

## Curriculum Vitae: Dr. Oliver T. Bruns



### Family Status, Nationality, birthdate

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Married; 2 children; German, born January 6<sup>th</sup>, 1980

### Professional Experience

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- 2020 Offer for a tenured full professorship at the **NCT Dresden** (Ruf für die W3-Professur für Funktionelle Bildgebung in der Operativen Onkologie am NCT-Dresden (getragen von dem DKFZ, dem HZDR und der Medizinischen Fakultät der TU Dresden))
- Since 2020 TUM Junior Fellow- Department of Medicine **TU Munich**
- Since 2018 Principal Investigator at the **Helmholtz Pioneer Campus / Emmy Noether Group leader**
- 2015-2017 Research Scientist (Senior Scientist) in the group of **Prof. Mounji Bawendi**/ Department of Chemistry at Massachusetts Institute of Technology (MIT)
- 2011-2015 Postdoctoral Associate in the group of **Prof. Mounji Bawendi** at Massachusetts Institute of Technology (MIT)
- 2009-2011 Senior Scientist in the group of **Dr. Heinrich Hohenberg** at Heinrich-Pette-Institute Hamburg/Germany
- 2005-2009 PhD-Thesis with **Prof. Ulrike Beisiegel and Prof. Horst Weller** at the University Medical Center and Institute of Physical Chemistry in Hamburg/Germany ('1.0')
- 2000-2005 Studies of Biochemistry, Molecular Biology at the University of Hamburg/Germany, Diploma in Biochemistry/Molecular Biology ('1.0')
- Since 2005 38 publications in peer reviewed journals, 4658 citations, h-index=26 (Google Scholar), 4 Highly cited papers (top 1% of the field) (Web of Science), 12 papers with more than 100 citations, 13 patent applications, more than 40 talks at international conferences and invited talks at national and international universities
- Since 2009 Referee for Nature Nanotechnology, Nature Biomedical Engineering, Advanced Materials, JACS, ACS Nano, Atherosclerosis and others as well as German and international grant agencies (DFG, DAAD, Humboldt Foundation, The Netherlands Organisation for Scientific Research (NWO/ZonMw))

## Honors, Awards, Fellowships, Mentoring

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2021-2023	PI and Coordinator for a deep tissue imaging grant by the Chan-Zuckerberg-Initiative (CZI) (\$1,000,000 for the consortium - \$610,000 for our sub-award)
2018-2023	Emmy Noether Grant (1,400,000 € direct costs and 300,000 € overhead)
2011-2013	EMBO Long-Term Fellowship (~\$80,000)
2010	DAAD fellowship (declined in favour of EMBO Long-term Fellowship)
2006-2009	'Studienstiftung des Deutschen Volkes' Fellowship (~36,000€)
2017	Travel grant for the World Molecular Imaging Congress
2015	EMBL Advanced Training Centre Fellowship (Travel grant) and Dr. Wilhelmy-GSO-Fellowship (Travel grant)
2014	SPOT award by MIT School of Science and Travel grant by MIT PDA
2010	Karl-Heinz Hölzer Award for Interdisciplinary Medical Research (PhD-Thesis)
2008	Young Investigator Award, 77 <sup>th</sup> European Atherosclerosis Congress, 2008
2007	Young Investigator Award, 30 <sup>th</sup> Meeting of European Lipoprotein Club
2006	Award for the best diploma thesis in Biochemistry/Molecular Biology
2004-2008	Spokesman of the Student Committee of the 'GBM' (German Biochemical Society)

## Publications and Patents

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**Summary:** 40 published or accepted articles in peer-reviewed journals including major multi-disciplinary journals like **Cell**, **Nature Medicine (2x)**, **Nature Biomedical Engineering (2x)**, **Nature Nanotechnology**, **Nature Chemistry**, **Cell Metabolism**, **Advanced Materials**, **Nano Letters (3x)**, **ACS Nano**, **Light: Science & Applications**, **Angewandte Chemie International Edition**, **Nature Communications (2x)**, **JACS (2x)**, **Journal of Hepatology (2x)** and **PNAS (4x)**

