



Michael Jahn

Curriculum vitae

Personal information

Name Dr. rer. nat. Michael Jahn
Date of birth Dec 31, 1985
Born in Dresden, Germany
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Current position

Post-doctoral fellow, group of Prof Paul Hudson, Science For Life Laboratory, Stockholm. Topic: Systems biology and metabolic engineering of autotrophic bacteria.

Education

- July 10, 2015 **Graduated *Doctor rerum naturalium***, at the University of Leipzig, Germany, with *summa cum laude* (1.0).
- 2011–2015 **PhD studies**, Group of Prof Susann Müller, Dept. Environmental Microbiology, Helmholtz-Centre for Environmental Research, Leipzig.
Thesis: 'Characterization of population heterogeneity in a model biotechnological process using *Pseudomonas putida*'.
- 2005–2011 **Diploma studies, biology**, Dresden University of Technology (TUD), main subjects: genetics, biochemistry, immunology.
Diploma thesis: 'Dynamic mating pheromone gradients for induction of mating projection and fluorescence in yeast', group of Prof Gerhard Rödel, grade 1.2.
- 1996–2004 **High school**, Romain-Rolland-Gymnasium, Dresden, Abitur with grade 1.6.
- 1992–1996 **Elementary school**, Dresden.

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Work experience

- 5/2016–now **Post-doctoral researcher**, System-wide analysis and metabolic engineering of autotrophic bacteria in the group of Prof Paul Hudson, Science For Life Laboratory - Royal Institute of Technology, Stockholm.
- 8–12/2009 **Erasmus internship**, Center of Excellence in Evolutionary Genetics and Physiology at the group of Prof Mikko Nikinmaa, Dept. of Biology, University of Turku, Finland.
- 2008–2009 **Student assistant**, Institute of Genetics, group of Prof Gerhard Rödel, Dept. of Biology, Dresden University of Technology (TUD).
- 2007–2008 **Student assistant**, Mitteldeutscher Praxisverbund Humangenetik, Dresden.
- 2004–2005 **Voluntary service 'Freiwilliges Ökologisches Jahr'**, National park 'Sächsische Schweiz', tour guide and education.

Leaves

- 11/2019–3/2020 Parental leave with 2nd child Sophie
- 9/2015–4/2016 Parental leave with 1st child Simon

Awards

- Nov 25, 2015 **PhD-Award** 2015 by the Helmholtz-Centre for Environmental Research, Leipzig. Awarded annually for excellent dissertations.

Awarded grants

- Nov 11, 2019 **Investigation of protein resource allocation in the model CO₂ fixing bacterium *Ralstonia eutropha*** (Swedish: Undersökning av proteiners resursfördelning i en modell för CO₂-fixerande bakterier, *Ralstonia eutropha*).
Funding agency: FORMAS. Project number: 2019-01491. Project leader: Dr. Michael Jahn. Awarded funding for period 2020-01-01-2021-12-31. Total funds: 2,000,000 SEK (200,000 Euro).

Grant proposals

- Jan 26, 2016 **Development of single cell screening tools to optimize N-glycosylation efficiency in *Saccharomyces cerevisiae*** (German: Entwicklung von Einzelzell-Analyseverfahren zur Optimierung der N-Glykosylierung in *Saccharomyces cerevisiae*).
Funding agency: Deutsche Forschungsgemeinschaft (DFG). Research Fellowship, two year funding period. Project number: JA 2529/1-1. Positively evaluated but turned down due to competing job offer.
- Jun, 2015 **Analysis of plasmid and chromosomal copy number variation in heterotrophic bacteria**. Co-author/mentor for PhD research proposal.
Funding agency: Deutsche Bundesstiftung Umwelt (DBU). Declined in second stage of evaluation.

Teaching and supervision

- Teaching **lecture for course KE2130 'Renewable fuels'**, at KTH Stockholm. Winter semester 2020/2021. Topics: Metabolic engineering, whole cell biocatalysts, genome-scale models, flux balance analysis.
- lecture for course CB2030 'Systems biology'**, at KTH Stockholm. Winter semester 2019/2020, *postponed* due to parental leave.
- lecture for course introduction to the programming language R** and its application for flow cytometry data, at the Helmholtz Centre for Environmental Research, Leipzig, 2015.
- PhD council Member of the PhD council and the Environmental Board of the Helmholtz Centre for Environmental Research, Leipzig, 2011-2015. Tasks: providing guidance for starting PhD students, organizing retreats and other student events.
- Supervision Supervised master and intern students during PhD and postdoctoral studies:
- Alexander Mattausch, intern biotechnology, University of Heidelberg, 2019
 - Timothy Bergmann, master student biotechnology (KTH, Stockholm), 2019
 - Raquel Perruca, master student, Lund Technical University, 2018
 - Carsten Vorpahl, master student University of Leipzig, 2015
 - Dominique Türkowsky, master student University of Leipzig, 2014

