

# Anja Kunze, Ph.D.

(August 2016)

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## Employments and Education

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- 08/2016 – present **Montana State University (MSU), Electrical & Computer Engineering Department, Bozeman, Montana, United States**  
**Assistant professor (Tenure Track)**  
Neuro-Biotechnology: Developing micro- and nanosystems to engineer brain cells from inside out
- 04/2012 – 06/2016 **University of California, Los Angeles (UCLA), Bioengineering Department, Los Angeles, California, United States**
- 07/2015 – 06/2016 **Assistant adjunct professor**  
Instructor for Mathematical Modeling and Calculus for the Life Sciences  
Vesicle dynamics, Biophysical modeling
- 04/2012 – 06/2016 **Post-doctoral researcher / Assistant project scientist**  
Prospective and advanced research fellowships funded by the Swiss National Science Foundation (SNSF), 3 year  
Topics: (1) *Connect the (brain) dots: How to drive neurons mechanically with magnetic forces.*  
(2) *Unscrambling the Influence of Brain Structure on Alzheimer's Disease: A High-Throughput Cell Micropatterning System.*  
Mentor: Dino Di Carlo
- 06/2007 – 03/2012 **École Polytechnique Fédérale de Lausanne (EPFL), Microsystems Laboratory (LMIS4), Lausanne, Switzerland**  
**Docteur ès science (Ph.D.)**  
**Teaching assistant, Graduate research assistant**
- 02/2008 – 03/2012 PhD thesis: *Microengineering the cerebral cortical cell niche: A new cell culture tool for neuroscience research*, Microsystems and Microelectronics doctoral school (EDMI) at EPFL  
Mentor: Philippe Renaud  
Jury Committee: Melody Swartz (UChicago), Micha E. Spira (HUJI), Albert van den Berg (UTwente)
- 09/2001 – 05/2007 **Dresden University of Technology (TUD), Electrical Engineering - Microelectronics, Dresden, Germany**

## **Dipl.-Ing. Electrical and Electronics Engineering (MSc. EE.)**

### **Undergraduate research assistant**

Internship: Paul Scherrer Institut (PSI, Switzerland), Laboratory for Micro- and Nanotechnology (06/2006 - 10/2006)

Supervisor: Celestino Padeste

## Awards and Grants

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10/2013 – 04/2015	Fellowship for advanced post-doctoral research (Swiss National Science Foundation, US\$ 100k)
06/2013	UC Systemwide Bioengineering Award for Best Oral Presentation at UC Bioengineering Symposium, San Diego, CA, USA
04/2012 – 10/2013	Fellowship for post-doctoral research abroad, (Swiss National Science Foundation, US\$ 68k)
11/2010	Nominated for the Art in Science Award, Lab Chip, 2011, 11, 993-994 DOI:10.1039/C1LC90007B
11/2007	ALA Award for Best Poster at NanoBioTech-Montreux, Switzerland
03/2005	Erasmus fellowship, TU Dresden, 6 month study exchange
09/2004	Femtec network fellowship, TU Berlin, 2 years career building program