**Citations** (Google Scholar August 6 2020): **4658**

**H-factor:** **26**

**Citations per article on average** **116**

**Patents:** **13 Patent applications / 3 granted / 3 licensed**

## First or Last Author Publications

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- [1] Cosco ED, Spearman AL, Ramakrishnan S, Lingg JGP, Saccomano M, Pengshung M, Arús BA, Wong KCY, Glasl S, Ntziachristos V, Warmer M, McLaughlin RR, **Bruns OT\***, and Sletten EM, *Shortwave infrared polymethine fluorophores matched to excitation lasers enable noninvasive, multicolor in vivo imaging in real time*, **Nature Chemistry**, in press  
**\*shared corresponding authorship**
- [2] **Bruns OT\***, Bischof TS\*, Harris DK, Franke D, Shi Y, Riedemann L, Bartelt A, Jaworski FB, Carr JA, Rowlands CJ, Wilson MWB, Chen O, Wei H, Hwang GW, Montana DM, Coropceanu I, Achorn OB, Kloepper J, Heeren J, So PTC, Fukumura D, Jensen KF, Jain RK, Bawendi MG, *Next-generation in vivo optical imaging with short-wave infrared quantum dots*, **Nature Biomedical Engineering** 1, Article number: 0056 (2017)  
doi:10.1038/s41551-017-0056  
**\*shared corresponding authorship**  
**Highly cited Paper (top 1% of the field) (Web of Science)**
- [3] Wei H\*, **Bruns OT\***, Kaul MG\*, Hansen E, Barch M, Wiśniowska A, Chen O, Cordero JM, Okada S, Heine M, Farrar C, Chen Y, Montana DM, Hansen E, Adam G, Ittrich H, Jasanoff A, Bawendi MG, *Exceedingly-Small Iron Oxide Nanoparticles as Positive MRI Contrast Agents*, **PNAS**, 2017 Feb 28;114(9):2325-2330.. doi: 10.1073/pnas.1620145114.  
**\*shared first authorship**  
**Highly cited Paper (top 1% of the field) (Web of Science)**
- [4] **Bruns OT\***, Ittrich H, Peldschus K, Kaul MG, Tromsdorf UI, Lauterwasser J, Nikolic MS, Mollwitz B, Merkel M, Bigall NC, Sapra S, Reimer R, Hohenberg H, Weller H, Eychmüller A, Adam G, Beisiegel U, Heeren J, *Real-time magnetic resonance imaging and quantification of lipoprotein metabolism in vivo using nanocrystals*, **Nature Nanotechnology**, 2009 Mar;4(3):193-201.  
**\*corresponding author**
- [5] Chen W, Cheng CA, Cosco ED, Ramakrishnan S, Lingg JGP, **Bruns OT\***, Zink JI, Sletten EM. *Shortwave Infrared Imaging with J-Aggregates Stabilized in Hollow Mesoporous Silica Nanoparticles*. **J Am Chem Soc.** 2019 Aug 14;141(32):12475-12480.  
**\*corresponding author**

