

# Cajetan Neubauer

## Natural Scientist

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### Expertise

Isotopic structure of biomolecules and oxyanions, rates of metabolite production in cells and microbiomes, stable isotopes, diagnostic biomarkers, enzyme mechanisms, structural biology, mass spectrometry.

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### Research Positions

#### University of Colorado Boulder / Affiliate

Jul 2020 - *Ongoing* | Institute of Arctic and Alpine Research | Boulder, CO

Research: Clumped isotope dimensions of marine nitrate.

#### California Institute of Technology / Visiting Scientist

Jun 2019 - *Ongoing* | Div. of Geological and Planetary Sciences | Pasadena, CA

Research: Isotopic structure of human cellular methionine.

#### Thermo Fisher Scientific / Guest Scientist

Feb 2020 - *Ongoing* | Bremen, Germany

Research: R&D for new stable isotope mass spectrometry methods.

#### Hanse-Wissenschaftskolleg (HWK) / Senior Fellow

Jun 2019 - Jun 2020 | Institute for Advanced Study | Germany

Research: Biosynthesis of an unusual microbial lipid found in marine sediments.

Hosting Lab: Organic geochemistry group (MARUM, Bremen)

#### California Institute of Technology / Postdoctoral Researcher

Jan 2012 - May 2019

Research: Microbiology, lipids, mass spectrometry, stable isotopes.

Hosting Labs: Prof. Dianne Newman, Prof. John M. Eiler

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### Education

#### MRC Laboratory of Molecular Biology / [PhD thesis](#)

May 2007 - Dec 2011 | Medical Research Council & Cambridge University, UK

Research: Structure of ribosomal RNA/protein complexes.

Adviser: Dr. Venki Ramakrishnan

#### Max Planck Institut für Biochemie / [Research Assistant](#)

Oct 2006 - Apr 2007 | Munich, Germany

Research: Cryogenic electron microscopy, type III secretion in *Salmonella*.

Adviser: Prof. Wolfgang Baumeister

#### Max Planck Institut für Biochemie / [MSc thesis](#)

Jan - Sep 2006 | Munich, Germany

Research: Protein crystallography, Alzheimer's disease.

Advisers: Prof. Wolfram Bode, Prof. Robert Huber

## Technische Universität Munich / BSc & MSc in Biochemistry

Oct 2001 - Sep 2006

Research: Molecular biology, NMR spectroscopy.

Majors: Pharmacology & biophysics

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## Current Research

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**Isotopic structure of nitrate:** We have recently developed a new approach to quantify the stable isotopic content of oxyanions. The technique is based on electrospray Orbitrap mass spectrometry and measures intact molecules. Using nitrate as a model compound, I am assembling a cross-functional team to bridge this potentially transformative technology to environmental science applications.

**Industrially-synthesized methionine in humans:** More than 1 million tons of methionine are fed annually as growth promoter to livestock. Newly emerging biomedical data indicate that excess input of this essential amino acid into the world food supply warrants attention. We use a novel isotope mass spectrometry method to quantify the fraction of methionine in humans that originates from petrochemical synthesis.

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## Public speaking

Conferences, Trainings and Lectures

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### NASA Workshop on Isotopologue Research

2019, Lecture | Pennsylvania State University

### Department seminars

2019, Lectures | University of Delaware & Stanford University

### Geobiology seminar

2019, Lecture | University of Colorado Boulder

### Los Angeles Metropolitan Mass Spectrometry Meeting

2019, Lecture | UC Riverside

### Southern California Geobiology Symposium

2019, Lecture

### MSACL Annual Congress in Clinical Mass Spectrometry

2019, Lecture | 'Scanning the Stable Isotopic Structure of Molecules by Tandem Mass Spectrometry'

2019, Training | 'A Comprehensive Review of Clinical Mass Spectrometry Technology & Techniques'

### Benchmarking of ESI-Orbitrap MS for isotope analysis

2017, R&D | Thermo Scientific, San Jose

### Department seminars

2016, Lectures | Trinity College Dublin | National University of Singapore | National University of Malaysia

### LipidMaps Annual Meetings

2014 - 2016, Conferences

### International Singapore Lipid Symposium

2015, Lecture

### **Secondary Metabolites Workshop**

2015, Training | DOE Joint Genome Institute

### **Fellowship conferences**

2014, Lectures | EMBO US Meeting | Boehringer Foundation US Meeting

### **EMBO Laboratory Management Course**

2014, Training | Heidelberg, Germany

### **GRC Organic Geochemistry**

2014, Conference

### **Microbial Diversity Course**

Jun & Jul 2013, Training | Marine Biological Laboratory

### **Summer School of Molecular and Theoretical Biology**

Aug 2013, Teaching | Pushchino, Russia

### **Meeting of the American Society of Microbiology**

2011 & 2012, Conferences

### **Invited seminars**

2011, Lectures | Max Delbrück Center Berlin | Princeton University | University of Washington | California Institute of Technology

### **European Bioinformatics Institute Summer School**

2010, Training

### **Invited seminars**

2010, Lectures | European Molecular Biology Laboratory (EMBL) | Uppsala University | Tsinghua University

