.A. Otero, **O.L. Cruz-González**, R. Guinovart-Díaz, J. Bravo-Castillero, F.J. Sabina, P. Padilla, F. Lebon, I. Sevostianov (**2020**). *Computation of the relaxation effective moduli for fibrous viscoelastic composites using the asymptotic homogenization method*. International Journal of Solids and Structures, 190, 281–290. 🔗

10. **O.L. Cruz-González**, D. Guinovart-Sanjuán, R. Rodríguez-Ramos, J. Bravo-Castillero, R. Guinovart-Díaz, J. Merodio, R. Penta, J.A. Otero, S. Dumont, F. Lebon, F.J. Sabina (**2019**). *An approach for modeling non-ageing linear viscoelastic composites with general periodicity*. Composite Structures, 223, 110927. ⬇ 🔗

11. **O.L. Cruz-González**, R. Rodríguez-Ramos, J. Bravo-Castillero, R. Martínez-Rosado, R. Guinovart-Díaz, J.A. Otero, F.J. Sabina (**2017**). *Effective viscoelastic properties of one-dimensional composites*. American Research Journal of Physics; V3, I1; pp: 1-17. ⬇ 🔗

Peer reviewed chapters in books

1. R. Rodríguez-Ramos, A. Ramírez-Torres, J. Bravo-Castillero, R. Guinovart-Díaz, D. Guinovart-Sanjuán, **O.L. Cruz-González**, F.J. Sabina, J. Merodio, R. Penta (**2020**) *Multiscale Homogenization for Linear Mechanics*. In: Merodio J., Ogden R. (eds) Constitutive Modelling of Solid Continua. Solid Mechanics and Its Applications, vol 262. Springer, Cham. 🔗

2. **Oscar L. Cruz-González**, Reinaldo Rodríguez-Ramos, José A. Otero, Julián Bravo-Castillero, Raúl Guinovart-Díaz, Raúl Martínez-Rosado, Federico J. Sabina, Serge Dumont, Frederic Lebon, and Igor Sevostianov. (**2018**) *Viscoelastic effective properties for composites with rectangular cross-section fibers using the asymptotic homogenization method*. In: Altenbach H., Pouget J., Rousseau M., Collet B., Michelitsch T. (eds) Generalized Models and Non-classical Approaches in Complex Materials 1. Advanced Structured Materials, vol 89. Springer, Cham. ⬇ 🔗

Publications in proceedings with reviews

1. ICIRASTE'2021-The International Conference on Interdisciplinary Research in Applied Sciences, Technologies and Engineering. **June, 5-6, 2021**. Sbeitla-Kasserine, Tunisia. **Oscar L. Cruz-González**, Reinaldo Rodríguez-Ramos, Frederic Lebon. *Evaluation of the effective viscoelastic properties of short fibers reinforced composites*. Proceedings of the conference. ⬇ 🔗

2. 5th Brazilian Conference on Composite Materials-BCCM 5. **January, 18-22, 2021**. V. Tita, J. R. Tarpani and M. L. Ribeiro (Editors). Sao Carlos School of Engineering – University of Sao Paulo, Brazil. **Oscar L. Cruz-González**, Reinaldo Rodríguez-Ramos, Frederic Lebon. *Overall viscoelastic properties of fiber-reinforced hierarchical composites*. Proceedings of the conference. ⬇ 🔗

3. JNC 21: Journées Nationales sur les Composites . **July 1-3, 2019**. Bordeaux, France. **Oscar L. Cruz-González**, Ariel Ramírez-Torres, Reinaldo Rodríguez-Ramos, Frederic Lebon. *Homogénéisation triple échelle de matériaux composites viscoélastiques*. Proceedings of the conference. ⬇ 🔗

4. COMPUMAT. **November 22-24, 2017**. Universidad Tecnológica de La Habana, Cuba. **Oscar L. Cruz González**, Reinaldo Rodríguez Ramos, José A. Otero, Federico J. Sabina, *Propiedades efectivas viscoelásticas de un material compuesto reforzado con fibras*. ISBN: 978-959-261-562-5.