- [6] Carr JA, Franke D, Caram JR, Perkinson CF, Askoxylakis V, Datta M, Fukumura D, Jain RK, Bawendi MG, **Bruns OT**, *Shortwave Infrared Fluorescence Imaging with the Clinically Approved Near-Infrared Dye Indocyanine Green*, **PNAS**, 2018 Apr 24;115(17):4465-4470. doi: 10.1073/pnas.1718917115.  
**Highly cited Paper (top 1% of the field) (Web of Science)**
- [7] Carr JA, Aellen M, Franke D, So PTC, **Bruns OT\***, Bawendi MG. *Absorption by water increases fluorescence image contrast of biological tissue in the shortwave infrared*. **PNAS**, 2018 Sep 11;115(37):9080-9085. doi: 10.1073/pnas.1803210115  
**\*shared corresponding authorship**
- [8] Chen Y, Montana DM, Wei H, Cordero JM, Schneider M, Le Guével X, Chen O, **Bruns OT\***, Bawendi MG\*. *Shortwave Infrared in Vivo Imaging with Gold Nanoclusters*. **Nano Lett.** 2017 Oct 11;17(10):6330-6334. doi: 10.1021/acs.nanolett.7b03070  
**\*shared corresponding authorship**
- [9] Rowlands CJ, **Bruns OT\***, Franke D, Fukamura D, Jain RK, Bawendi MG, So PTS *Increasing the penetration depth of temporal focusing multiphoton microscopy for neurobiological applications* **Journal of Physics D: Applied Physics**. 52 (26), 264001  
**\*shared first authorship**
- [10] Heeren J, **Bruns OT**, *Nanocrystals, a new tool to study lipoprotein metabolism and atherosclerosis* **Current Pharmaceutical Biotechnology**, 2012 Feb;13(2):365-72.
- [11] Heine M\*, Bartelt A\*, **Bruns OT\***, Bargheer D, Giemsa A, Freund B, Scheja L, Waurisch C, Eychmüller A, Reimer R, Weller H, Nielsen P, Heeren J, *The cell-type specific uptake of polymer-coated or micelle-embedded QDs and SPIOs does not provoke an acute pro-inflammatory response in the liver*, **Beilstein Journal of Nanotechnology**. 2014, 5, 1432–1440  
**\*shared first authorship**

## Second and Second to Last Author Publications

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- [12] Bartelt A, **Bruns OT**, Reimer R, Hohenberg H, Ittrich H, Peldschus K, Kaul MG, Tromsdorf UI, Weller H, Waurisch C, Eychmüller A, Gordts PLSM, Rinninger F, Bruegelmann K, Freund B, Nielsen P, Merkel M and Heeren J, *Brown adipose tissue activity controls triglyceride clearance*. **Nature Medicine**, 2011 Feb;17(2):200-5.  
**Highly cited Paper (top 1% of the field) (Web of Science)**
- [13] Tromsdorf UI, **Bruns OT**, Salmen S, Beisiegel U and Weller H, *A highly effective, nontoxic T1 MR contrast agent based on ultrasmall PEGylated iron oxide nanoparticles.*, **Nano Letters**, 2009 Dec;9(12):4434-40.
- [14] Saif M, Kwanten WJ, Carr JA, Chen IX, Posada JM, Srivastava A, Zhang J, Zheng Y, Pinter M, Chatterjee S, Softic S, Kahn CR, van Leyen K, **Bruns OT**, Jain RK, Bawendi MG. *Non-invasive monitoring of chronic liver disease via near-infrared and shortwave-infrared imaging of endogenous lipofuscin*. **Nature Biomedical Engineering**. 2020 Jun 22. doi: 10.1038/s41551-020-0569-y
- [15] Rowlands CJ, **Bruns OT**, Franke D, Fukamura D, Jain RK, Bawendi MG, So PTC. *Increasing the penetration depth of temporal focusing multiphoton microscopy for neurobiological applications*. **J Phys D Appl Phys**. 2019 Jun

26;52(26):264001. doi: 10.1088/1361-6463/ab16b4. Epub 2019 Apr 25.

- [16] Valdez TA, Carr JA, Kavanagh KR, Schwartz M, Blake D, **Bruns O**, Bawendi M. *Initial findings of shortwave infrared otoscopy in a pediatric population.* **Int J Pediatr Otorhinolaryngol.** 2018 Nov;114:15-19. doi: 10.1016/j.ijporl.2018.08.024.
- [17] Carr JA, Valdez TA, **Bruns OT**, Bawendi MG, *Using the shortwave infrared to image middle ear pathologies.* **Proc Natl Acad Sci U S A (PNAS).** 2016 Sep 6;113(36):9989-94.
- [18] Rowlands CJ, **Bruns OT**, Bawendi MG, So PTC. *An objective, comparative assessment of the penetration depth of temporal focusing microscopy for imaging various organs.* **Journal of Biomedical Optics,** 2015 Jun 1;20(6):61107
- [19] Wei H, **Bruns OT**, Chen O, Bawendi MG. *Compact zwitterion-coated iron oxide nanoparticles for in vitro and in vivo imaging.* **Integrative Biology (Camb).** 2012 Dec 17;5(1):108-14.
- [20] Perbandt M, **Bruns O**, Vallazza M, Lamla T, Betzel C and Erdmann VA, *High resolution structure of streptavidin in complex with a novel high affinity peptide tag mimicking the biotin binding motif,* **Proteins.** 2007 Jun 1;67(4):1147-53.
- [21] Mangerich A, Herbach N, Hanf B, Fischbach A, Popp O, Moreno-Villanueva M, **Bruns OT**, Bürkle A. *Inflammatory and age-related pathologies in mice with ectopic expression of human PARP-1.* **Mech Ageing Dev.** 2010 Jun;131(6):389-404.
- [22] Boldt K, **Bruns OT**, Gaponik N, and Eychmuller A, *Comparative Examination of the Stability of Semiconductor Quantum Dots in Various Biochemical Buffers,* **Journal of Physical Chemistry B,** 2006 Feb, 110(5), 1959-63.

