

# POST-WORKSHOP REPORT

“Modern methods to treat presbyopia”

April 1<sup>st</sup>-2<sup>nd</sup>, 2017

Poznań, Poland



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## 1. Introduction

In 2012, presbyopia affected around 1.7 billion people with a projected prevalence of 2.1 billion people affected worldwide by 2020. Seventy five percent of them are not aware what presbyopia is and how it can be corrected. Despite the recent technological development, awareness of this in both Polish ophthalmologists and patients is insufficient. The aim of the workshop „Modern methods to treat presbyopia“, that took place on April, 1<sup>st</sup>-2<sup>nd</sup> in Don Prestige Residence in Poznań, was the development of invited ophthalmologists' knowledge and skills according to the latest international standards that could be later shared with other ophthalmologists.

Foundation for the development of ophthalmology „Ophthalmology 21“ – the organiser of the workshop, received a grant for the project „Scientific workshop – modern methods to treat presbyopia“ financed under the contract 849/1/P-DUN/2017 from the funds of the Minister of Science and Higher Education dedicated to spread the scientific knowledge.

## 2. Speakers

High-class scientists, doctors and speakers dealing with presbyopia and correction of presbyopia were invited to the workshops. Below you can find the short summary of their accomplishments.





Professor Marek Zając, Master in Engineering, PhD

- Graduate of the Faculty of Mechanical Engineering, Wrocław University of Technology (Master in Engineering)
- Employed at Wrocław University of Technology (since 1971) at the Institute of Physics, and currently the Chair of Optics and Photonics as an Associate Professor.
- Doctor of Physical Sciences (thesis on optical holography).
- Doctorate in Physical Sciences (thesis in the field of aberrations of hybrid and diffractive lenses).
- Scientific interests: wave optics, interferometry, holography, optical projection theory; now optic vision and optometry.
- Author or co-author of about 100 scientific publications in the field of optics, including more than 50 in the Philadelphia Philatelic journals. Author or co-author of 10 monographs and textbooks in the field of optics.
- Co-author of the conception and organizer of higher education in the field of ophthalmic and optometry at Wrocław University of Technology. Vice Chairman of the Optometry and Optometry Accreditation Commission.
- Supervisor of over 50 master's theses and two PhDs.
- Author of many popular papers on optics and optometry.





Ramin Khoramnia, Priv.-Doz. Dr. med., F.E.B.O., Associate Professor

- Dr. Khoramnia is an Associate Professor and Senior Physician at the Dept. of Ophthalmology, University of Heidelberg, where is one of the leaders of the cataract and refractive surgery division.
- Dr. Khoramnia has received the European Board of Ophthalmology Certification (Fellow of the European Board of Ophthalmology – F.E.B.O.) in 2013 after participation at the European Board of Ophthalmology Diploma (EBOD). He passed examination as the second best participant amongst more than 440 participants from 24 European countries.
- His research interests include cataract surgery, intraocular lenses, ophthalmic viscoelastic devices, refractive laser technology and surgery, diagnostic tools, the cornea, and retinal diseases. Dr. Khoramnia has published more than 55 papers in journals with peer-review. He has received several awards for his scientific work including the ASCRS Foundation Resident Excellence Award and has given lectures and presentations at numerous scientific conferences worldwide.



Dr. Friedrich Kirchner, Zeiss, Germany

- Friedrich Kirchner received his PhD in Physics from the University of Munich, Germany
- He joined the Zeiss Research and Development department for IOLs, where he has been working on new IOL designs.
- His focus is optical design and studying contributions to refractive errors in the cataract workflow.





	<p>Scott McNamara, Carl Zeiss, Germany</p> <ul style="list-style-type: none"> <li>• For the past six years, Scott McNamara has been presenting internal and external trainings on cataract treatments, including biometry, in the ZEISS Academy.</li> <li>• ZEISS Academy trainer.</li> </ul>
	<p>Prof. Barbara Pierscionek, BSc, PhD, MBA, LLM</p> <ul style="list-style-type: none"> <li>• Professor Barbara Krystyna Pierscionek is qualified in Optometry with a PhD in Biochemistry and Optics from the University of Melbourne and an MBA and legal qualifications from the UK.</li> <li>• Her research is in the anterior eye with an emphasis on lens optics and ageing, accommodation and presbyopia.</li> </ul>
	<p>Prof. Andy Augousti, FInstP FIET FInstMC MBA</p> <ul style="list-style-type: none"> <li>• Andy Augousti is a Professor of Applied Physics and Instrumentation at Kingston University, where he teaches and researches in a range of areas including vision science.</li> <li>• He has over 130-refereed scientific publications, holds three patents</li> <li>• He has edited several volumes of conference proceedings.</li> <li>• He has been a director of four companies (he holds MBA Diploma)</li> <li>• In the UK, he is a Chartered Physicist and a Chartered Engineer, as well as a Fellow of the Institute of Physics, the</li> </ul>



	<p>Institute of Engineering and Technology and the Institute of Measurement and Control.</p> <ul style="list-style-type: none"> <li>• He is a recipient of the Honeywell International Medal from the Institute of Measurement and Control in the UK and the President's Award from Tianjin University, China.</li> </ul>
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### 3. Workshop summary

Workshop was prepared based on the highest standards. Experts with great knowledge and experience in the field of presbyopia corrections were invited as Speakers. Simultaneous translation was provided during workshop, which allowed for a free interaction between participants and speakers. Participants of the workshop: six speakers, 21 ophthalmologists, 3 representatives of the companies.

