

# NICOLAS COUDRAY

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Research scientist specialized in image processing and automation in the cryo-electron microscopy and deep-learning histopathology fields. Applied organization skills toward consistently achieving objectives and deadlines with proven successes in managing projects from inception through completion.

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## Experience

### 03/2017– **Senior Research Scientist, Image Analysis Specialist**

current *New York University (NYU), USA, Applied Bioinformatics Lab & Bhabha-Ekiert Lab*

- ✓ Deep-learning in histopathology: study image classification and outcome prediction using supervised/unsupervised convolutional neural networks on medical images (lung cancer, melanoma, osteosarcoma, etc.); Developed processing pipelines (python, tensorflow)
- ✓ Cryo-electron microscopy: 3D reconstruction of proteins from single particles micrographs (dynein motor protein, LetB and Mla lipid transporters) or cryo-electron tomography (microsporidia)
- ✓ Provide image processing support, training and mentoring; Maintain toolchains; Coordinate projects with collaborators

### 01/2015– **Research Associate Scientist**

03/2017 *New York University (NYU), USA – Stokes Lab*

- ✓ Solved the structure of membrane proteins (YiiP, Bor1p) from helical crystals by cryo-EM
- ✓ Developed new techniques to validate the indexing of helical assemblies
- ✓ Created Matlab and Python programs to assist data analysis or image processing
- ✓ Designed and supervised 2D-crystallization experiments

### 11/2010– **Project Manager, Post-doctoral fellow**

12/2014 *New York Structural Biology Center, USA*

- ✓ Coordinated projects (data & sample transfer, projects updates...) with collaborating labs
- ✓ Planned and supervised crystallization screening projects (~300 experiments covering 57 membrane protein targets)
- ✓ Developed and maintained a robotic tool chain for high-throughput screening, including an automated JEOL 1230 microscope (throughput improved by a factor of 4.8)
- ✓ Conceived programs (Matlab and Python) to assist data analysis and image processing
- ✓ Increased the crystallization success rate by designing new and more efficient screening strategies
- ✓ Conceived a database to facilitate the design of new screens and better understand the crystallization process (data mining and statistical analysis)
- ✓ Analyzed the output of 2D crystallization experiments and wrote summary reports
- ✓ Solved the structure of the zinc transporter YiiP from helical crystals using state-of-the-art image processing tools

*This position was part of the TEMIMPS project, a consortium funded by the NIH PSI:Biolog program.*

### 09/2010– **Post-doctoral fellow**

10/2010 *C-CINA Laboratory, University of Basel, Switzerland*

- ✓ Developed image processing algorithms for the automatic screening of drug-related samples

### 09/2008– **Research and Teaching Associate**

08/2010 *University of Upper Alsace (UHA), France*

Research:

- ✓ Created an Image Processing Matlab Toolbox for the automatic control of an electron microscope and the characterization of biological samples
- ✓ Improved the speed of the screening process by testing and integrating those algorithms into a Tecnai F20 microscope (extensive collaboration with the University of Basel and FEI Company).
- ✓ Participated in writing progress reports with milestones

*This research was part of a consortium funded by the European Union to develop a High-Throughput EM toolchain.*

Teaching:

- ✓ at the University of Technology (2009-2010): Industrial data processing (Microprocessor control), Supervision (Human-computer interactions), Internship coordinator

- 10/2005–06/2008 **Supply Teacher in Information, Systems, Communication**  
*UHA, France*  
 Teaching (Master's degree):
  - ✓ Control Engineering (Control and identification of linear systems)
  - ✓ Signal Processing (Electronic, sensors, and image processing)
  - ✓ Project Tutoring
- 09/2004–07/2005 **Research Intern**  
*UHA, France*
  - ✓ Established the use of optical and electron microscopy to characterize nanoparticles impacted on an Electrical Low Pressure Impactor used to characterize potentially hazardous nanoparticles
  - ✓ Conceived a method based on image analysis to provide particle density, and to correct the number size distribution provided by the instrument
  - ✓ Improved the comprehension of the instrument and the impaction phenomena
  - ✓ Proposed, tested and validated a new substrate for particle collection
- 04/2001–07/2001 **Computer Vision Intern**  
*European Molecular Biology Laboratory, Heidelberg, Germany*
  - ✓ Developed image processing algorithms with ImageJ to study nematodes and neurons characterization

## Education

- 2005 – 2008 **Ph.D.** *Signal and Image Processing (automation of an electron microscope using image processing)*  
*MIPS, University of Upper Alsace (UHA), Mulhouse, France*
- 2004 – 2005 **DEA** *Automatism and Industrial Computing*  
 (equivalent to MPhil) with highest honors, at the *UHA, France*
- 2003 – 2004 **Master** *Electrical Engineering, Electronics and Automatism*  
 with highest honors, exchange student at *Concordia University, Montréal, Canada*
- 2001 – 2002 **Bachelor** *Engineering*  
 first class honors, at *De Montfort University, Leicester, UK*

## Skills and Expertise

*Computing skills* --- Image Processing, Programming (Python, Matlab), Protein reconstruction and visualization software packages (RELION, CryoSPARC, Dynamo, UCSF Chimera, Coot, Phenix, Pymol), Automation software (Leginon, SerialEM), Tensorflow Deep Learning library

*Molecular Biology & electron microscopy* --- Membrane proteins, Protein 2D crystallization, Structure determination from helical assemblies and single particles, cryo-electron tomography tools

*Peer-reviewing* activities in international scientific journals and conferences

*Certification:* C-14 Laboratory Certificate of Fitness