#### Co-author Publications

- [23] Fischer AW, Jaeckstein MY, Gottschling K, Heine M, Sass F, Mangels N, Schlein C, Worthmann A, **Bruns OT**, Yuan Y, Zhu H, Chen O, Ittrich H, Nilsson SK, Stefanicka P, Ukropec J, Balaz M, Dong H, Sun W, Reimer R, Scheja L, Heeren J. *Lysosomal lipoprotein processing in endothelial cells stimulates adipose tissue thermogenic adaptation.* **Cell Metab.** 2020 Dec 17:S1550-4131(20)30656-2. doi: 10.1016/j.cmet.2020.12.001.
- [24] Zhao S, Todorov MI, Cai R, Al-Maskari R, Steinke H, Kemter E, Mai H, Rong Z, Warmer M, Aguilera KS, Schoppe O, Paetzold JC, Gesierich B, Wong MN, Huber TB, Duering M, **Bruns OT**, Menze B, Lipfert J, Puelles VG, Wolf E, Bechmann I, Ertürk A. *Cellular and Molecular Probing of Intact Human Organs.* **Cell.** 2020 Feb 20;180(4):796-812.e19. doi: 10.1016/j.cell.2020.01.030
- [25] Bartelt A, Widenmaier SB, Schlein C, Johann K, Goncalves RLS, Eguchi K, Fischer AW, Parlakgöl G, Snyder NA, Nguyen TB, **Bruns OT**, Franke D, Bawendi MG, Lynes MD, Leiria LO, Tseng YH, Inouye KE, Arruda AP, Hotamisligil GS. *Brown adipose tissue thermogenic adaptation requires Nrf1-mediated proteasomal activity.* **Nature Medicine.** 2018 Mar;24(3):292-303. doi: 10.1038/nm.4481
- [26] Cosco ED, Caram JR, Bruns OT, Franke D, Day RA, Farr EP, Bawendi MG, Sletten EM, *Flavylium polymethine fluorophores for imaging in the near- and shortwave infrared.* **Angewandte Chemie International Edition,** 2017 Aug 14. doi: 10.1002/anie.201706974.
- [27] Rowlands CJ, Park D, **Bruns OT**, Piatkevich K, Fukumura D, Jain RK, Bawendi MG, Boyden E, So PTC, *Wide-field Three-Photon Excitation in*

*Biological Specimens. Light: Science & Applications*, (2017) 6, e16255; doi:10.1038/lisa.2016.255

