

**Dr. Mayeul COLLOT**

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## CNRS Researcher (CRCN)

### EDUCATION – PROFESSIONAL EXPERIENCE

**10<sup>th</sup> January 2020** Habilitation à diriger des recherches, HDR (University of Strasbourg)  
**Since October 2013** CNRS researcher ; UMR 7021 (University of Strasbourg)  
**Sep 2010 – Jul 2013** Postdoctoral fellow; Ecole Normale Supérieure (Paris)  
**Jun 2008 – Jul 2010** Postdoctoral fellow; ETH (Zürich), Max Planck Institute (Berlin)  
**Oct 2004 – May 2008** PhD student Molecular Chemistry; ENS Paris; UPMC (Paris VI)  
**Sep 2003 – Jul 2004** Master 2 (DEA) Molecular chemistry; UPMC (Paris VI)

### DISTINCTIONS-AWARDS

November 2019

*CNRS Bronze Medal Award*



### RESEARCH INTEREST

#### Fluorescent probes

Design and synthesis of fluorescent molecules displaying advanced properties in various microscopy techniques (super resolution microscopy STED, STORM, Two-photon excitation microscopy). Development of fluorescent probes for bioimaging: Calcium probes, pH probes, detection of biomolecules (RNA Aptamers) or reductive/oxidative environments. Organelle specific fluorescent probes: Plasma membrane (MemBright®), photoconvertible probes (BrightSwitch®), lipid droplets, endosomes etc. Fluorogenic detection of receptors anchored at the membrane.

#### Fluorescent nanomaterials

Development of fluorescent organic nanoparticles for bioimaging. Ultrabright “protein like” monomolecular fluorescent nanoparticles based on an amphiphilic polymer. Enhancement of their brightness by means of molecular design of new fluorophores. Functionalization of their surface by click chemistry. Development of ultrabright nanoemulsions by means of efficient encapsulation of new bright fluorophores. Functionalization of nanoemulsions by wrapping with an amphiphilic polymer for their specific targeting. Development of hybrid nanoparticles (oil/polymer). Biocompatible macro and nanomaterials for controlled drug delivery.

