Young Career Focus: Professor Christoph Nitsche (Australian National University, Australia)

Background and Purpose. SYNFORM regularly meets young up-and-coming researchers who are performing exceptionally well in the arena of organic chemistry and related fields of research, in order to introduce them to the readership. This Young Career Focus presents Professor Christoph Nitsche (Australian National University, Australia).

Biographical Sketch

Assoc. Prof. C. Nitsche

Christoph Nitsche is an Associate Professor at the Australian National University (ANU, Australia). He grew up in Anklam, Germany, and studied chemistry at the University of Halle-Wittenberg (Germany). He completed his PhD at Heidelberg University (Germany) in 2014 and received a Feodor Lynen Research Fellowship from the Alexander von Humboldt Foundation to work at the ANU from 2015 to 2018. After a short period as a Rising Star Fellow at the Free University of Berlin (Germany), he was awarded an ARC Discovery Early Career Research Award (2019) to return to the ANU, where he was appointed to a faculty position in 2020. He recently received an ARC Future Fellowship (2022), the John Wade Early Career Researcher Award (2022), the Peter Schwerdtfeger Award (2022), the Australian Research Award as the top researcher in the field of Medicinal Chemistry (2023), a Thieme Chemistry Journals Award (2023), and the RSC Medicinal Chemistry Emerging Investigator Lectureship (2023).

INTERVIEW

SYNFORM *What is the focus of your current research activity?*

Assoc. Prof. C. Nitsche My present research revolves around the biocompatible modification of peptides and proteins. Our particular focus lies in selective chemical modifications that can be carried out under conditions applicable to bioconjugation, imaging, and peptide display technologies, where the need for selective and robust chemical modifications is crucial. The simpler and more reliable these chemical transformations are, the higher the chances that they will find broad applications.

SYNFORM *When did you get interested in synthesis?*

Assoc. Prof. C. Nitsche I studied the classical chemistry curriculum in Germany, which was heavy on synthetic chemistry. I became fascinated by how synthetic compounds can manipulate biological systems, igniting my interest in medicinal chemistry and chemical biology. During my undergraduate studies, I synthesised several molecules that were tested in cellular apoptosis assays. This direct link between synthesis and biological activity has intrigued me ever since. I moved on to pursue a PhD in medicinal chemistry and a postdoc in structural biology to learn more about the biological aspects, while synthesis has remained an essential part of my research.

SYNFORM *What do you think about the modern role and prospects of organic synthesis?*

Assoc. Prof. C. Nitsche A central aspect of organic chemistry has always been studying and manipulating compounds of natural origin, which, in the broadest sense, is still what my current research is focused on. The continuing importance of organic chemistry for biomedical sciences has recently been

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demonstrated by the Nobel Prize awarded to Bertozzi, Meldal and Sharpless for the development of click chemistry and bioorthogonal chemistry.

SYNFORM *Could you tell us more about your group's areas of research and your aims?*

Assoc. Prof. C. Nitsche We have developed biocompatible reactions that are valuable in peptide-based drug discovery and protein bioconjugation. One of our primary goals is to create simple methods that can restrict the flexibility of peptides, thereby enhancing their potential as drug candidates. Through our biocompatible modifications, we have demonstrated the ability to simultaneously improve the biological activity, proteolytic stability, and cell membrane permeability of peptides.

SYNFORM *What is your most important scientific achievement to date and why?*

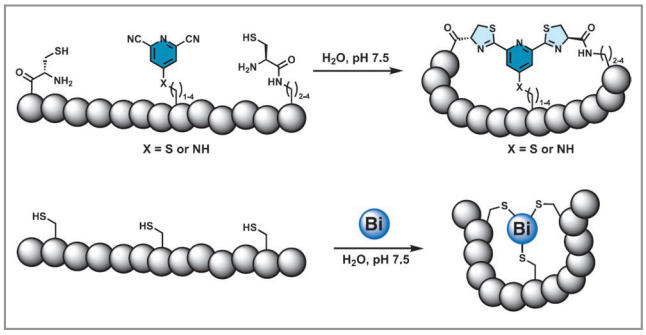
Assoc. Prof. C. Nitsche The modification of peptides and proteins using bismuth(III) has gathered some attention. In 2017, I discovered that bismuth can be utilised to selectively attach probes to proteins. Since then, we have further expanded this work, for example, to constrain peptides. The use of bismuth in peptides and proteins is intriguing due to its simplicity and its potential for therapeutic applications.

SYNFORM *Could you tell us something about yourself outside the lab, such as your hobbies or extra-work interests?*

Assoc. Prof. C. Nitsche I have three children who keep me both busy and entertained. In my free time, I enjoy gardening, reading, and going on bush walks. I am also working on improving my surfing skills, taking it step by step.

SYNFORM *What is the most exciting aspect of your job, the one you like the most?*

Assoc. Prof. C. Nitsche What I find most enjoyable about my job is the daily interactions with my research group. Working with highly motivated and innovative students at all levels is incredibly rewarding. The best moments undoubtedly occur when the students find that an idea, once just sketched on a piece of paper, actually works, or when they make an unexpected discovery.



Scheme 1 Two biocompatible strategies to constrain peptides pioneered by the Nitsche laboratory

Figure 1 Assoc. Prof. Christoph Nitsche holding a bismuth crystal. Bismuth is a green and non-toxic metal with outstanding potential for bioconjugation

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