Dr. Sarah C. Brüningk

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I am a highly skilled and ambitious postdoctoral researcher seeking new opportunities in the area of computational biology. My education as a medical physicist provided me with excellent problem solving skills and analytical thinking, as well as a broad general knowledge of computing, mathematics, physics and cancer biology. My expertise in both, practical biological lab work and computational implementations sets me apart from other computational biologists. I have demonstrated being able to work both independently and as part of a team within an international, multidisciplinary environment in the past. This experience and my motivation to further scientific progress enable me to pursue challenging projects where multidisciplinary teamwork is key.

Employment

Since 9/19 **Postdoctoral research fellow,** *Swiss Federal Institute of Technology (ETH), Zurich, Switzerland*
- Project: Response prediction of metastatic melanoma patients to immunotherapy combination treatments based on multi-parametric data including liquid and solid biopsies (CyTOF, flow cytometry and scRNAsq data) and radiological information (PET-CT images).

10/18 – 8/19 **Postdoctoral research fellow**, *The Institute of Cancer Research,* London, UK
- Project: Computational modelling of tumour response to multimodality cancer therapies of radiation, chemotherapy and hyperthermia in advanced bladder cancer patients.

05/14 – 09/14 **Medical physicist**, *Klinikum rechts der Isar*, Munich, Germany
- Radiotherapy treatment planning in Eclipse, Linear accelerator and patient IMRT QA, radiotherapy plan approval, treatment delivery supervision

07/12 – 04/13 **Working student in radiotherapy research**, *Klinikum rechts der Isar*, Munich, Germany
- Data analysis of cell irradiation experiments in MATLAB
- Implementation of carbon ion fragmentation spectra into a research treatment-planning platform for particle cancer therapy in MATLAB

03/11 – 05/11 **Working student in soft matter research**, *Technische Universität München*, Munich, Germany
10/11 – 12/11 • Analysis of polymer solutions using dynamic light scattering

Education

10/14 – 09/18 **PhD in Biophysics**, *The Institute of Cancer Research*, London, UK
- Final result: Accepted without corrections in 12/18
- Title: "Biological Dosimetry for multimodality therapies" – Biological cell experiments, systems oncology simulations, and biophysical cell survival modelling to quantify the biological effects of combination treatments of therapeutic ultrasound and radiation therapy

10/11 – 05/14 **M.Sc. in Physics (Biophysics)**, *Technische Universität München*, Germany
- Final result: 1.1 (passed with high distinction)
- Thesis: "EUD-based biological optimization for carbon ion therapy" – Implementation of an EUD-based treatment optimization algorithm in a research treatment planning system for particle therapy
- 01/12 – 05/12 **Semester abroad,** National University of Singapore, Singapore
  Supported by the PROMOS stipend of the German Academic Exchange Service

10/08 – 09/11 **B.Sc. in Physics**, *Technische Universität München*, Germany
- Final result: 1.7 (passed with merit)
- Thesis: "New Systems for drug delivery" – Dynamic light scattering experiments on amphiphilic block copolymer solutions
- 01/10 – 05/10 **Semester abroad**, Université de Rennes I, France
  Supported by the EU Erasmus stipend

09/99 – 08/08 **A-Levels**, Humboldt Gymnasium Vaterstetten, Germany
- Overall Average: 1.2. Major fields of study: Math, Physics.

Scientific Recognition

- Seven first author, one second co-author publications in renowned scientific journals
- Oral conference presentations at >20 national and international conferences
- Recognition of scientific work and presentation skills by several young investigator, poster and presentation awards
- Referee for leading medical physics journals (Medical Physics, Physica Medica, Ultrasound in Medicine and Biology)
- Invited workshop (Workshop on Mathematical Medicine and Pharmacology, Swansea, UK(2017)), seminar (Fraunhofer Mevis, Bremen, Germany (2018); Oxford University, Oxford, UK (2018); OncoRay, Dresden, Germany (2018)), and conference speaker (ISTU, Barcelona, Spain (2019); AAPM, San Antonio, US (2019); Medical Imaging Convention, Birmingham, UK (2019))

Oral conference presentations and awards (selection)

11/19 **The Institute of Mathematical Oncology workshop on Evolutionary Tumor Boards**, Tampa, USA – a 5 day team competition. As winning team we obtained 50k $ to continue the proposed project on personalized therapy approaches for recurrent glioblastoma, ***(Travel award)***

07/19 **Annual Meeting of the Society for Mathematical Biology**, Montreal, Canada: *"*A systems oncology framework for modelling spheroid response to radiation and hyperthermia treatments", ***(Funded by the Institute of Cancer Research Postdoctoral Travel Award****)*

07/19 **American Association of Medical Physics, 61st Annual Meeting**, San Antonio, USA: "Therapeutic ultrasound and radiation therapy dose relationships", ***(invited speaker)***

06/19 **International Society for Therapeutic Ultrasound, 19th Annual Symposium**, Barcelona, Spain: "Analysis, quantification and modelling of biological effects induced by combination treatments of radiation and hyperthermia at cell (population) level", ***(invited speaker)***