### PRODUCTION

Publications : 75\*

Patents: 5

Proceedings : 2

Book Chapter : 1

\* 35 as first or last author, 35 as corresponding author

### SUPERVISION SINCE PERMANENT RESEARCHER

Total: **24 students**: 3 Postdocs, 11 PhD, 12 Master students

## PUBLICATIONS AND PATENTS

- (1) Collot, M.; Pfister, S.; Klymchenko, A. S. Advanced Functional Fluorescent Probes for Cell Plasma Membranes. *Curr. Opin. Chem. Biol.* 2022, 69, 102161. <https://doi.org/10.1016/j.cbpa.2022.102161>.
- (2) Fam, K. T.; Pelletier, R.; Bouhedda, F.; Ryckelynck, M.; Collot, M.; Klymchenko, A. S. Rational Design of Self-Quenched Rhodamine Dimers as Fluorogenic Aptamer Probes for Live-Cell RNA Imaging. *Anal. Chem.* 2022, 94 (18), 6657–6664. <https://doi.org/10.1021/acs.analchem.1c04556>.
- (3) Bou, S.; Klymchenko, A. S.; Collot, M. Fluorescently Labeled Branched Copolymer Nanoparticles for In Situ Characterization of Nanovectors and Imaging of Cargo Release. *ACS Appl. Nano Mater.* 2022, 5 (3), 4241–4251. <https://doi.org/10.1021/acsanm.1c04582>.
- (4) Wang, X.; Collot, M.; Vandamme, T. F.; Anton, N. Study of the Spontaneous Nano-Emulsification Process with Different Octadecyl Succinic Anhydride Derivatives. *Colloids Surf. Physicochem. Eng. Asp.* 2022, 128858. <https://doi.org/10.1016/j.colsurfa.2022.128858>.
- (5) Michelis, S.; Danglot, L.; Vauchelles, R.; Klymchenko, A. S.; Collot, M. Imaging and Measuring Vesicular Acidification with a Plasma Membrane-Targeted Ratiometric PH Probe. *Anal. Chem.* 2022, 94 (15), 5996–6003. <https://doi.org/10.1021/acs.analchem.2c00574>.
- (6) Mukherjee, T.; Kanvah, S.; Klymchenko, A. S.; Collot, M. Probing Variations of Reduction Activity at the Plasma Membrane Using a Targeted Ratiometric FRET Probe. *ACS Appl. Mater. Interfaces* 2021, 13 (34), 40315–40324. <https://doi.org/10.1021/acsami.1c11069>.
- (7) Sendid, B.; Lecoite, K.; Collot, M.; Danzé, P.-M.; Damiens, S.; Drucbert, A.-S.; Fradin, C.; Vilcot, J.-P.; Grenouillet, F.; Dubar, F.; de Ruyck, J.; Jawhara, S.; Mallet, J.-M.; Poulain, D. Dissection of the Anti- *Candida Albicans* Mannan Immune Response Using Synthetic Oligomannosides Reveals Unique Properties of  $\beta$ -1,2 Mannotriose Protective Epitopes. *Sci. Rep.* 2021, 11 (1), 10825. <https://doi.org/10.1038/s41598-021-90402-4>.
- (8) Cubi, R.; Bouhedda, F.; Collot, M.; Klymchenko, A. S.; Ryckelynck, M. MIVC-Useq: A Microfluidic-Assisted High-Throughput Functional Screening in Tandem with next Generation Sequencing and Artificial Neural Network to Rapidly Characterize RNA Molecules. *RNA* 2021, rna.077586.120. <https://doi.org/10.1261/rna.077586.120>.
- (9) Bou, S.; Klymchenko, A. S.; Collot, M. Fluorescent Labeling of Biocompatible Block Copolymers: Synthetic Strategies and Applications in Bioimaging. *Mater. Adv.* 2021, 2 (10), 3213–3233. <https://doi.org/10.1039/D1MA00110H>.
- (10) Wang, X.; Bou, S.; Klymchenko, A. S.; Anton, N.; Collot, M. Ultrabright Green-Emitting Nanoemulsions Based on Natural Lipids-BODIPY Conjugates. *Nanomaterials* 2021, 11 (3), 826. <https://doi.org/10.3390/nano11030826>.
- (11) Fam, K. T.; Saladin, L.; Klymchenko, A. S.; Collot, M. Confronting Molecular Rotors and Self-Quenched Dimers as Fluorogenic BODIPY Systems to Probe Biotin Receptors in Cancer Cells. *Chem. Commun.* 2021, 57 (39), 4807–4810. <https://doi.org/10.1039/D1CC00108F>.
- (12) Belcastro, E.; Rehman, A. U.; Remila, L.; Park, S.-H.; Gong, D. S.; Anton, N.; Auger, C.; Lefebvre, O.; Goetz, J. G.; Collot, M.; Klymchenko, A. S.; Vandamme, T. F.; Schini-Kerth, V. B. Fluorescent Nanocarriers Targeting VCAM-1 for Early Detection of Senescent Endothelial Cells. *Nanomedicine Nanotechnol. Biol. Med.* 2021, 34, 102379. <https://doi.org/10.1016/j.nano.2021.102379>.
- (13) Ashokkumar, P.; Collot, M.; Klymchenko, A. S. Fluorogenic Squaraine Dendrimers for Background-Free Imaging of Integrin Receptors in Cancer Cells. *Chem. – Eur. J.* 2021, 27 (22), 6795–6803. <https://doi.org/10.1002/chem.202100480>.
- (14) Mukherjee, T.; Soppina, V.; Ludovic, R.; Mély, Y.; Klymchenko, A. S.; Collot, M.; Kanvah, S. Live-Cell Imaging of the Nucleolus and Mapping Mitochondrial Viscosity with a Dual Function Fluorescent Probe. *Org. Biomol. Chem.* 2021, 19 (15), 3389–3395. <https://doi.org/10.1039/D0OB02378G>.
- (15) Mukherjee, T.; Martinez-Sanchez, R. J.; Fam, K. T.; Bou, S.; Richert, L.; Garnier, D.; Mély, Y.; Kanvah, S.; Klymchenko, A. S.; Collot, M. Near Infrared Emitting Molecular Rotor Based on Merocyanine for Probing the Viscosity of Cellular Lipid Environments. *Mater. Chem. Front.* 2021, 5 (5), 2459–2469. <https://doi.org/10.1039/D0QM00872A>.
- (16) Rehman, A. U.; Anton, N.; Bou, S.; Schild, J.; Messaddeq, N.; Vandamme, T.; Akram, S.; Klymchenko, A.; Collot, M. Tunable Functionalization of Nano-Emulsions Using Amphiphilic Polymers. *Soft Matter* 2021, 17 (7), 1788–1795. <https://doi.org/10.1039/D0SM01952F>.
- (17) Collot, M. Recent Advances in Dioxaborine-Based Fluorescent Materials for Bioimaging Applications. *Mater. Horiz.* 2021, 8 (2), 501–514. <https://doi.org/10.1039/D0MH01186J>.
- (18) Giri, K. R.; de Beaurepaire, L.; Jegou, D.; Lavy, M.; Mosser, M.; Dupont, A.; Fleurisson, R.; Dubreil, L.; Collot, M.; Van Endert, P.; Bach, J.-M.; Mignot, G.; Bosch, S. Molecular and Functional Diversity of Distinct Subpopulations of the Stressed Insulin-Secreting Cell's Vesiculome.