Scientific interests and expertise

- Data science, metabolic modeling High-throughput methods generate larger amounts of biological data than ever before. This poses problems but also opportunities. I strive for a close integration of experiments and data with **predictive mathematical models**, such as genome scale metabolic models.
- Proteomics & other 'omics Proteomics, transcriptomics and metabolomics are probing the whole cell instead of isolated parts. This allows to discover biological relationships that were not considered in the original hypothesis, and gives an unbiased picture.
- Metabolic engineering Microbial cells are 'programmed' for production of biomass, not fine chemicals. **Rational design and engineering of pathways** is necessary to turn autotrophic bacteria into microbial cell factories.
- Single cell variability Previous work regarding **single cell variability** in *S. cerevisiae*, *E. coli*, and *Pseudomonas putida* taught me that populations are never uniform, but that cells vary extensively in size, shape, productivity, and genetic background.
- Reproducibility and Transparency Adopting **open standards, sharing protocols and resources**, and depositing data and apps on publicly available sites has great advantages. It increases reach, trust of the scientific community, and reproducibility of results.

Qualifications and skills

Expertise	Data analysis and visualization Next generation sequencing (Illumina) Mass spectrometry, proteomics Flow cytometry, cell sorting, automated imaging Bioreactor cultivation, chemostat, turbidostat Molecular biology, cloning
Programming languages	R (advanced), Python (moderate)
Authored software	SysbioTreemaps, ShinyTreemaps – visualizing gene expression with treemaps Lattice-tools – panel functions to extend R lattice ShinyMC, ShinyProt, ShinyLib – interactive apps to monitor bioreactor cultivations, visualize proteomics and gene knockout library data fluctuator – Interface to overlay flux data on metabolic maps in R TnSeq-pipe, rebar – Pipelines to process NGS knockout library data
Metabolic models	<i>Synechocystis</i> resource allocation model, for GAMS, and ported to python. Genome scale metabolic model (GEM) for <i>Cupriavidus necator</i> a.k.a. <i>Ralstonia eutropha</i> . Genome scale resource balance analysis (RBA) model for <i>Cupriavidus necator</i> a.k.a. <i>Ralstonia eutropha</i>
Courses (selection)	Approved project manager for genetic works, according to German laws (§ 14,15 GenTSV), 2015. Laser scanning microscopy, 1 week course, 2013. Scientific writing and project proposal writing, 2 week course, 2013.
Model organisms	Expertise in cultivation and molecular biology of cyanobacteria (e.g. <i>Synechocystis</i> sp.), <i>Cupriavidus necator</i> , <i>Pseudomonas putida</i> , <i>E. coli</i>

Peer review and outreach

Peer review	Active reviewer for several journals including Microbial Cell Factories, Frontiers in Microbiology, Photosynthesis Research, and others. The full list of my review contributions is available on Publons ↗ or ORCID ↗
Outreach	All software and computational pipelines available on Github ↗ . Research communicated to the public via home page ↗ , ResearchGate ↗ , and Twitter ↗ .

Languages

German	Native language.
English	Proficient user , CEF level C1.
Swedish	Vantage user , CEF level B2.