5. IV International scientific-practical conference on applied aspects of Geology, Geophysics and Geoecology with the use of contemporary technological informations. **May 15-18, 2017**. Maykop, Republic of Adygea, Russia. Proceedings of the conference Part I, p. 10-20, 258 pages. ISBN 978-5-906696-84-7, ISBN 978-5-906696-85-4. **Oscar L. Cruz-González**, J. A. Otero, R. Rodríguez-Ramos, R. Guinovart-Días, J. Bravo-Castilleros. *Computation of the effective properties of viscoelastic composite materials*. 🔗

6. VIII International Scientific Convention "Integrated and Innovative University", CIUM. **April 10-14, 2017**. Varadero, Matanzas, Cuba. Proceedings of the conference, ISBN 978-959-16-3296-8. **Oscar L. Cruz-González**. *Facial Recognition*. 🔗

Conferences, congresses and seminars

1. Seminar Team MISES, Institut Jean Le Rond d'Alembert, Sorbonne University. **September 13th, 2022**. Speaker: **Oscar L. Cruz González**. *Characterizing short-fiber composites using advanced micro-mechanical models*. Authors: Oscar L. Cruz-González, Rémi Cornaggia, Sophie Dartois, Renald Brenner.

2. 9th Metropolitan Congress on Numerical Modeling and Simulation. **May, 4th-6th, 2022**. Speaker: **Reinaldo Rodríguez-Ramo**. *Study of imperfect interfaces in viscoelastic composite materials*. Authors: Oscar L. Cruz-González, Reinaldo Rodríguez-Ramos, Frederic Lebon. 🔗

3. Séminaire Jeunes Chercheurs. **July 13, 2021**. Laboratoire de Mécanique et d'Acoustique-LMA, Marseille, France. Speaker: **O.L. Cruz-González**. *A hierarchical asymptotic homogenization approach for the analysis of the effective mechanical behavior of viscoelastic composite materials*. Authors: Oscar L. Cruz-González, Reinaldo Rodríguez-Ramos, Frederic Lebon. 🔗

4. Workshop MISTRAL: Homogenization methods. First internal workshop of the joint laboratory. **June 9, 2021**. IUT d'Aix-en-Provence Amphi Est, Marseille, France. Speaker: **O.L. Cruz-González**. *Semi-analytical approach for the homogenization of viscoelastic composite materials* . Authors: Oscar L. Cruz-González, Reinaldo Rodríguez-Ramos, Frederic Lebon.

5. ICIRASTE'2021. **June, 5-6, 2021**. Speaker: **O.L. Cruz-González**. *Evaluation of the effective viscoelastic properties of short fibers reinforced composites*. Authors: Oscar L. Cruz-González, Reinaldo Rodríguez-Ramos, Frederic Lebon. 🔗 ▷

6. SIAM Conference on Mathematical Aspects of Materials Science-MS 21. Minisymposium "Multiscale modelling in Biomechanic" (MS67) **May, 17-27, 2021**. Virtual. Speaker: **O.L. Cruz-González**. *Multi-scale Homogenization of Hierarchical Viscoelastic Composites*. Authors: Oscar L. Cruz-González, R. Rodríguez-Ramos, A. Ramírez-Torres, R. Penta, F. Lebon. 🔗

7. 2nd International Conference on Theoretical, Analytical and Computational Methods for Composite Materials and Composite Structures-ICOMP2021. **March, 5-7, 2021**. Online attendance. Speaker: **O.L. Cruz-González**. *On the Imperfect Interfaces in Viscoelastic Composite Materials*. Authors: Oscar L. Cruz-González, R. Rodríguez-Ramos, F. Lebon. 🔗

8. 5th Brazilian Conference on Composite Materials. **January, 18th-22nd, 2021**. Keynotes: Prof. Reinaldo Rodriguez Ramos. *A semi-analytical approach to describe the effective behavior of viscoelastic composites*. Authors: R. Rodríguez-Ramos, **Oscar L. Cruz-González**, J. A. Otero, F. Lebon. Collaborators: A. Ramírez-Torres, R. Penta. 🔗

9. 5th Brazilian Conference on Composite Materials. **January, 18th-22nd, 2021**. Speaker: **O.L. Cruz-González**. *Overall viscoelastic properties of fiber-reinforced hierarchical composites*. Authors: Oscar

L. Cruz-González, Reinaldo Rodríguez-Ramos, Frederic Lebon.

10. Applied Mathematics online seminar series programmed by the School of Mathematics and Statistics from University of Glasgow. **October 15, 2020**. Speaker: Prof. Reinaldo Rodríguez Ramos. *Overall properties of linear viscoelastic composites*. Authors: R. Rodríguez-Ramos, **Oscar L. Cruz-González**, J.A. Otero, F. Lebon.