06/17 **The Institute of Cancer Research Annual Meeting**, London, UK: "Simulating response to multimodality therapies *in vitro* - towards modelling of virtual patient treatments", ***(poster prize)***

06/17 **European Society for Hyperthermic Oncology, 31st Annual Meeting**, Athens, Greece: "Simulating response to multimodality therapies in vitro – towards modelling of virtual patient treatments", ***(Sensius Young Investigator Award)***

06/17 **International Society for Therapeutic Ultrasound, 17th Annual Symposium**, Nanjing, China: "A predictive simulation framework for combined focused ultrasound hyperthermia and radiation treatment modelling at a cellular level", ***(Travel award and Nadine Barrie Smith Student Award)***

07/16 **European Conference on Mathematical and Theoretical Biology**, Nottingham, UK: "Multiscale Modelling of Cancer Progression and Radiation Treatment"**, *(Funded by University of London Scholarship Fund)***

04/16 **International Congress of Hyperthermic Oncology**, New Orleans, USA: "A comprehensive model of hyperthermia and radiotherapy induced cell death", ***(New Investigator Travel Award)***

09/14 **Joint Conference of the SGSMP, DGMP, OGMP**, Zurich, Switzerland: "Biological optimization for carbon ion therapy planning based on the equivalent uniform dose (EUD)", ***(Travel award)***

Skills

Computational skills

- **MATLAB**: >5 years experience, optimization toolbox, data visualization, processing, and fitting
- **C++**: >3 years experience, standard library, STL containers, HPC implementation using OpenMP, multithreading and vectorization
- **Python**: recently started

  Machine learning:
  - Participated in a 10h machine learning course using KERAS and Tensorflow covering logistic regression, SVM, k-fold cross validation, and CNNs (The Institute of Cancer Research, 2018).
  - Currently improving my knowledge by participating in the Coursea deep learning specialization course.
  - Application of a CNN for automated segmentation of tumour spheroid images
  - Use of representation learning for the detection of marker cell populations in single cell data

Single cell data analysis:
  - CyTOF, scRNAsq and flow cytometry data analysis including batch correction, imputation, cell type assignment, clustering and statistical analysis.

- **Statistical analysis**:
  - Supervision of clinical research fellow project on the analysis and representation of clinical trial data
  - Biological data analysis (significance testing, regression analysis, survival analysis)
  - (Variance-based) sensitivity analysis of multiparametric simulations

- **Courses and workshop** *(selection)*
  - Intel Software Developer Conference, UK (2016)
  - Intel Code Modernization Workshop for Life Sciences, UK (2016)

Lab skills

- Mammalian 2D and 3D cell culture and aseptic technique
- Cell viability and survival testing (clonogenic assay, MTT, alamar blue, Cell titreGlow)
- Histological preparation and (IHC/IF) staining of tissue and spheroid sections
- (Fluorescent) microscopy, live cell analysis, flow cytometry
- Preparation of tissue mimicking materials and cell scaffolds
- DNA and protein extraction, western blotting

Team player

- As a member of two different research teams during my PhD, I regularly joined team meetings, and fostered collaboration and communication between the groups to advanced scientific progress.
- Student supervisor: Supervision of three M.Sci (5 months), three summer student projects (3 months), and recently two PhD students including the design, trouble shooting and discussion of their research projects.
- To account for the multidisciplinary nature of my PhD project, I initiated successful collaborations with external research groups (three national, one international) that, after continuous exchange over two years, already led to a joint publication and invitations to seminars and workshops.
- Extra-curricular activity: Coaching a group of disabled children in vaulting and joining them to competitions

Organizational skills and project management

- As part of the organizing committee, I planned and executed a three day team building, networking and communication event for a group of 25 people.
- Initiated and organized multidisciplinary student presentation club with monthly presentations
- Responsibility for designing, budgeting and conducting my 4-year PhD project including the allocation of funds for lab consumables, conference attendance and tuition fees as part of being awarded an ICR studentship (£84 000 (salary) + 29 000 (consumables)).
- Successful application for funding for two summer student projects awarded by the Focused Ultrasound foundation Global Internship Program (2x1000$)
- Participation in the ESTRO Research Masterclass in radiotherapy (Florence, Italy, 2017) – a three day course on writing and defending a successful research proposal

Presentation and communication skills

- Participated in a two-day science communication workshop by Cancer Research UK
- Communicated my research to a lay audience at several occasions including lab tours for students and local politicians, as well as school visits
- Languages: German (native), English (fluent), French (good), Mandarin (basic)

Referees

- Prof. Dr. G. ter Haar, The Institute of Cancer Research, London, UK; gail.terhaar@icr.ac.uk
- Prof. Dr. U. Oelfke, The Institute of Cancer Research, London, UK; uwe.oelfke@icr.ac.uk
- Dr. G.G. Powathil, Swansea University, Swansea, UK; g.g.powathil@swansea.ac.uk
- Prof. Dr. Jan J. Wilkens, TU München, München, Germany; wilkens@tum.de