## Invited Talks and Seminars

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01/2016	UWashington – Invited Faculty Talk – BE Seminar: <i>Nanoparticle based therapeutic approaches to engineer brain cell behavior</i> . Host: M. Regnier
01/2016	MSU – Invited Faculty Talk – ECE Seminar: <i>Nanoparticle based therapeutic approaches to engineer brain cell behavior</i> . Host: R. Maher
01/2016	McGill – Invited Faculty Talk – BME/BE Seminar: <i>Engineering brain cell polarity: From microsystems to nanoengineering approaches</i> . Host: D. V. Nicolau
01/2016	RPI – Invited Faculty Talk – BME Seminar: <i>Nanoparticle based therapeutic approaches to engineer brain cell behavior</i> . Host: X. Intes
02/2015	UFlorida – Invited Faculty Talk – ECE Seminar: <i>Nanoengineered intracellular forces and their interplay with neurons</i> . Host: D. Arnold
02/2015	GeorgiaTech – Invited Faculty Talk – BE Seminar: <i>Nanoengineered intracellular forces and their interplay with neurons</i> . Host: C. R. Ethier
04/2014	UIUC – Invited Faculty Talk – BE Seminar: <i>Engineering the Neuronal Cell Niche Using Micro- and Nanotechnological Tools for Neurodegenerative Disease Studies</i> . Host: S. A. Boppart
03/2014	TUM – Invited Faculty Talk – Neurosymposium: <i>Nanoengineering tools to determine mechanical sensitivity of cortical neurons during development</i> . Host: W. Hemmert
03/2012	EPFL – Public Thesis Defense: <i>Micro-engineering the cerebral cortical cell niche: a new cell culture tool for neuroscience research</i> , Host: Ph. Renaud
11/2009	EPFL – IBI Seminar: <i>Microfabricated hydrogel layers to study neuronal network formation</i> , Host: Ph. Renaud

## Public Outreach

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01/2014	Le Monde de l'Intelligence – N° 34 – Janvier/Février 2014: Featured in “Des
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08/2013 mini-cerveaux reconstitués en laboratoire” by Sabine Sasalunga, p. 36 -40  
MIT Technology Review: Interviewed for comment about “Miniature Human Brains Grown in Petri Dish”

## Teaching and student-supervision

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**Instructor (UCLA)**

09/2015 – 06/2016 MA 142 Mathematical Modeling (40 students, 1 TA)  
MA 3A Calculus for Life sciences (100 students, 4 TAs)

**Student mentoring (UCLA)**

03/2016 – 06/2016 Sneha Belkhale: MATH 199\* – Topic: *Optimization of object tracking algorithm for intracellular vesicle dynamics. \*in collaboration with D. Zosso and M. Roper*

03/2016 – 06/2016 Mellisa Waltzer: MATH 99 – Topic: *Modeling random walk effects in vesicle dynamics.*

09/2014 – 06/2016 Andy Tay: BE Graduate student – Topic: *Engineering calcium waves in neurite networks.*

09/2013 – 12/2014 Chanya Godzich: BE 199 – Topic: *Mechanotransduction via fluorescent magnetic nanoparticles – an exploration of factors at play.*

04/2013 – 03/2014 Bioengineering Capstone Design I & II – Topic: Organ-on-a-Chip, Grant writing

**Guest lecture (UCLA)**

04/2013 – 05/2013 BE 167L Bioengineering Laboratory - Topic: 3D cell cultures

**Teaching assistant (EPFL)**

05/2007 – 02/2011 Practical work for Master students: design, cleanroom fabrication and bench characterization of silicon oxide micro cantilevers

**Master project co-supervision (EPFL)**

09/2009 – 02/2010 Serena Brando: *Characterization of a microfluidic device for 2D cell patterning and perfusion system to reproduce an artificial Alzheimer’s model.*

02/2009 – 08/2009 Marc-Olivier Schwartz: *Microfluidic filters to perfuse cell cultures in hydrogels.*

09/2008 – 02/2009 Simon Riniker: *Three-dimensional electrodes for neuronal cell cultures in hydrogels.*

**Bachelor project co-supervision (EPFL)**

02/2009 – 06/2009 Clara Fausta Moldovan: *Perfusion of hydrogel pattern and cell cultures in microenvironments.*

02/2008 – 06/2008 Tojo Razafiarsion: *Characterization of hydrogel mixture for electrophysiology.*

02/2008 – 06/2008 Barbara Muriene: *Influence of viscosity on flow in chips.*

## Current and Former Collaborations

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06/2012 – present Felix Schweizer, Schweizer Lab, Department of Neurobiology, David Geffen School of Medicine, UCLA, CA, USA

03/2011 – 12/2012 Pierre J. Magistretti, Laboratory of Neuroenergetics and Cellular Dynamics, EPFL, Lausanne, Switzerland

