# Radek Macháň (RNDr., Ph. D.)


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**Place and date of birth:**

28/02/1982, Liberec, Czech Republic

**Languages:**

***Czech*** (native speaker)
***English*** (full professional proficiency)
***German, Spanish*** (limited working proficiency)
***Malay*** (beginner level)

**Other qualifications:**

Class B driving license (Europe)

## Computer skills:

*Programming:* Java, Visual Basic
*Image and data analysis:* ImageJ/FIJI, MATLAB, SVI Huygens, Origin Pro, SigmaPlot
*Experiment control:* Micro-Manager, LabVIEW
*Web development* (HTML, CSS)

## Education:

### Ph.D.

**Years: 2006 – 2012**
**School:** Charles University in Prague, Faculty of Mathematics and Physics.
**Field of study:** Physics, **specialization:** Biophysics, Macromolecular and Chemical Physics
**Supervisor:** Prof. Martin Hof, DSc. (J. Heyrovský Institute of Physical Chemistry of AS CR, *martin.hof@jh-inst.cas.cz*)
**Thesis:** Supported phospholipid bilayers and their interactions with proteins studied by ellipsometry, atomic force microscopy and confocal fluorescence microscopy (defended on 07/03/2012).

### M.Sc.

**Years: 2001 – 2006**
**School:** Charles University in Prague, Faculty of Mathematics and Physics.
**Field of study:** Physics, **specialization:** Biophysics and Chemical Physics
**Supervisor:** Prof. RNDr. Josef Štěpánek, CSc. (Charles University in Prague, Faculty of Mathematics and Physics., *josef.stepanek@mff.cuni.cz*)
**Thesis:** Comprehensive characterization of cellular suspensions by the means of elastic scattering of light (defended on 15/05/2006).

## Praxis:

**From: 09/09/2019** **To: Present**
**Position:** Senior Research fellow
**Employer:** Singapore Centre for Environmental Life Sciences, Nanyang Technological University, Singapore
**Direct supervisor:** Prof. Peter Török, Ph.D. (*peter.torok@ntu.edu.sg*)

Managing Advanced Biofilm Imaging Facility - providing training and support to the facility users; assisting with experiment design, microscope operation, data analysis and interpretation; development of custom data analysis routines; maintenance and regular testing of equipment in the facility; participating in development of instruments and methods conducted by the group of Prof. Peter Török.

**From: 01/09/2016** **To: 31/08/2019**
**Position:** Imaging scientist
**Employer:** Imaging Methods Core Facility, Faculty of Science, Charles University in Prague, Czech Republic
**Direct supervisor:** Aleš Benda, Ph.D. (*ales.benda@natur.cuni.cz*)

Providing training and support to the users of optical microscopy in the facility; assisting with experiment design, microscope operation, data analysis and interpretation. Development of data analysis programs. Participating in practical and theoretical training of students. Participating in methodological development conducted at the facility.

**From: 15/04/2016** **To: 31/12/2016**
**Position:** Research assistant
**Employer:** J. Heyrovský Institute of Physical Chemistry of AS CR, Czech Republic
**Direct supervisor:** Prof. Martin Hof, DSc. (*martin.hof@jh-inst.cas.cz*)

Building a total internal reflection fluorescence (TIRF) microscope and implementing imaging fluorescence correlation spectroscopy (FCS) in the laboratory of Prof. Martin Hof.

**From: 01/01/2013** **To: 31/03/2016**
**Position:** Research fellow
**Employer:** Department of Biological Sciences and NUS Centre of BioImaging Sciences, National University of Singapore.
**Direct supervisor:** Prof. Thorsten Wohland, Ph.D. (*twohland@nus.edu.sg*)

Studying lipid bilayers and live cell membranes by imaging FCS with two main objectives: i) comparison of imaging FCS and fluorescence recovery after photobleaching by simultaneous

measurements in lipid bilayers and live cells and ii) study of membrane receptor dimerization in live cell plasma membranes by means of dual-colour imaging fluorescence cross-correlation spectroscopy.

