

Cesar Augusto VALADES CRUZ, PhD

Nationality: French and Mexican
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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. Working experiences in different countries enable me to work independently and as part of international environments

PROFESSIONAL EXPERIENCE

Postdoctoral researcher – Team SERPICO Paris with Dr. C. Kervrann and Dr. J. Salamero 01/2022 – current
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 their system 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

PUBLICATIONS

- [1] Prigent S.*, **Valades-Cruz C.A.***, Leconte L.*, Maury L., Salamero J., Kervrann C. BiomagelT: Open-source framework for integration of image data-management with analysis. **Nature Methods** (2022)
- [2] 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)
- [3] Vaz Rimoli C.*, **Valades-Cruz C.A.***, Curcio V., Mavrikakis M., Brasselet S. 4polar-STORM polarized super-resolution imaging of actin filament organization in cells. **Nature Communications** (2022)
- [4] 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)
- [5] 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)
- [6] 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)
- [7] 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.
- [8] 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)
- [9] Banerjee A., Grazon 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)
- [10] Shaban H.*, **Valades-Cruz C. A.***, Savatier J., Brasselet S. Polarized super-resolution structural imaging inside amyloid fibrils using Thioflavine T. **Scientific Reports** (2017)
- [11] **Valades-Cruz C. A.***, Shaban H.*, Kress A., Bertaux N., Monneret S., Mavrikakis M., Savatier J., Brasselet S. Quantitative nanoscale imaging of orientational order in biological filaments by polarized superresolution microscopy. **PNAS** (2016)
- [*] Prigent S., Nguyen H-N., Leconte L., **Valades-Cruz C. A.**, Hajj B., Salamero J., Kervrann C. SPITFIR(e): A supermaneuverable algorithm for restoring 2D-3D fluorescence images and videos, and background subtraction. **bioRxiv** (2022)

Reviews & 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

ADDITIONAL 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 BiomagelT: 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)	2008-2010	Mexican National Council of Science and Technology (CONACYT) fellowship for Master
2010-2014	Erasmus Mundus Fellowship for PhD	2008-2010	Erasmus Mundus Fellowship for Master