11/2006 – 12/2008 Michele Giugliano, now: Laboratory of Theoretical Neurobiology and Neuroengineering, Uni Antwerp, Antwerp, Belgium; former: Group leader at EPFL

## Professional Service

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### **Jury committee (UCLA)**

Undergraduate Dean's Prize 2013

### **Grant Reviewer**

Stein Oppenheimer Endowment Award / The Spitzer Grant Research Program

### **Journal Reviewer**

Lab on a Chip, Frontiers in Neuroscience, PLoS ONE, Biomedical Microdevices, Biomaterials

### **Exam observation (EPFL)**

Semiconductor - P.-A. Besse

Bio inspired artificial intelligence - D. Floreano

## Extra-Curricular Activities

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| 01/2011 – 02/2012 | Delegate for Doctoral students at the Doctoral School Commission (CDoct-EDOC), EPFL, Lausanne, Switzerland |
| 09/2000 – 08/2001 | Social Service, Integrative Kindergarden, Dresden, Germany   |

## Membership & Languages

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Biophysical Society: Early-Career Membership

German (native), English (professional), French (professional) Russian (basic)

# Anja Kunze's Publication list

(August 2016)

## In preparation or in review

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*Nanomagnetic forces impact vesicle dynamics in cortical neurons*, **A. Kunze**, C. Murray, C. Godzich, K. Owsley, J. Lin, A. Tay and D. Di Carlo (in review)

## Peer-Reviewed Journal Articles (\*\*most important)

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14. *The Age of Cortical Neural Networks Affects their Interactions with Nanoparticles*, A. Tay, **A. Kunze**, D. Jun, E. Hoek and D. Di Carlo, *Small*, 2016, DOI: 10.1002/smll.201600673. (IF: 8.4)
13. *Induction of Calcium Influx in Cortical Neural Networks by Nanomagnetic Forces*, A. Tay\*, **A. Kunze**\*, C. Murray and D. Di Carlo, *ACS Nano* 10(2), 2016, p. 2331-2341. \*equally contributed, (IF: 13.3) \*\*
12. *Engineering cortical neuron polarity with nanomagnets on a chip*, **A. Kunze**, P. Tseng, C. Godzich, C. Murray, A. Caputo, F. E. Schweizer and D. Di Carlo, *ACS Nano* 9(4), 2015, p. 3664-3676. \*\*
11. *Research highlights: cell separation at the bench and beyond*, **A. Kunze**, J. Che, A. Karimi, D. Di Carlo, *Lab on a Chip* 15, 2015, p. 605-609. (IF: 5.6)
10. *Flexible and stretchable micromagnet arrays for tunable biointerfacing*, P. Tseng, J. Lin, K. Owsley, J. Kong, **A. Kunze**, C. Murray, and D. Di Carlo, *Advanced Materials* 27 (6), 2015, p. 1083-1089. (IF: 17.5)
9. *Research highlights: measuring and manipulating cell migration*, **A. Kunze**, I. Pushkarsky, H. Kittur and D. Di Carlo, *Lab on a Chip* 14(21), 2014, p. 4117-4121.
8. *Research highlights: microtechnologies for engineering the cellular environment*, P. Tseng, **A. Kunze**, H. Kittur and D. Di Carlo, *Lab on a Chip* 14(7), 2014, p. 1226-1229
7. *Advances in High-Throughput Single-Cell Microtechnologies*, W. M. Weaver, P. Tseng, **A. Kunze**, M. Masaeli, A. Chung, J. S. Dudani, H. Kittur, R. P. Kulkarni and D. Di Carlo, *Curr. Op. in Biotechnol.* 25, 2014, p. 114-123 – author of neuroscience section (IF: 8.3)
6. *Astrocyte neuron co-culture on microchips based on the model of SOD mutation to mimic ALS*, **A. Kunze**, S. Lengacher, E. Dirren, P. Aebischer, P. J. Magistretti, Ph. Renaud, *Integr. Biol.* 5(7), 2013, p. 964-975. (IF: 3.4) \*\*
5. *Synergistic NGF/B27 gradients position synapses heterogeneously in 3D micropatterned neural cultures*, **A. Kunze**, A. Valero, D. Zosso and Ph. Renaud, *PLoS ONE* 6(10): e26187. 2011 (IF: 3.1) \*\*
4. *Co-pathological connected primary neurons in a microfluidic device for Alzheimer studies*. **A. Kunze**\*, R. Meissner\*, S. Brando and Ph. Renaud, *Biotechnology and Bioengineering* 108(9),