11. Seminario de Investigación de la Escuela de Ingeniería y Ciencias programmed by the Instituto Tecnológico y de Estudios Superiores de Monterrey. **October, 2020**. Puebla, Mexico. Speaker: Prof. Reinaldo Rodríguez Ramos. *Cálculo de propiedades efectivas de materiales compuestos viscoelásticos*. Authors: R. Rodríguez-Ramos, **Oscar L. Cruz-González**, J.A. Otero, F. Lebon, A. Ramírez-Torres, R. Penta.

12. Journée des Doctorants du Laboratoire de Mécanique et d'Acoustique. **November 26, 2020**. Speaker: **Oscar L. Cruz-González**. Marseille, France.

13. International Seminar of Mathematical Modeling programmed by the Institute of Applied Mathematics and Systems (IIMAS), from Universidad Nacional Autónoma de México with the collaboration of Instituto Tecnológico y de Estudios Superiores de Monterrey. **September 30th, 2020**. Speaker: **Oscar L. Cruz González**. *Homogenization of viscoelastic composites*. Authors: Oscar L. Cruz-González, Reinaldo Rodríguez-Ramos, Frederic Lebon.

14. Presentation at the Institute of Mechanics of Otto von Guericke University Magdeburg. Speaker: Prof. Reinaldo Rodríguez Ramos (Faculty of Mathematics and Computer Science, University of Havana). *Prediction of macroscopic viscoelastic properties in heterogeneous media. Applications*. Authors: R. Rodríguez-Ramos, **Oscar L. Cruz-González**, F. Lebon. **December 11, 2019**. Contact person: Dr. Harald Berger.

15. Presentation at Karlsruhe Institute of Technology (KIT). Speaker: Prof. Reinaldo Rodríguez Ramos (Faculty of Mathematics and Computer Science, University of Havana). *Three scale asymptotic homogenization method for viscoelastic heterogeneous media. Applications*. Authors: R. Rodríguez-Ramos, **Oscar L. Cruz-González**, F. Lebon. **December 4, 2019**. Contact person: Thomas Böhlke (Speaker).

16. Journée des Doctorants du Laboratoire de Mécanique et d'Acoustique. **December 4, 2019**. Speaker: **Oscar L. Cruz-González**. Marseille, France.

17. JNC 21: Journées Nationales sur les Composites . **July 1-3, 2019**. Bordeaux, France. Poster presentation: **Oscar L. Cruz-González**.

18. Journée des Doctorants du Laboratoire de Mécanique et d'Acoustique. **November 28, 2018**. Speaker: **Oscar L. Cruz-González**. Marseille, France.

19. 4th International Conference on Mechanics of Composites Universidad Carlos III de Madrid, Spain (Puerta de Toledo Campus) **July 9-12, 2018**. Plenary Lectures: Prof. Reinaldo Rodriguez Ramos. *Mathematical modeling of non-ageing linear viscoelastic composites with general periodicity*. Authors: R. Rodríguez-Ramos, **Oscar L. Cruz-González**, D. Guinovart-Sanjuán, J. A. Otero, J. Bravo-Castillero, R. Guinovart-Díaz, S. Dumont, F. Lebon, F.J. Sabina.

20. Seminar of Scientific Initiation programmed by the Department of Mathematics and Statistics of the National University of Colombia Sede Manizales. **March 5, 2018**. Speakers: Prof. Reinaldo Rodríguez Ramos and **Oscar L. Cruz González**. *Effective properties of non-aging quasi-periodic, linear viscoelastic composites. Examples*.

21. XV International Congress COMPUMAT. Technological University of Havana "José Antonio Echeverría", **November 22-24, 2017**. Havana, Cuba. 🔗

22. II International Workshop of Didactic and Application of the Basic Science. University of Matanzas. Speaker: **Oscar L. Cruz-González**. *Facial Recognition*. **April, 2017**. Matanzas, Cuba. 🔗

23. JCE. Faculty of Mathematics and Computer Sciences. University of Havana. Speaker: Oscar L. Cruz-González. **April, 2016**. Havana, Cuba. 🔗
    Método de Homogeneización asintótica en una dimensión para materiales viscoelásticos. Authors: **Oscar L. Cruz-González**, Reinaldo Rodríguez-Ramos, Raúl Guinovart-Díaz, Julián Bravo-Castillero. **Mention award**.
    Reconocimiento Facial. Valores y Vectores Propios. Authors: Oscar L. Cruz-González, Marta L. Baguer Díaz-Romañach. **Outstanding award**.