- [28] Franke D, Harris DK, Chen O, **Bruns OT**, Carr JA, Wilson MWB, Bawendi MG *Continuous Injection Synthesis of Indium Arsenide Quantum Dots as Short-Wavelength Infrared Emitters* **Nature Communications**. 2016 Nov 11;7:12749. doi: 10.1038/ncomms12749.
- [29] Lemon CM, Karnas E, Han X, **Bruns OT**, Kempa TJ, Fukumura D, Bawendi MG, Jain RK, Duda DG, Nocera DG *Micelle-Encapsulated Quantum Dot-Porphyrin Assemblies as in Vivo Two-Photon Oxygen Sensors*. **Journal American Chemical Society (JACS)**. 2015 Aug 12;137(31):9832-42. doi: 10.1021/jacs.5b04765.
- [30] Carambia A, Freund B, Schwinge D, **Bruns OT**, Salmen SC, Ittrich H, Reimer R, Heine M, Huber S, Waurisch C, Eychmüller A, Wraith DC, Korn T, Nielsen P, Weller H, Schramm C, Lüth S, Lohse AW, Heeren J, Herkel *Nanoparticle-based autoantigen delivery to Treg-inducing liver sinusoidal endothelial cells enables control of autoimmunity in mice*. **Journal of Hepatology**. 2015 Jun;62(6):1349-56. doi: 10.1016/j.jhep.2015.01.006.
- [31] Chen O, Riedemann L, Etoc F, Herrmann H, Coppey M, Barch M, Farrar CT, Zhao J, **Bruns OT**, Wei H, Guo P, Cui J, Jensen R, Chen Y, Harris DK, Cordero JM, Wang Z, Jasanoff A, Fukumura D, Reimer R, Dahan M, Jain RK, Mounji G, Bawendi MG *Magneto-Fluorescent Core-Shell Supernanoparticles*. **Nature Communications**. 2014 Oct 9;5:5093.
- [32] Raabe N, Forberich E, Freund B, **Bruns OT**, Heine M, Kaul MG, Tromsdorf U, Herich L, Nielsen P, Reimer R, Hohenberg H, Weller H, Schumacher U, Adam G, Ittrich H. *Determination of liver-specific  $r_2^*$  of a highly monodisperse USPIO by 59 Fe iron core-labeling in mice at 3 T MRI*. **Contrast Media Mol Imaging**. 2015 Mar-Apr;10(2):153-62. doi: 10.1002/cmml.1612.
- [33] Heidemann F, Schildt A, Schmid K, **Bruns OT**, Riecken K, Jung C, Ittrich H, Wicklein D, Reimer R, Fehse B, Heeren J, Lüers G, Schumacher U, Heine M. *Selectins mediate small cell lung cancer systemic metastasis*. **PLoS One**. 2014 Apr 3;9(4):e92327.
- [34] Jung C; Kaul MG; **Bruns OT**; Freund B; Heine M; Reimer R, Meents A, Salmen SC; Weller H, Nielsen P, Dučić T; Adam G; Heeren J; Ittrich H *Intraperitoneal injection improves the uptake of nanoparticle labeled HDL to atherosclerotic plaques compared to intravenous injection: A multimodal imaging study in ApoE<sup>-/-</sup> Mice*. **Circulation: Cardiovascular Imaging**. 2014 Mar 1;7(2):303-11
- [35] Carambia A, Frenzel C, **Bruns OT**, Schwinge D, Reimer R, Hohenberg H, Huber S, Tiegs G, Schramm C, Lohse AW, Herkel J. *Inhibition of inflammatory CD4 T cell activity by murine liver sinusoidal endothelial cells*. **J Hepatol**. 2013 Jan;58(1):112-8.
- [36] Freund B, Tromsdorf U, **Bruns OT**, Heine M, Giemsa A, Bartelt A, Salmen SC, Raabe N, Heeren J, Ittrich H, Reimer R, Hohenberg H, Schumacher U, Weller H, Nielsen P. *A simple and widely applicable method to 59Fe-radiolabel monodisperse superparamagnetic iron oxide nanoparticles for in vivo quantification studies*. **ACS Nano**. 2012 Aug 28;6(8):7318-25.
- [37] Heine M, Nollau P, Masslo C, Nielsen P, Freund B, **Bruns OT**, Reimer R, Hohenberg H, Peldschus K, Ittrich H, Schumacher U. *Investigations on the usefulness of CEACAMs as potential imaging targets for molecular imaging purposes*. **PLoS One**. 2011;6(12):e28030. Epub 2011 Dec 5.

