

# Cesar Augusto VALADES CRUZ, PhD

Nationality: French and Mexican

Birthdate: 27/11/1985

*My research experience ranges from construction/running of advanced optical microscopes to processing/analyzing imaging data together with cell biology applications, as well as, machine learning, data handling, high-content imaging, and visualization of 3D+time data.*

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## >>> PROFESSIONAL EXPERIENCE <<<

**Associate researcher – Algal Growth and Development TEAM with Prof. Zhang Cheng-Cai** 02/2023 – Current  
**Institute of Hydrobiology, Chinese Academy of Sciences, Wuhan, China**

My research focus on the study of the growth and differentiation of cyanobacterial cells using advance microscopy and machine learning algorithms.

**Postdoctoral researcher – Team SERPICO Paris with Dr. C. Kervrann and Dr. J. Salamero** 01/2022 – 01/2023  
**French National Institute for Research in Digital Science and Technology (Inria) & CNRS-Institut Curie, Paris, France**

*Project: Polarization Microscopy for Imaging of Membrane Organization (PoMIMO).*

LabEx Cell(n)Scale collaborative project between Inria and Curie Institute. Implementation of polarization module in a STORM-TIRFM (PolarSTORM) system at Curie Institute. Developing of image analysis workflow of biomolecules tracking and estimating spatial high-resolution maps of molecular mobility.

**Postdoc/Engineer –Inria and startup Biotech Myriade** 01/2021 – 12/2021

*Project: Improvement of tracking and size estimation of virus and extracellular vesicles.*

Collaboration between SERPICO Team and the Biotech startup Myriade. I develop mathematical models and image processing tools to improve the tracking and size estimation of virus and extracellular vesicles in VideoDrop.

**Inria Starting Research Position – Team SERPICO Paris** 04/2019 – 12/2020  
**French National Institute for Research in Digital Science and Technology (Inria) & CNRS-Institut Curie, Paris, France**

*Project: Acquisition, analysis, and visualization of 3D Dynamic cellular imaging of endocytosis/recycling mechanisms in the membrane during cell migration using machine learning.*

I work in novel machine learning methods of image processing able to detect the main regions of interest, and automatic quantification of molecular interactions and cell processes. In addition, I collaborate in the development of machine learning-driven navigation and interaction techniques for 3D+Time data enabling the analysis of localized intra-cellular events (endocytosis and exocytosis) and cell processes (migration, division, etc.).

**Postdoctoral researcher – Team of Prof. Ludger JOHANNES** Curie Institute, Paris, France 01/2016 – 03/2019

*Project: Advanced cellular imaging of endocytosis.* Development of 3D image processing and quantification methods to study different modes of endocytosis, using advanced high spatio-temporal resolution imaging and single particle tracking. In addition, I was also responsible of setting up a Lattice Light Sheet Microscope on the PICT-IBISA imaging facility at Curie Institute, which is part of the France BioImaging National Infrastructure.

**University Lecturer** Monterrey Institute of Technology and Higher Education, Mexico 01/2015 – 12/2015

*Teaching Physics, mathematics, and differential equations.*

**Research Engineer – CNRS Institut Fresnel, Marseille, France** 12/2013 – 04/2014

*Responsible of developing image processing and quantification methods for super-resolution microscopy (dSTORM).*

**Ph. D with Dr. Sophie BRASSELET and Dr. Pablo LOZA-ALVAREZ**

**Institut Fresnel, Marseille, France & Institute of Photonic Sciences, Barcelona, Spain** 12/2010 – 07/2014

*Thesis: Polarized Super-Resolution Fluorescence Microscopy.* Implementation of a novel method of super resolution microscopy, in combination with a polarized detection to study molecular orientation behaviors, to report structural information at the single molecule and at nanometric spatial scale.

