Biophysical Reviews' "Meet the IUPAB councillor series": a brief profile of Tjaart P. J. Krüger

Tjaart P. J. Krüger[1]

[1]Department of Physics, University of Pretoria, Pretoria, South Africa

Correspondence to Tjaart P. J. Krüger. Email: tjaart.kruger@up.ac.za

Abstract

It is a great privilege for me to have been elected to the IUPAB Council earlier this year and to represent the African continent on the Council. In this short commentary, I am giving a very brief account of my academic training, biophysics research activities, and biophysics educational and outreach activities in Africa.

Profile photo of Tjaart Krüger. Photo taken by Mariki Uitenweerde from EYEscape Corporate Photography.

My fascination with biophysics started during my undergraduate studies in South Africa while majoring in physics, mathematics, and applied mathematics. I studied at Potchefstroom University, which changed its name to the North-West University during my studies. During that time, I became aware that educational and research opportunities in biophysics were very limited in South Africa, particularly in the physics community. After a Master's degree in Space Physics at the North-West University, I pursued a PhD in Biophysics and a short

postdoctoral fellowship at the Vrije Universiteit Amsterdam under the mentorship of Rienk van Grondelle. I returned to South Africa in 2013 and assumed a permanent position in the Department of Physics at the University of Pretoria with a strong desire to help establish biophysics in the country. Within a year, I managed to secure funds from various sources to bring the first biophysics research group in the country into being.

My PhD research focussed on the application of single-molecule spectroscopy (SMS) to the main light-harvesting complex of plants, a research direction that I have significantly expanded since then, for example, by broadening the scope to various other photosynthetic complexes, incorporating plasmonic field enhancement (Kyeyune et al. 2019), and more recently focussing also on lipid-protein interactions. Our experimental work is strongly supported by theoretical modelling and simulations (Nöthling et al. 2022; Ugwuoke et al. 2020) and provides a springboard for studies in quantum biology (Marais et al. 2018). My main interest is still to resolve the molecular details of energy transfer and regulation in various photosynthetic organisms' light-harvesting complexes and to apply some of the underlying design principles to organic solar cells (Krüger and van Grondelle 2016).

After building the first SMS facility on the African continent, I have continued to focus on experimental developments with accompanying data analysis software. One of our recent experimental extensions is real-time single-particle tracking (van Heerden et al. 2022), while much of our software development was recently published as an extended open-source package for SMS data analysis (Botha et al. 2024). We have also ventured into ultrafast transient-absorption spectroscopy of photosynthetic complexes (Elnour et al. 2018). To date, my research has been published in over 60 journal articles and I have supervised over 20 postgraduate students to completion.

A year after returning to South Africa, I became the Chair of the Biophysics Initiative of the South African Institute for Physics (SAIP), which facilitated the organisation of various biophysics training events across the country. A few years later, SAIP became an IUPAB member. Through the African Strategy for Fundamental and Applied Physics, I have broadened my scope for biophysics capacity building to various other African countries, which has resulted in two status reports on biophysics education and research in Africa (Krüger et al. 2023; Krüger 2024). The first report was pivotal in the establishment of the Society of Africa Biophysical Societies (SABS, https://www.sabsafricabiophysics.org) in 2023, an important strategic step in the development of biophysics on the continent. Other strategic biophysics activities include the biennial Biophysics in Africa Zoom Conferences and a monthly African biophysics colloquium series, which I started with Lawrence Norris and Trevor Sewell in 2021 and 2023, respectively.

As a new IUPAB Councillor, I hope to witness rapid growth in educational and outreach biophysics activities across the African continent during my term and to be the voice of biophysics for Africa.

Contributions

T. P. J. K. wrote the full text.

Competing interests

The authors declare no competing interests.

Data availability

No datasets were generated or analysed during the current study.

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