

Guest Editorial

Highlights in biochemistry Bochum 2022

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The Faculty of Chemistry and Biochemistry of the Ruhr-Universität Bochum (RUB), Germany, celebrated the 30th anniversary of its Biochemistry Studies Course on October 1st, 2022. This event was delayed by one year because of the Covid-19 pandemic disease. The 20th anniversary celebration took place in December 2011.

More than hundred (125) alumni, staff and family members or friends assembled in the *Veranstaltungszentrum* of the RUB to celebrate the achievements made in this interdisciplinary Biochemistry Studies Course comprising more than 60 working groups allocated to four different Faculties of the RUB. Participants with an advanced career track in academia or industry were encouraged to present their talks and to contribute minireviews or original papers for this Highlight Issue of *Biological Chemistry*. Accordingly, the authors are bridging a wide range of topics, ranging from the expansion of the genetic code, novel roles of ATP in protein folding and neurodegenerative disease, novel microscopic methods at the nanoscale, the discussion of the molecular basis of mood diseases and cell biological mechanisms for cancer development (Figure 1).

Working with synthetic nucleic acids, Stephanie Kath-Schorr (University of Cologne, Germany) introduced the stimulating idea that the two base pairs used by nature could be expanded by an additional artificial base pair in a “nature-like” environment. In her review article entitled “Two are not enough: synthetic strategies and applications of unnatural base pairs“, strategies towards the synthesis of c-glycosidic nucleotides are presented, resulting in a broad spectrum of applications such as SELEX (systematic evolution of ligands by exponential enrichments) (Dörrenhaus et al. 2023).

Amazing aspects for an emerging role of ATP, apart from its use as source of energy and metabolite, were brought forward by Simon Ebbinghaus (Technical University Braunschweig and RUB, Germany). The impact of ATP on biomolecular solubility, folding stability and phase transition is presented. In his minireview the selective binding of

ATP to an intrinsically disordered region of pro-nerve growth factor was described, suggesting an allosteric modulation of the conformation (Paoletti et al. 2023). A possible relevance for therapeutic interventions in neurodegenerative diseases was evaluated (Hautke and Ebbinghaus 2023).

Amyotrophic lateral sclerosis is a neurodegenerative disease associated with fatal accumulation of mutated unfolded/misfolded superoxide dismutase (SOD1). In the paper by Arie-lev Gruzman (Ban-Ilan University, Israel) and Simon Ebbinghaus spatially targeted chemical chaperons directed against intracellular organelles such as endoplasmic reticulum, mitochondria and lysosomes were described, thereby regulating the native state stability of SOD1 (Ribeiro et al. 2023).

Fine tuning of the synaptic strength is a major determinant of brain function during development and in the adult. Agnes Thalhammer (University of Trieste and CIMA, Italy) described the structural basis of understanding the mechanisms triggering vesicle release: The nanoscale organization of voltage gated Cav2.1 channels at the pre-synaptic terminal was investigated by comparing to the distances between a Ca^{2+} sensor and different splice variants of the Cav2.1 channel. The strength of coupling between Ca^{2+} sensor and Cav2.1 was explained by differences in co-localization of splice isoforms applying superresolution structured illumination microscopy (Cingolani et al. 2023).

The molecular basis for the evolvement of mood diseases, including depressive and bipolar disorders, is poorly understood. The neuronal mechanisms for understanding social behaviors in rodent animal models are discussed by Nadja Freund (RUB, Germany) and an outlook on promising future directions is presented (Reinhardt et al. 2023).

Cancer ranks as a leading cause of death, globally indicating its burden for the health system in any country (Sung et al. 2021). Thomas Dittmar (Witten/Herdecke University, Germany) explains that cell fusion is a rare event towards the generation of malignant tumors. Yet, the surviving cancer hybrid cells can overgrow other cancer cells exhibiting proliferation advantage or acquisition of cancer stem cell properties. These issues are discussed in the context of understanding the generation of cancer as an evolutionary development versus random processes (Dittmar et al. 2023).

Finally, we thank all participants and colleagues for their valuable contributions and lively discussions helping to shape

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Figure 1: Alumni and staff members of the Biochemistry Units within the Faculty of Chemistry and Biochemistry at RUB came together in October 2022 to communicate ideas and anecdotal stories evolving during the 30 years of the Studies Course Biochemistry at Bochum. Some of the speakers decided to submit manuscripts based on their own research data or reviews about newly arising topics according to the author's choice. The resulting papers are collected in this Highlight Issue here. The photograph shows all speakers attending in person, including the organizers. (photo by Dr. Daniel Tapken).

this Highlight Issue and thereby demonstrating the impact of emerging biochemists on a broad spectrum of novel topics, which may also include medical or social aspects.

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