- [38] Muñoz Javier A, Kreft O, Semmling M, Kempter S, Skirtach AG, **Bruns OT**, del Pino P, Bedard M, Rädler J, Käs J, Plank C, Sukhorukov GB, Parak WJ, *Uptake of colloidal polyelectrolyte coated particles and polyelectrolyte multilayer capsules by living cells*, **Advanced Materials**, 2008 Nov; 20 (22): 4281-7
- [39] Tromsdorf UI, Bigall NC, Kaul MG, **Bruns OT**, Nikolic MS, Mollwitz B, Sperling RA, Reimer R, Hohenberg H, Parak WJ, Förster S, Beisiegel U, Adam G and Weller H, *Size and Surface Effects on the MRI Relaxivity of Manganese Ferrite Nanoparticle Contrast Agents*, **Nano Letters**, 2007 Aug;7(8):2422-7.
- [40] Redecke L, von Bergen M, Clos J, Konarev PV, Svergund DI, Fittschen UE, Broekaert JA, **Bruns O**, Georgieva D, Mandelkow E, Genov N, and Betzel C, *Structural characterization of beta-sheeted oligomers formed on the pathway of oxidative prion protein aggregation in vitro*, **J Struct Biol.** 2007 Feb;157(2):308-20.

### Granted Patent Applications

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- [1] Carambia A, Freund B, **Bruns O**, Heeren J, Nielsen P, Lohse, A, Lueth S, Weller H, Salmen S, Herkel J, *Nanoparticle compositions for generation of regulatory T cells and treatment of autoimmune diseases and other chronic inflammatory conditions* Pub. No.: WO/2013/072051 International Application No.: PCT/EP2012/004735  
**-The company Topas Therapeutics GmbH was spun out based on this patent and raised more than 40,000,000 EUR in series A and series B funding rounds, first patient enrolled in phase 1 clinical trial in 2019-**
- [2] Carr JA, **Bruns OT**, Valdez TA, Bawendi MG, *Systems and Methods for a Short Wave Infrared Device*, US Provisional Patent application 62/199,126
- [3] Wei H, **Bruns OT**, Chen O, Bawendi MG, *Nanoparticles for Magnetic Particle Imaging Applications*, US10086094B2

### Other Patent Applications

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- [4] **Bruns OT**, Carr JA, Franke D, Aellen M, Valdez TA, Bawendi MG *Device and Method for Imaging Shortwave Infrared Fluorescence* International Patent Application No. PCT/US2017/021824 – pending application
- [5] **Bruns OT**, Carr JA, Zheng Y, Aellen M, van Leyen K, Bawendi MG *Device and Method for Imaging Shortwave Infrared Fluorescence* International Patent Application No. PCT/US2017/021845 – pending application
- [6] Tromsdorf UI, **Bruns OT**, Weller H, *Metal Oxide Particles Coated With Polyethylen Glycol and Their Synthesis*, Pub. No.: WO/2011/015670 International Application No.: PCT/EP2010/061547 – abandoned application
- [7] Reimer R, Eggert D, **Bruns OT**, Hohenberg H, *Polychromatische Elektronenmikroskopie*, German Patent application 2015092514295800DE – pending application
- [8] Wei H, **Bruns OT**, Chen O, Bawendi MG, *Nanoparticles for Magnetic Resonance Imaging Applications* US Provisional Patent application 62/050,477 – pending application
- [9] **Bruns OT**, Harris D, Bischof TS, Bawendi MG, *Short-Wavelength InfraRed (SWIR) Fluorescence in Vivo and Intravital Imaging with SEMICONDUCTOR NANOCRYSTALS* US Provisional Patent application 61/814,528 – pending application
- [10] **Bruns O**, Hohenberg H, Reimer R, Tromsdorf, U, Weller H, Adam G, Ittrich H, Kaul M, Nielsen P, Freund B, Bartelt A, Heeren J, *Visualization of Lipid Metabolism* Pub. No.: WO/2012/098226 International Application No.: PCT/EP2012/050863 – abandoned application

- [11] *Method and device for imaging fluorescent proteins in near- and short-wave infrared*, application filed but not published yet
- [12] *System and method for real-time multicolor shortwave infrared fluorescence imaging*, application filed but not published yet
- [13] *Optical systems and methods for intraoperative detection of CSF leaks*, application filed but not published yet