**From: 01/04/2012** **To: 31/12/2012**
**Position:** Assistant professor
**From: 01/12/2009** **To: 31/03/2012**
**Position:** Teaching assistant
**Employer:** Faculty of Biomedical Engineering, Czech Technical University in Prague, Czech Republic
**Direct supervisor:** Prof. Ing. Miroslava Vrbová, CSc. (*vrbova@fbmi.cvut.cz*)

Preparing syllabus and teaching a course on Fluorescence Spectroscopy and Microscopy in Biology and Medicine; co-supervising student projects on ellipsometry and fluorescence spectroscopy.

**From: 01/09/2006** **To: 31/12/2012**
**Position:** Research assistant
**Employer:** J. Heyrovský Institute of Physical Chemistry of AS CR, Czech Republic
**Direct supervisor:** Prof. Martin Hof, DSc. (*martin.hof@jh-inst.cas.cz*)

Experimentally studying models of biological membranes (supported lipid bilayers, giant unilamellar vesicles) and their interactions with membrane-active peptides; main experimental techniques used were fluorescence imaging, fluorescence spectroscopy, fluorescence correlation spectroscopy and ellipsometry.

## List of publications:

### *A. Journal Articles:*

1. Magalhaes-Novais S, Blecha J, Naraine R, Mikesova J, Abaffy P, Pecinova A, Milosevic M, Bohuslavova R, Prochazka J, Khan S, Novotna E, Sindelka R, Machan R, Dewerchin M, Vlcak E, Kalucka J, Stemberkova Hubackova S, Benda A, Goveia J, Mracek T, Barinka C, Carmeliet P, Neuzil J, Rohlenova K, Rohlena J. *Mitochondrial respiration supports autophagy to provide stress resistance during quiescence*, Autophagy (2022) DOI: 10.1080/15548627.2022.2038898.

2. Agarwal K, Macháň R, Prasad D. *Non-heuristic automatic techniques for overcoming low signal-to-noise-ratio bias of localization microscopy and multiple signal classification algorithm*, Scientific Reports (2018) **8**: 4988.

3. Agarwal K, Macháň R. *Multiple Signal Classification Algorithm for super-resolution fluorescence microscopy*, Nature Communications (2016) **7**: 13752.

4. Yavas S, Macháň R, Wohland T. *The Epidermal Growth Factor Receptor Forms Location-Dependent Complexes in Resting Cells*, Biophysical J (2016), **111**: 2241–2254.

*5.* Macháň R, Foo YH, Wohland T. *On the Equivalence of FCS and FRAP: Simultaneous Lipid Membrane Measurements.* Biophys J (2016), **111**: 152–161.

6. Macháň R, Wohland T. *Recent Applications of Fluorescence Correlation Spectroscopy in Live Systems.* FEBS Lett. (2014), **19**: 3571–3584.

7. Macháň R, Jurkiewicz P, Olzyńska A, Olšinová M, Cebecauer M, Marquette A, Bechinger B, Hof M. *Peripheral and integral membrane binding of peptides characterized by time-dependent fluorescence shifts: focus on the antimicrobial peptide $LAH_4$.* Langmuir (2014), **30**: 6171–6179.

*8.* Macháň R, Kapusta P, Hof M. *Statistical filtering in fluorescence microscopy and fluorescence correlation spectroscopy.* Anal. Bioanal. Chem. (2014), **406**: 4797-4813.

9. Kapusta P, Macháň R, Benda A, Hof M. *Fluorescence Lifetime Correlation Spectroscopy (FLCS): Concepts, Applications and Outlook*. Int. J. Mol. Sci. (2012), **13:** 12890-12910.

10. Štefl M, Šachl R, Humpolíčková J, Cebecauer M, Macháň R, Kolářová M, Johansson L B-A, Hof M. *Dynamics and Size of Cross-Linking-Induced Lipid Nanodomains in Model Membranes*, Biophys. J. (2012) **102:** 2104-2113.

11. Norris SCP, Humpolíčková J, Amler E, Huranová M, Buzgo M, Macháň R, Lukáš D, Hof M. *Raster image correlation spectroscopy as a novel tool to study interactions of macromolecules with nanofiber scaffolds*, Acta Biomaterialia (2011) **7:** 4195-4203.