2011, p. 2241-2245. \*equally contributed - selected Spotlight, (IF: 4.2)\*\*

3. *Micropatterning neural cell cultures in 3D with a multi-layered scaffold.* **A. Kunze**, M. Giugliano, A. Valero and Ph. Renaud, *Biomaterials* 8 (32) 2011, p. 2088-2098. (IF: 8.4)\*\*
2. *A virtual valve for smooth contamination-free flow switching.* T. Braschler, J. Theytaz, R. Zvitov-Marabi, H. van Lintel, G. Loche, **A. Kunze**, N. Demierre, R. Tornay, M. Schlund and Ph. Renaud, *Lab Chip* 9 (7) 2007, p. 1111-1113.
1. *Influence of solvent viscosity on surface graft-polymerization.* P. Farquet, **A. Kunze**, C. Padeste, H. H. Solak, S. A. Gürsel, G. G. Scherer and A. Wokaun, *Polymer* 48 (17) 2007, p. 4936-4942. (IF: 3.6)

## Book Chapters

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*Compartmentalized Microfluidics for In Vitro Alzheimer's Disease Studies. In Microfluidic and Compartmentalized Platforms for Neurobiological Research.* Y. Ren, **A. Kunze**, P. Renaud; Ed. E. Biffi; Springer New York: 2015; Vol. 103, pp 197-215.

## Phd Thesis

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*Micro-engineering the Cerebral Cortical Cell Niche: A new Cell Culture Tool for Neuroscience Research,* **A. Kunze**, Lausanne, EPFL, 2012 Thèse École polytechnique fédérale de Lausanne EPFL, n° 5290 (2012)

## Peer-Reviewed Conference Papers in Proceedings (\*online available)

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7. *Micro magnet chips to study nanoparticle force-induced neural cell migration,* **A. Kunze**, P. Tseng, C. Murray, A. Caputo, F. E. Schweizer and D. Di Carlo, *Proceedings of the 17<sup>th</sup> International Conference on Miniaturized Systems for Chemistry and Life Sciences (MicroTAS), Freiburg, Germany, p. 431-433, 2013 – Poster\**
6. *Co-pathological states of tau proteins in a 3d micropatterned neural cell culture,* **A. Kunze**, R. Meissner, S. Brando and Ph. Renaud, *Proceedings of the 15th International Conference on Miniaturized Systems for Chemistry and Life Sciences (MicroTAS), Seattle, p. 696- 698, 2011. – Oral\**
5. *Neurite guidance through 3D hydrogel layers in a microfluidic environment.* **A. Kunze**, R. Meissner and Ph. Renaud, *Proceedings of the 14<sup>th</sup> International Conference on Miniaturized Systems for Chemistry and Life Sciences (MicroTAS), Groningen, p. 187-189, 2010. – Poster\**
4. *Engineering the micro electrode environment with microfluidics: A new approach for cell culture patterning or controlled chemical stimulation.* **A. Kunze**, M. O. Heuschkel, M. Giugliano and Ph. Renaud, *Proceedings of the 7<sup>th</sup> International Meeting on Substrate-Integrated Microelectrode Arrays (MEA meeting), Reutlingen, p. 316-317, 2010. – Poster\**
3. *Microfluidic hydrogel layers with multiple gradients to stimulate and perfuse three-dimensional neuronal cell cultures.* **A. Kunze**, A. Bertsch, M. Giugliano and Ph. Renaud, *Procedia Chemistry, p. 369-372, 2009. – Poster\**

