Leopold Schmetterer: the research journey of ocular imaging

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Expert introduction

Leopold Schmetterer (*Figure 1*) is currently Professor of Ophthalmology at the Nanyang Technological University and head of ocular imaging at Singapore Eye Research Institute, Singapore. He has also holds a professorship at the Medical University of Vienna, Austria.

His interests span a wide range of ocular imaging from the development of novel technologies to applications in preclinical research and clinical settings. He is also interested in clinical trials and is involved in many studies in retina, glaucoma, cornea and dry eye.

Prof. Schmetterer is a member of the Editorial Boards of *Progress in Retinal and Eye Research*, *Scientific Reports*, *Acta Ophthalmologica*, *Journal of Ocular Pharmacology and Therapeutics*, *Current Eye Research* and many other journals. He has published more than 300 peer-reviewed publications and was invited for more than 200 lectures.

Prof. Schmetterer has made major contributions to our understanding of blood flow auto-regulation in the eye and elucidated mechanisms of choroidal blood flow auto-regulation, and was the first to show abnormalities in retinal neurovascular coupling in diabetes and glaucoma and worked on the mechanisms of neurovascular coupling in the retina proving the modulatory role of nitric oxide and oxygen.

Editor's note

On April 21 and 22, 2018, the 2nd Guangzhou Glaucoma Forum was successfully held at Zhongshan Ophthalmic Center, Sun Yat-sen University.

With numerous of outstanding experts worldwide gathering together, this meeting was no doubt a grand feast which covered all the significant topics and latest developments across the field of ophthalmology. Topics include new treatment in retinal and vitreous disease and glaucoma, integrated images analysis and early diagnosis of glaucoma, minimally invasive surgical procedures, pediatric glaucoma, neuroprotection and translational medicine.

Figure 1 Prof. Leopold Schmetterer.

At the forum, Prof. Leopold Schmetterer gave an impressive speech on ocular imaging and showed us its current status and future potential. On behalf of the Editorial Team of *Annals of Eye Science* (*AES*), I was honored to have the opportunity to interview Prof. Schmetterer and share with our readers his experience and perspectives on ocular imaging.

Interview questions

AES: Ocular imaging provides important information that aids in the detection of disease progression. In the future, what significant benefits will the ocular imaging bring? Could you kindly share with us its future potential?

Prof. Schmetterer: Ocular imaging has revolutionized the way we treat and follow glaucoma patients because it has provided new insights into the structural damages and contributed to our understanding of the pathophysiology. I think ocular imaging's future potential can be discussed in two major parts. First, OCT will be extended from pure structural imaging to functional imaging, which we have already seen with the advent of OCT angiography

(OCTA). Second, with novel analysis techniques such as deep learning, we will better understand the discrimination between health and disease. These techniques will also allow for better follow-up and identifying patients who are at risk of getting blind.

AES: You have studied the effects of physical diseases on the eyes, like the correlation of intraocular pressure with blood pressure and retina with diabetes. What do other physical illnesses do you think could be associated with eye diseases?

Prof. Schmetterer: It is known that cardiovascular disease with elevated blood pressure is a risk factor for many of the major eye diseases such as glaucoma, age-related macular degeneration or diabetic retinopathy. And I think it is obvious that there are other diseases associated with eye disease as well. Just look at the association between cerebral disease such as dementia and Alzheimer's disease with neurodegenerative diseases of the eye. We have a program in Singapore where we investigate details of the association between renal disease and ocular disease because it seems that these two diseases share some similarities, particularly in terms of vascular damage.

AES: Being the head of ocular imaging at Singapore Eye Research Institute, what are the main challenges you have faced? And what research projects are your team working on now?

Prof. Schmetterer: The Singapore eye research institute has always been very strong in imaging even before I came. Currently, we are trying to bring an additional engineering aspect into the work. The idea is to do translational research in the basic science lab so as to develop novel technology for imaging, then via the Singapore Eye Research Institute facilities to rapid translation to patients. It is the concept we had in Vienna and also is what we're trying to bring into the Singapore Eye Research Institute.

AES: You have been worked in Europe for a long time, what made you decide to move to an Asian country—Singapore? Have you had any concerns?

Prof. Schmetterer: I have been to Singapore many times and knew the people there, so I didn't have too many concerns. But of course, it's a challenge when you move 10,000 kilometers from home, yet it is always interesting and exciting. One of the reasons that I came to Singapore was because of my interest in exploring new things. I've been staying in Vienna for approximately 20 years and it was a great time. But I also felt the desire for doing something new and wanted take on a new challenge. Singapore was no doubt an optimal environment for this given its world-class facilities and I was offered a good opportunity at the Singapore eye research institute. I think we are on a good way to really set up an exciting and world-class imaging center there.

AES: After two years of teaching at the University of Lausanne in Switzerland, you returned to the Medical University of Vienna. Now, you are a professor at the Nanyang Technological University. Please share with us your educational experience in these three countries. And how did these experiences influence your career?

Prof. Schmetterer: Though my main affiliation in Singapore is with the Singapore Eye Research Institute, I get a lot of chances to interact with PhD students and junior scientists. What I find exciting is that Asian are very motivated, maybe the young are even more motivated than the young in Europe or the US nowadays. They are willing to dedicate themselves to achieve scientific goals, to explore new thing in ophthalmology. I particularly enjoy to be a mentor who supports other basic researchers or clinician scientists. It's extremely exciting that there are so many young people with a lot of scientific drive here in Asia and I'm really glad to have the opportunity to work with them and help them foster their careers. I had very good mentors when I was young so I know how difficult it would be to make a career by yourself without mentors nowadays. The most important part of being a mentor is to share your knowledge with young people and support them so that they can become independent researchers and scientists. Interacting with the young always influences old ways of thinking because they can come in with new ideas and with novel challenges. Just like the progress with artificial intelligence was to a large degree driven by the younger generation.

AES: Do you have any words of advice to share with the younger generation?

Prof. Schmetterer: In my opinion, it's important for them to know that the career as clinicians and scientists is still

Figure 2 Photo with Prof. Leopold Schmetterer after the interview.

extremely exciting and promising. For me, it has been a wonderful experience and also is a big privilege to be able to do research, try to explore new things and improve our diagnostic and therapeutic capabilities. I still think this is the best job that you can ever get (*Figure 2*).

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(Science Editor: Cheng-Ying Lin, Annals of Eye Science, aes@amegroups.com)