12. Macháň R, Hof M, Chernovets T, Zhmak MN, Ovchinnikova TV, Sýkora J. *Formation of arenicin-1 microdomains in bilayers and their specific lipid interaction revealed by Z-scan FCS*, Anal. Bioanal. Chem. (2011) **399**: 3547-3554.

13. Humpolíčková J., Benda A., Macháň R., Enderlein J., Hof M. *Dynamic saturation optical microscopy: employing dark-state formation kinetics for resolution enhancement*. Phys Chem Chem Phys (2010) **12:** 12457-12465.

14. Macháň R, Hof M. *Lipid lateral diffusion in planar bilayers investigated by fluorescence correlation spectroscopy*. Biochim Biophys Acta (2010) **1798**: 1377-1391.

15. Macháň R, Hof M. *Recent Developments in Fluorescence Correlation Spectroscopy for Diffusion Measurements in Planar Lipid Membranes*. Int J Mol Sci (2010) **11**:427-457.

16. Macháň R, Miszta A, Hermens W, Hof M. *Real-time monitoring of melittin induced pore and tubule formation from supported lipid bilayers and its physiological relevance.* Chem Phys Lipids (2010) **163**: 200-206.

17. Miszta A, Macháň R, Benda A, Ouellette AJ, Hermens WT, Hof M. *Combination of ellipsometry, laser scanning microscopy and Z-scan fluorescence correlation spectroscopy elucidating interaction of cryptdin-4 with supported phospholipid bilayers.* J Pept Sci (2008) **14**: 503-509.

18. Humpolíčková J, Benda A, Sýkora J, Macháň R, Kral T, Gasinska B, Enderlein J, Hof M. *Equilibrium dynamics of spermine-induced plasmid DNA condensation revealed by fluorescence lifetime correlation spectroscopy.* Biophys J (2008) **94**: L17-L19.

19. Klika Z, Čapková P, Horáková P, Valášková M, Malý P, Macháň R, Pospíšil M. *Composition, structure, and luminescence of montmorillonites saturated with different aggregates of methylene blue*. J Colloid Interface Sci (2007) **311**: 14-23.

## *B. Proceedings articles:*

1. Steinberger T, Macháň R, *Study of membrane formation by the null ellipsometer*. In: Dubničková A, Dubnička S, Granja C, Leroy C, Stekl I (eds.), Nuclear physics methods and accelerators in biology and medicine, vol. 1204, Amer Inst Physics, Melville (2009), pp. 258-259.

## *C. Books and Book Chapters:*

1. Wohland T, Maiti S, Macháň R. *An Introduction to Fluorescence Correlation Spectroscopy*, IOP Publishing, Bristol (2020)

2. Hof M, Macháň R. *Basics of Optical Spectroscopy*. In Gauglitz G, Vo-Dinh T, Moore DS. (eds.) Handbook of spectroscopy, 2nd edition, Wiley-VCH, Weinheim (2014), pp. 31-38.

3. Sablinkas V, Steiner G, Hof M, Macháň R. *Applications of Optical Spectroscopy*. In Gauglitz G, Vo-Dinh T, Moore DS. (eds.) Handbook of spectroscopy, 2nd edition, Wiley-VCH, Weinheim (2014), pp. 95-182.

4. Macháň R, Hof M. *Fluorescence correlation spectroscopy of lipids*. In Roberts GCK. (ed.) Encyclopedia of Biophysics, Springer, New Delhi (2013), pp. 789-795.

5. Štefl M, Macháň R, Hof M. *Z-scan fluorescence correlation spectroscopy: A powerful tool for determination of lateral diffusion in biological systems*. In Geddes C (ed.) Reviews in fluorescence 2009, Springer, New York (2011), pp. 321-344.

6. Miszta A, Macháň R, Hermens WT, Hof M. *Peptide–membrane interactions studied by ellipsometry, laser scanning microscopy, and Z-scan fluorescence correlation spectroscopy.* In Castanho M (ed.) Membrane-active peptides: methods and results on structure and function, IUL Publishers, La Jolla (2009), pp. 217-245.

## *D. Software:*

1. Wohland T et al. *Imaging FCS ImageJ Plugin*, (2016), http://www.dbs.nus.edu.sg/lab/BFL/imfcs_image_j_plugin.html.