Licenses & Certifications

Jul 03, 2023	**Transformers: Text Classification for NLP Using BERT**. LinkedIn Learning. Certification 📄 🔗
Jun 15, 2023	**Applied AI: Building NLP Apps with Hugging Face Transformers**. LinkedIn Learning. Certification 📄 🔗
Jun 15, 2023	**Applied AI: Getting Started with Hugging Face Transformers**. LinkedIn Learning. Certification 📄 🔗
Jun 23, 2023	**Build GANs and Diffusion Models with TensorFlow and PyTorch**. LinkedIn Learning. Certification 📄 🔗
Jun 19, 2023	**PyTorch Essential Training: Deep Learning**. LinkedIn Learning. Certification 📄 🔗
Jun 19, 2023	**Transfer Learning for Images Using PyTorch: Essential Training**. LinkedIn Learning. Certification 📄 🔗
Jan 09, 2023	**Building Resilience**. LinkedIn Learning. Certification 📄 🔗
Aug 24, 2022	**Deep Learning**. Coursera Learning. Certification 📄 🔗
Aug 24, 2022	**Sequence Models**. Coursera Learning. Certification 📄 🔗
Aug 9, 2022	**Convolutional Neural Networks**. Coursera Learning. Certification 📄 🔗
July 15, 2022	**Structuring Machine Learning Projects**. Coursera Learning. Certification 📄 🔗
July 10, 2022	**Improving DNN: Hyperparameter Tuning, Regularization and Optimization**. Coursera Learning. Certification 📄 🔗
June 18, 2022	**Neural Networks and Deep Learning**. Coursera Learning. Certification 📄 🔗
June 12, 2022	**Fundamentals of Dynamic Programming**. LinkedIn Learning. Certification 📄 🔗
June 12, 2022	**Communicating Across Cultures**. LinkedIn Learning. Certification 📄 🔗
June 27, 2021	**Git: Branches, Merges, and Remotes**. LinkedIn Learning. Certification 📄 🔗

| May 29, 2021 | **Git Essential Training: The Basics**. LinkedIn Learning. Certification |
| Apr 10, 2021 | **Machine Learning**. An online non-credit course authorized by Stanford University and offered through Coursera. Certification |

Workshops

| March 14-18, 2022 Champs-sur-Marne (France) | fft-workshop-22 : Introduction to FFT-based numerical methods for the homogenization of random materials. |

Skills & Abilities

Research expertise

- Applied Mathematics
- Micromechanics

Industry Knowledge

- AI-ML-DL
- Programming
- Mathematics education

Softwares expertise

- Licensed Softwares: MATLAB$^{®}$ · COMSOL Multiphysics$^{®}$ · Wolfram Mathematica

- Free and Open Source: PyTorch · VS Code · LaTex · Inkscape · Zotero · FreeFem++ · Git / GitHub

Programming

6 YOE
Matlab
Python
C++

Languages

Español	C2	mother tongue
English	B2	
Français	B1	

Scientific competences

- Scientific knowledge
- Ability to learn and innovate.
- Ability to formulate a research problem
- Ability to integrate existing knowledge

Project and team management skills

- Communication skills
- Motivation / Commitment to the project
- To work in a multidisciplinary team
- Project management skills

Personal capabilities

- Creativity
- Adaptability
- Open-mindedness
- Intrinsic passion for learning

Hobbies

- Sportive life
- Trying new cooking recipes

References

PhD

Frederic Lebon	Professor, Aix-Marseille University	lebon@lma.cnrs-mrs.fr
Reinaldo Rodríguez-Ramos	Professor, University of Havana	reinaldo@matcom.uh.cu

Postdoc at d'Alembert

Remi Cornaggia	Associate Professor, Sorbonne University	remi.cornaggia@sorbonne-universite.fr
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Renald Brenner	Research Director, CNRS, d'Alembert	renald.brenner@sorbonne-universite.fr

Postdoc at IRPHÉ / AMSE

Valérie Deplano	Research Director, CNRS, IRPHÉ	valerie.deplano@univ-amu.fr
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