### **Seminar at the Indian Institute of Science**

2008, Lecture

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## **Fellowship & Awards**

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(Scheduled) **Study Group on Stable Isotope Analytics** / [HWK](#)

2019 - 2020 **Senior Fellow** / [HWK](#)

2017 **Training Grant** / [Caltech Center for Environmental Microbial Interactions](#)

2012 - 2013 **Long-Term Fellowship** / [EMBO](#)

2012 **Salje Medal** / [Clare Hall College, Cambridge, UK](#)

2012 **Postdoctoral Fellowship** / [Agouron Institute](#)

2010 **Max Perutz Prize** / [MRC-LMB](#)

2007 - 2010 **PhD fellowship** / [Boehringer Ingelheim Fonds](#)

2007 - 2010 **PhD Fellowship** / [Medical Research Council UK](#)

(Not taken up) **PhD Fellowship** / [Cambridge European Trust](#)

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## Teaching

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### Project Lead & Lecturer / [Summer School for Molecular and Theoretical Biology](#)

Jul & Aug 2013 | Pushchino, Russia

**Responsibilities:** Leader of a research lab in environmental microbiology. Geobiology lecture series. [More info](#)

### Teaching Assistant / [Introductory Biology](#)

2012 | California Institute of Technology

**Responsibilities:** Teaching weekly recitation sessions.

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## Publications

Hilkert A, Bohlke JK, Kopf SH, [Neubauer C](#) (in preparation) Unlocking the isotope signatures of intact nitrate molecules.

[Neubauer C](#), Landecker H (in review) Fossil fuel to food: Understanding the synthetic origins of ten percent of human cellular methionine.

[Neubauer C](#), Cremiere A, Wang XT, Thiagarajan N, Sessions AL, Adkins JF, Dalleska NF, Turchyn AV, Clegg JA, Moradian A, Sweredoski MJ, Garbis SD, Eiler JM (2020) Stable isotope analysis of intact oxyanions using electrospray Orbitrap mass spectrometry. *Analytical Chemistry* [\[Link\]](#)

[Neubauer C](#), Sweredoski MJ, Moradian A, Newman DK, Robins RJ, Eiler JM (2018). Scanning the isotopic structure of molecules by tandem mass spectrometry. *Int J Mass Spec.* [\[Link\]](#)

[Neubauer C](#), Kasi AS, Grahl N, Sessions AL, Kopf SH, Kato R, Hogan DA, Newman DK (2018). Refining the application of microbial lipids as tracers of *Staphylococcus aureus* growth rates in cystic fibrosis sputum. *J Bacteriology*. [\[Link\]](#) [\[Commentary\]](#)

[Neubauer C](#), Sessions AL, Booth IR, Bowen BP, Kopf SH, Newman DK, Dalleska NF (2018). Towards measuring growth rates of pathogens during infections by D<sub>2</sub>O-labeling lipidomics. *Rapid Commun Mass Spectrom.* [\[Link\]](#)

Newman DK, [Neubauer C](#), Ricci JN, Wu C-H, Pearson A (2016). Cellular and molecular biological approaches to interpreting ancient biomarkers. *Annu Rev Earth Planet Sci.* [\[Link\]](#)

[Neubauer C](#), Dalleska NF, Cowley ES, Shikuma NJ, Wu C-H, Sessions AL, Newman DK (2015). Lipid remodeling in *Rhodopseudomonas palustris* TIE-1 upon loss of hopanoids and hopanoid methylation. *Geobiology*. [\[Link\]](#)

Voorhees RM, Mandal D, [Neubauer C](#), Köhrer C, RajBhandary UL, Ramakrishnan V (2013). The structural basis for specific decoding of AUA by isoleucine tRNA on the ribosome. *Nat Struct Mol Biol.* [\[Link\]](#)

[Neubauer C](#), Gillet R, Kelley AC, Ramakrishnan V (2012). Decoding in the absence of a codon by tmRNA and SmpB in the ribosome. *Science*. [\[Link\]](#)

[Neubauer C](#), Gao Y-G, Andersen KR, Dunham CM, Kelley AC, Hentschel J, Gerdes K, Ramakrishnan V, Brodersen DE (2009). The structural basis for mRNA recognition and cleavage by the ribosome-dependent endonuclease RelE. *Cell*. [\[Link\]](#)

Weixlbaumer A, Jin H, [Neubauer C](#), Voorhees RM, Petry S, Kelley AC, Ramakrishnan V (2008). Insights into translational termination from the structure of RF2 bound to the ribosome. *Science*. [\[Link\]](#)

Klages J, [Neubauer C](#), Coles M, Kessler H, Luy B (2005). Structure Refinement of Cyclosporin A in chloroform by using RDCs measured in a stretched PDMS-gel. *Chembiochem*. [\[Link\]](#)

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## Patents

Eiler JM, [Neubauer SC](#), Sweredoski MJ, Griep-Raming J (2018). Isotopic mass spectrometry. Application: **WO 2020/035505 A1** [\[Link\]](#)