## >>> EDUCATION <<<

- 12/2010 – 07/2014 **Erasmus Mundus PhD in Photonics Engineering, Nanophotonics and Biophotonics**  
**Mención Très honorable. Sobresaliente. Cum Laude.**  
Aix-Marseille University, France & Polytechnic University of Catalonia, Spain
- 08/2008 – 07/2010 **Erasmus Mundus M. Sc. in Biophotonics for telecommunications and biotechnologies** **GPA: 14.4/20 “Magna Cum Laude”**  
Ecole Normale Supérieure de Cachan, France & Complutense University of Madrid, Spain
- 08/2009 – 12/2011 **MEng. in Quality Systems and Productivity.** **GPA: 90.7/100**  
Monterrey Institute of Technology and Higher Education, Mexico
- 08/2003 – 05/2008 **B. S. in Mechatronics Engineering.** **GPA: 92/100 “With honors”**  
Monterrey Institute of Technology and Higher Education, Toluca, Mexico

## >>> SKILLS <<<

**Computational Languages & Tools:** MATLAB, Python, C/C++, LabVIEW, Java, ImageJ/FIJI, Icy, IMARIS, GPU programming, Parallel computing, TensorFlow, Keras, Machine Learning, R, Prism, Microsoft Excel, Zen celldiscover, IDEAS(ImageStream) **Languages:** English, Spanish and French.

## >>> ONGOING PROJECTS & COLLABORATIONS <<<

- 2022 **Project POMIMO: Polarization Microscopy for Imaging of Membrane Organization.** Create a new imaging approach that will have the potential to be applied to the topics where the spatial and molecular organization of lipids/proteins defines both the structure and function of assemblies in reconstituted systems and in living cells.
- 2019 **Project NAVISCOPE: image-guided navigation and visualization of large data sets in live cell imaging and microscopy.** INRIA IPL project, initiated to implement novel machine-learning methods able to detect the main regions of interest, and automatic quantification of sparse sets of molecular interactions and cell processes during navigation to save memory and computational resources.
- 2019 **Project BioImageT: open-source integrator for Image DATA management and analysis.** Ongoing project of the Serpico TEAM in the frame of the NRI (National Research Infrastructure – France BioImaging) and dissemination toward the 18 Imaging Facilities that constitute the Core of the Infrastructure.
- 2019 **Project: Ultrastructure imaging of actin assemblies imaged by polarized light sheet microscopy.** Ongoing collaboration in the frame of France BioImaging R&D program for image processing of polarized light sheet microscopy data with Dr. Sophie Brasselet, Institut Fresnel.
- 2017 **Project ANR: Data Assimilation and Lattice Light Sheet imaging for endocytosis/exocytosis pathway modeling in the whole cell (DALLISH).** Collaboration to investigate endocytosis pathways in the whole cell using 3D single particle tracking.

## >>> FELLOWSHIPS & DISTINCTIONS <<<



- 2020-2024 Member of the Mexican National Research System (SNI 1)
- 2010-2014 Erasmus Mundus Fellowship for PhD
- 2008-2010 Mexican National Council of Science and Technology (CONACyT) fellowship for Master
- 2008-2010 Erasmus Mundus Fellowship for Master

## >>> PUBLICATIONS <<<

### First author publications

- [1] Prigent S.\*, **Valades-Cruz C.A.\***, Leconte L.\*, Maury L., Salamero J., Kervrann C. BioImagelT: Open-source framework for integration of image data-management with analysis. **Nature Methods** (2022)
- [2] Vaz Rimoli C.\*, **Valades-Cruz C.A.\***, Curcio V., Mavrakakis M., Brasselet S. 4polar-STORM polarized super-resolution imaging of actin filament organization in cells. **Nature Communications** (2022)
- [3] Shaban H.\*, **Valades-Cruz C. A.\***, Savatier J., Brasselet S. Polarized super-resolution structural imaging inside amyloid fibrils using Thioflavine T. **Scientific Reports** (2017)
- [4] **Valades-Cruz C. A.\***, Shaban H.\*, Kress A., Bertaux N., Monneret S., Mavrakakis M., Savatier J., Brasselet S. Quantitative nanoscale imaging of orientational order in biological filaments by polarized superresolution microscopy. **PNAS** (2016)

### Corresponding author publications

- [1] Prigent S. , **Valades-Cruz C.A.** , Leconte L., Salamero J., Kervrann C. STracking: a free and open-source python library for particle tracking and analysis. **Bioinformatics** (2022)