- Front. Immunol. 2020, 11. <https://doi.org/10.3389/fimmu.2020.01814>.
- (19) Klymchenko, A. S.; Liu, F.; Collot, M.; Anton, N. Dye-Loaded Nanoemulsions: Biomimetic Fluorescent Nanocarriers for Bioimaging and Nanomedicine. *Adv. Healthc. Mater.* 2021, 10 (1), 2001289. <https://doi.org/10.1002/adhm.202001289>.
- (20) Collot, M.; Schild, J.; Fam, K. T.; Bouchaala, R.; Klymchenko, A. S. Stealth and Bright Monomolecular Fluorescent Organic Nanoparticles Based on Folded Amphiphilic Polymer. *ACS Nano* 2020, 14 (10), 13924–13937. <https://doi.org/10.1021/acsnano.0c06348>.
- (21) Khalin, I.; Heimbürger, D.; Melnychuk, N.; Collot, M.; Groschup, B.; Hellal, F.; Reisch, A.; Plesnila, N.; Klymchenko, A. S. Ultrabright Fluorescent Polymeric Nanoparticles with a Stealth Pluronic Shell for Live Tracking in the Mouse Brain. *ACS Nano* 2020, 14 (8), 9755–9770. <https://doi.org/10.1021/acsnano.0c01505>.
- (22) Fam, K. T.; Collot, M.; Klymchenko, A. S. Probing Biotin Receptors in Cancer Cells with Rationally Designed Fluorogenic Squaraine Dimers. *Chem. Sci.* 2020, 11 (31), 8240–8248. <https://doi.org/10.1039/D0SC01973A>.
- (23) Bou, S.; Wang, X.; Anton, N.; Bouchaala, R.; Klymchenko, A. S.; Collot, M. Lipid-Core/Polymer-Shell Hybrid Nanoparticles: Synthesis and Characterization by Fluorescence Labeling and Electrophoresis. *Soft Matter* 2020, 16 (17), 4173–4181. <https://doi.org/10.1039/D0SM00077A>.
- (24) Bou, S.; Wang, X.; Anton, N.; Klymchenko, A. S.; Collot, M. Near Infrared Fluorogenic Probe as a Prodrug Model for Evaluating Cargo Release by Nanoemulsions. *J. Mater. Chem. B* 2020, 8 (27), 5938–5944. <https://doi.org/10.1039/D0TB00783H>.
- (25) Esteouille, L.; Daubeuf, F.; Collot, M.; Riché, S.; Durroux, T.; Brasse, D.; Marchand, P.; Karpenko, I. A.; Klymchenko, A. S.; Bonnet, D. A Near-Infrared Fluorogenic Dimer Enables Background-Free Imaging of Endogenous GPCRs in Living Mice. *Chem. Sci.* 2020, 11 (26), 6824–6829. <https://doi.org/10.1039/D0SC01018A>.
- (26) Wang, X.; Collot, M.; Omran, Z.; Vandamme, T. F.; Klymchenko, A.; Anton, N. Further Insights into Release Mechanisms from Nano-Emulsions, Assessed by a Simple Fluorescence-Based Method. *J. Colloid Interface Sci.* 2020, 578, 768–778. <https://doi.org/10.1016/j.jcis.2020.06.028>.
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- (29) Trofymchuk, K.; Valanciunaite, J.; Andreiuk, B.; Reisch, A.; Collot, M.; Klymchenko, A. S. BODIPY-Loaded Polymer Nanoparticles: Chemical Structure of Cargo Defines Leakage from Nanocarrier in Living Cells. *J. Mater. Chem. B* 2019, 7 (34), 5199–5210. <https://doi.org/10.1039/C8TB02781A>.
- (30) Ashokkumar, P.; Ashoka, A. H.; Collot, M.; Das, A.; Klymchenko, A. S. A Fluorogenic BODIPY Molecular Rotor as an Apoptosis Marker. *Chem. Commun.* 2019, 55 (48), 6902–6905. <https://doi.org/10.1039/C9CC03242H>.
- (31) Wang, X.; Anton, N.; Ashokkumar, P.; Anton, H.; Fam, T. K.; Vandamme, T.; Klymchenko, A. S.; Collot, M. Optimizing the Fluorescence Properties of Nanoemulsions for Single Particle Tracking in Live Cells. *ACS Appl. Mater. Interfaces* 2019, 11 (14), 13079–13090. <https://doi.org/10.1021/acsami.8b22297>.