Publications

- **Jahn M**, Crang N, Janasch M, Hober A, Forsström B, Kimler K, Mattausch A, Chen Q, Asplund-Samuelsson J, Hudson EP. *Protein allocation and utilization in the versatile chemolithoautotroph Cupriavidus necator*, eLife, **2021**, In revision.
- Karlsen J, Asplund-Samuelsson J, **Jahn M**, Vitay D, Hudson EP. *Slow Protein Turnover Explains Limited Protein-Level Response to Diurnal Transcriptional Oscillations in Cyanobacteria*. Frontiers in Microbiology, 12, 820, **2021**.
- Yao L, Shabestary K, Björk SM, Asplund-Samuelsson J, Joensson HN, **Jahn M**, Hudson EP. *Pooled CRISPRi screening of the cyanobacterium Synechocystis sp PCC 6803 for enhanced industrial phenotypes*. Nature Communications, **2020**.
- Karlsen J, Asplund-Samuelsson J, Thomas Q, **Jahn M**, Hudson EP. *Ribosome Profiling of Synechocystis Reveals Altered Ribosome Allocation at Carbon Starvation*. MSystems 3, e00126-18, **2018**.
- **Jahn M**, Vialas V, Karlsen J, Maddalo G, Edfors F, Forsström B, Uhlén M, Käll L, Hudson EP. *Growth of Cyanobacteria Is Constrained by the Abundance of Light and Carbon Assimilation Proteins*. Cell Reports 25, 478–486.e8., **2018**.
- Shabestary K, Anfelt J, Ljungqvist E, **Jahn M**, Yao L, Hudson EP. *Targeted Repression of Essential Genes To Arrest Growth and Increase Carbon Partitioning and Biofuel Titters in Cyanobacteria*. ACS Synthetic Biology, 7, 1669–1675, **2018**.
- **Jahn M**, Vorpahl C, Hübschmann T, Harms H, Müller S. *Copy number variability of expression plasmids determined by cell sorting and Droplet Digital PCR*. Microbial Cell Factories, **2016**.
- Lindmeyer M, **Jahn M**, Vorpahl C, Müller S, Schmid A, Bühler B. *Variability in sub-population formation propagates into biocatalytic variability of engineered Pseudomonas putida strains*. Frontiers in microbiology 6, **2015**.
- Lieder S, **Jahn M**, Koepff J, Müller S, Takors Ralf. *Environmental stress speeds up DNA replication in Pseudomonas putida in chemostat cultivations*. Biotechnology journal, **2015**.
- **Jahn M**, Günther S, Müller S. *Non-random distribution of macromolecules as driving forces for phenotypic variation*. Current Opinion in Microbiology. 25:49-55, **2015**.
- Rödiger S, Burdukiewicz M, Blagodatskikh K, **Jahn M**, Schierack P. *R as an environment for reproducible analysis of DNA amplification experiments*. R Journal 7/1:127-150, **2015**.
- **Jahn M**, Vorpahl C, Türkowsky D, Lindmeyer M, Bühler B, Harms H, Müller S. *Accurate determination of plasmid copy number of flow-sorted cells using droplet digital PCR*. Analytical Chemistry 86:5969-76, **2014**.
- Lieder S, **Jahn M**, Seifert J, von Bergen M, Müller S, Takors R. *Subpopulation-proteomics reveal growth rate, but not cell cycling, as a major impact on protein composition in Pseudomonas putida KT2440*. AMB Express 4:71, **2014**.
- **Jahn M**, Seifert J, von Bergen M, Schmid A, Bühler B, Müller S. *Subpopulation-proteomics in prokaryotic populations*. Current Opinion in Biotechnology 24:79-87, **2013**.

- **Jahn M**, Seifert J, Hübschmann T, von Bergen M, Harms H, Müller S. *Comparison of preservation methods for bacterial cells in cytomics and proteomics*. Journal Of Integrated Omics 3:1-9, **2013**.
- **Jahn M**, Mölle A, Rödel G, Ostermann K. *Temporal and spatial properties of a yeast multi-cellular amplification system based on signal molecule diffusion*. Sensors 13:14511-22, **2013**.

Conference contributions

- Sep 07–09, 2020 **11EWBC** - 11th European workshop on the biology of cyanobacteria, Porto, Portugal (changed to virtual format). Oral presentation.
- May 22–24, 2019 **NPC 14** - Nordic congress on photosynthesis, Turku, Finland. Short oral presentation.
- Oct 24–26, 2018 **4th Applied Synthetic Biology meeting** - Toulouse, France. Oral presentation.
- Jul 20–22, 2015 **Single Cell VI** – 6th International Conference on Analysis of Microbial Cells at the Single Cell Level, Retz (Austria). Oral presentation.
- Oct 15–17, 2014 **DGFZ** – 24th Annual Conference of the German Society for Cytometry, Dresden. Oral presentation.
- Jul 13–16, 2014 **ECB16** – 16th European Congress on Biotechnology, Edinburgh. Oral presentation.
- May 26–28, 2014 **DECHEMA** – Biomaterials Made in Bioreactors, Dresden. Poster.
- Mar 06–08, 2013 **RPP7** – 7th European Conference on Recombinant Protein Production, Ulm. Oral presentation.
- Jul 21–25, 2013 **FEMS** – 5th Congress of European Microbiologists, Leipzig. Poster.
- Oct 10–12, 2012 **DGFZ** – 22nd Annual Conference of the German Society for Cytometry, Bonn. Oral presentation.
- Jun 23–27, 2012 **CYTO 2012** – 27th Congress of the International Society for Advancement of Cytometry, Leipzig. Oral presentation.