### Other publications

- [1] Lemaigre C., Ceuppens A., **Valades-Cruz C. A.**, Ledoux B., Vanbeneden B., Hassan M., Zetterberg F. R., Nilsson U. J., Johannes L., Wunder C., Renard H-F., Morsomme P. N-BAR and F-BAR proteins – Endophilin-A3 and PSTPIP1 – control clathrin-independent endocytosis of L1CAM. **Traffic** (2023)
- [2] Prigent S., Nguyen H-N., Leconte L., **Valades-Cruz C. A.**, Hajj B., Salamero J., Kervrann C. SPITFIR(e): a supermaneuverable algorithm for fast denoising and deconvolution of 3D fluorescence microscopy images and videos. **Scientific Reports** (2023)
- [3] Forrester A., Rathjen S., Garcia-Castillo M. D., Bachert C., Couhert A., Tepshi L., Pichard S., Martinez J., Munier M., Sierocki R., Renard H.F., **Valades-Cruz C.A.**, Dingli F., Loew D., Lamaze C., Cintrat J.C., Linstedt A., Gillet D., Barbier J., Johannes L. Functional Dissection of the Retrograde Shiga Toxin Trafficking Inhibitor Retro-2. **Nature Chemical Biology** (2020)
- [4] Renard H-F, Tyckaert F., Lo Giudice C., Hirsch T., **Valades-Cruz C.A.**, Lemaigre C., Shafaq-Zadah M., Wunder C., Wattiez R., Johannes L., van der Bruggen P., Alsteens D., Morsomme P. Endophilin-A3 and Galectin-8 control the clathrin-independent endocytosis of CD166. **Nature Communications** (2020)
- [5] Briane V, Vimond M, **Valades-Cruz CA**, Salomon A, Wunder C, Kervrann C. A sequential algorithm to detect diffusion switching along intracellular particle trajectories. **Bioinformatics** (2020)
- [6] Salomon A., **Valades-Cruz C. A.**, Leconte L., Kervrann C. Dense Mapping of Intracellular Diffusion and Drift from Single-Particle Tracking Data Analysis, ICASSP 2020 - 2020 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), Barcelona, Spain, 2020, pp. 966-970.
- [7] Torrino S., Shen W., Blouin C., Kailasam Mani S., Viaris de Lesegno C., Bost P., Grassard A., Köster D., **Valades-Cruz C. A.**, Chambon V., Johannes L., Pierobon P., Soumelis V., Coirault C., Vassilopoulos S., Lamaze C. EHD2 is a mechanotransducer connecting caveolae dynamics with gene transcription. **J Cell Biol.** (2018)
- [8] Banerjee A., Gazon C., Pons T., Bhatia D., **Valades-Cruz C. A.**, Johannes L., Krishnan Y., Dubertret B. A Novel Type of Quantum Dot–Transferrin Conjugate Using DNA Hybridization Mimics Intracellular Recycling of Endogenous Transferrin. **Nanoscale** (2018)

### Preprints and submitted manuscripts

- [\*] **Valades-Cruz C. A.\***, Barth R. \*, Abdellah M.\*, Shaban, H. A. Genome-wide analysis of the dynamic and biophysical properties of chromatin and nuclear proteins in living cells with Hi-D. bioRxiv (2022) [Under revision in Nature Protocols].
- [\*] Papereux S.\*, Leconte L.\*, **Valades-Cruz C. A.\***, Liu T., Dumont J., Chen Z., Salamero J., Kervrann C., Badoual A. DeepCristae, a CNN for the restoration of mitochondria cristae in live microscopy images. bioRxiv (2023) [Under revision in Communications Biology].

### Reviews, Perspectives & Comments

- [1] **Valades-Cruz C. A.** et al. Challenges of intracellular visualization using virtual and augmented reality. **Frontiers in Bioinformatics** (2022)
  - [2] Johannes L., **Valades-Cruz C. A.** The final twist in endocytic membrane scission. **Nature Cell Biology** (2021)
- Review assignments journals:** Bioinformatics, PLOS Computational Biology & Journal of Physical Chemistry Letters