- (32) Collot, M.; Ashokkumar, P.; Anton, H.; Boutant, E.; Faklaris, O.; Galli, T.; Mély, Y.; Danglot, L.; Klymchenko, A. S. MemBright: A Family of Fluorescent Membrane Probes for Advanced Cellular Imaging and Neuroscience. *Cell Chem. Biol.* 2019, 26 (4), 600–614.e7. <https://doi.org/10.1016/j.chembiol.2019.01.009>.
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- (34) Akram, S.; Wang, X.; Vandamme, T. F.; Collot, M.; Rehman, A. U.; Messaddeq, N.; Mély, Y.; Anton, N. Toward the Formulation of Stable Micro and Nano Double Emulsions through a Silica Coating on Internal Water Droplets. *Langmuir* 2019, 35 (6), 2313–2325. <https://doi.org/10.1021/acs.langmuir.8b03919>.
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- Probe. *Bioconjug. Chem.* 2019, 30 (1), 192–199. <https://doi.org/10.1021/acs.bioconjchem.8b00828>.
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- (38) Collot, M.; Fam, T. K.; Ashokkumar, P.; Faklaris, O.; Galli, T.; Danglot, L.; Klymchenko, A. S. Ultrabright and Fluorogenic Probes for Multicolor Imaging and Tracking of Lipid Droplets in Cells and Tissues. *J. Am. Chem. Soc.* 2018, 140 (16), 5401–5411. <https://doi.org/10.1021/jacs.7b12817>.
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- (41) Ponsot, F.; Shen, W.; Ashokkumar, P.; Audinat, E.; Klymchenko, A. S.; Collot, M. PEGylated Red-Emitting Calcium Probe with Improved Sensing Properties for Neuroscience. *ACS Sens.* 2017, 2 (11), 1706–1712. <https://doi.org/10.1021/acssensors.7b00665>.
- (42) Dukhno, O.; Przybilla, F.; Collot, M.; Klymchenko, A.; Pivovarenko, V.; Buchner, M.; Muhr, V.; Hirsch, T.; Mély, Y. Quantitative Assessment of Energy Transfer in Upconverting Nanoparticles Grafted with Organic Dyes. *Nanoscale* 2017, 9 (33), 11994–12004. <https://doi.org/10.1039/C6NR09706E>.
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- (44) Collot, M.; Ponsot, F.; Klymchenko, A. S. Ca-NIR: A Ratiometric near-Infrared Calcium Probe Based on a Dihydroxanthene-Hemicyanine Fluorophore. *Chem. Commun.* 2017, 53 (45), 6117–6120. <https://doi.org/10.1039/C7CC02418E>.
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- (54) Despras, G.; Zamaleeva, A. I.; Dardevet, L.; Tisseyre, C.; Magalhaes, J. G.; Garner, C.; Waard, M. D.; Amigorena, S.; Feltz, A.; Mallet, J.-M.; Collot, M. H-Rubies, a New Family of Red Emitting Fluorescent PH Sensors for Living Cells. *Chem. Sci.* 2015, 6 (10), 5928–5937. <https://doi.org/10.1039/C5SC01113B>.
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### **Patents**

(1) Fluorescent red emitting functionalizable calcium indicators, **2014**, *WO2015078948A1* Jean-Maurice Mallet, Mayeul Collot

(2) Fluorescent red emitting functionalizable pH probes **2014**, *WO2015097262A1*, Jean-Maurice Mallet, Mayeul Collot

(3) Fluorescent compounds, **2019**, European patent application number *EP19305806.2* Michalél Ryckelynck, Farah Bouhedda, Mayeul Collot, Andrey S. Klymchenko, Kyong T. Fam

(4) Ultra-small fluorescent organic Nanoparticles, **2020**, European patent application number *EP20306027.2*, Mayeul Collot, Andrey S. Klymchenko.

(5) Fluorogenic dimer compound, useful as a probe for detection of endogenous receptors, **2021**, *PCT/EP2021/062626*, Klymchenko Andrey, Bonnet Dominique, Karpenko Iuliia et Collot Mayeul.