2. *Sequential build-up of hydrogel environments around single cells.* T. Braschler, A. Valero, L. Colella, **A. Kunze**, G. Loche, R. Marabi, J. Theytaz and Ph. Renaud, Proceedings of the 13<sup>th</sup> International Conference on Miniaturized Systems for Chemistry and Life Sciences (MicroTAS), p. 515-517, 2009. – Poster

1. *Technology of localized surface modification.* **A. Kunze**, F. Sonntag, M. Rabenau and R. Poll, Biomedizinische Technik, 50(1): p. 542, 09/2005 – Oral

## Peer-Reviewed Conference Abstracts

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13. *Controlling Vesicle Motion in Cortical Neurons with Magnetic Forces,* **A. Kunze**, C. Murray, A. Tay and D. Di Carlo, Proceedings of the Biophysical Society, Los Angeles, 110(3), Supplement 1, p. 466a, 2016 – Poster

12. *The age of cortical neural networks affects their interactions with nanoparticles,* A. Tay, **A. Kunze**, D. Di Carlo, Biology of Aging Scientific Conference, Singapore, 2015 – Poster

11. *Nanoparticle surface charge impacts vesicle motion in cortical neurons,* C. Godzich, D. Di Carlo, **A. Kunze**, Proceedings of the BMES, Texas, San Antonio, USA, 2014 – Poster

10. *Directed neuronal growth using magnetic gradients and nanoparticles,* **A. Kunze**, P. Tseng, and D. Di Carlo, Proceedings of the BMES, Seattle, Washington, USA, 2013 – Poster

9. *Microchip based multi parameter study of magnetic nanoparticle induced neurite outgrowth,* **A. Kunze**, P. Tseng, A. Caputo, F. E. Schweizer and D. Di Carlo, 14<sup>th</sup> UC Systemwide Bioengineering Symposium, San Diego, 2013. – Oral

8. *Locally induced Alzheimer's disease in 3D microengineered neuronal cell cultures,* **A. Kunze** and Ph. Renaud, Proceedings of Annual Meeting of Society of Neuroscience, New Orleans, 2012. – Poster

7. *Microenvironmental influence on gradient sensing in neural cell cultures,* **A. Kunze** and Ph. Renaud, 13<sup>th</sup> UC Systemwide Bioengineering Symposium, Berkley, 2012. – Oral

6. *A microfluidic based artificial Alzheimer's disease model,* **A. Kunze**, R. Meissner, S. Brando and Ph. Renaud, Proceedings of NanoBioTech, Montreux, 2011, p. 515-517, 2011. – Oral

5. *Gradient-Engineered Synapse Formation in 3D Neural Cell Cultures,* **A. Kunze**, A. Valero and Ph. Renaud, Proceedings of the BMES, Hartford Connecticut, USA, 2011. – Oral

4. *Local synaptic alignment in vitro using engineered gradients of guidance molecules,* **A. Kunze**, A. Valero and Ph. Renaud, Gordon Research Conference, Les Diablerets, 2011. – Poster

3. *Synapse distribution in a 2D-3D micropatterned neural cell culture,* **A. Kunze** and Ph. Renaud, Proceedings of the 8<sup>th</sup> International Conference on Microtechnologies in Medicine and Biology (MMB), Luzern, p. 177 - 178, 2011. – Poster

2. *PDMS Microfluidic Device for Parallel Structured 3D Neuronal Cell Culture.* **A. Kunze**, R. Marabi, T. Braschler, L. Gambazzi, M. Giugliano, H. Markram, H. van Lintel, Ph. Renaud, Proceedings of NanoTech, Montreux, 2007. – Poster

1. *Process chamber for bio-mobilization of polymer surfaces with UV Laser treatment.* **A. Kunze**, M. Jäger, F. Sonntag and R. Poll, Proceedings of Gemeinsame Jahrestagung der Schweizerischen, Deutschen und Österreichischen Gesellschaft für Biomedizinische Technik, Zürich, 09/2006 – Poster