On the first day there were held lectures – the programme is attached in the annex 1. On the second day the „Presbyopia 2017“ conference was discussed and the November date and the draft of the programme were established. Other discussed topics concerned: the necessity to develop guidelines for visual acuity / visual contrast testing; The need to develop a questionnaire about the quality of life, as well as brochures about truths and myths of patient care before and after surgery - addressed to doctors and non-surgeons.





## 4. Lectures' summary

### I. Selected problems of presbyopia correction

During the lecture issues of amethyst correction, spectacle lenses, bifocal and progressive lenses were discussed. The requirements for spectacle lenses and requirements for their fitting were described. The types of progressive lenses were described:

- I. type "overview"
- ii. "To the use of the computer"
- iii. for the office
- iv. individual

### II. Basics of IOL optics

- Several new developments in MIOL Technology (segmental refractive, trifocal diffractive, EDOF)
- General trend to enhance intermediate vision
- Reduction of near addition (low-add MIOL)
- Trifocal technology improves vision at all distances
- Enhanced Depth of Focus (EDOF) IOLs are promising because of a reduction of photic phenomena
- Surgeons can choose the right IOL for the patients' individual needs, because a broad range of different multifocal IOL concepts are available these days.

### III. Pearls for premium IOL calculation

- State of the art formulas & optimized constants are critical calculation of the IOL power can be performed using a great variety of formulas.
- Accurate measurements are key to success with advanced formula





- Topography is essential in ruling out possible corneal irregularities
- Services available for expertise sharing and in unexpected post-op situations
- 80% within +/-0.5 D (Barrett Universal II)

**IV. The mechanisms and models of the accommodative system- new discoveries about the effect of the ciliary muscle and zonule**

- Stress patterns for human lenses with gradient elastic moduli vary depending on whether a single modulus value or a gradient modulus is used for the cortex
- Choice of material properties can alter which theory of accommodation is supported
- The zonule should be represented as three separate forces rather than a single force direction

**V. Introduction to the theories of accommodation, what evidence do we have and how can this impact in design of new intraocular lenses**

Accommodation in the eye has had historical explanations provided by Helmholtz [1] and Tscherning [2], both involving a general flattening and thinning of the lens. Schachar [3] refutes these explanations, and claims that for particular conditions, both the central anterior and posterior lens surfaces become steeper, the peripheral lens surfaces close to the equator flatten, and the lens thickens across the central axis. The particular conditions require a stretching of the lens capsule of less than 0.5%, and maintenance of a constant volume. Schachar calls such a modified shape 'the steep profile', and he supports his experimental results by deriving a theoretical model based on a model that minimises changes in the bending energy of the lens. We present here a more exact formulation that includes also the surface energy of the lens in order to take into account the stretching of the lens capsule and indeed of the lens itself. The model is solved



under similar conditions to Schachar's model for a lens undergoing accommodation. Our model provides support for Schachar's results, and a steep profile is produced under appropriate circumstances. The steep profile does not appear to be depend significantly on the contribution of the surface energy compared to that, which comes from the bending energy.

#### References:

1. Von Helmholtz H Uber die akkommodation des auges *Archiv. Ophthalmol.* 1855 1:1-74s
2. Tscherning M. *Physiological Optics* Translated by Weiland C 2<sup>nd</sup> Edition The Keystone, Philadelphia PA 1904
3. See for example, Schachar RA The mechanism of accommodation and presbyopia Kugler Publications The Netherlands 2012

## 5. Photo gallery







## 6. Annex 1 – Workshops' programme

**April 1<sup>st</sup> 2017**

**15.00-15.05 Opening**

**15.05-18.15 Workshop 1 – IOL optics and how to minimize the risk of having unhappy patients**

15.00-15.30 Selected problems of presbyopia correction.

*Prof. Marek Zajac, Master of Engineering, PhD*

15.30-15.45 Discussion

15.45-16.25 Basics of IOL optics (MTF, TFR, Defocus curves, Kappa angle, etc.).

*Priv.-Doz. Dr. med. Ramin Khoramnia, F.E.B.O.Oberarzt/Associate Professor*

16.25-16.35 Discussion

16.35-17.00 Coffee Break

17.00-18.00 Pearls for premium IOL calculation.

*Scott McNamara, Dr. Friedrich Kirchner, Zeiss, Germany*

18.00-18.10 Discussion

**18.10 – 19.40 Workshop 2 Accommodation – scientific background and practice**

18.10-18.40 The mechanisms and models of the accommodative system- new discoveries about the effect of the ciliary muscle and zonule.

*Prof. Barbara Pierscionek, BSc, PhD, MBA, LL.M*

18.40-18.55 Discussion

18.55-19.25 Introduction to the theories of accommodation, what evidence do we have and how can this impact in design of new intraocular lenses.

*Prof. Andy Augousti, FInstP FIET FInstMC MBA*



19.25-19.40 Discussion

20.00 Dinner

**April, 2<sup>nd</sup> 2017**

9.00 – 13.00 Meeting of the club:

1. Plans for the future
2. Bringing into general knowledge methods for treating presbyopia in Poland
3. Development of the presbyopia treatment services in Poland
4. Clinical and scientific cooperation

12.00 Coffee break

