BIOGRAPHICAL SKETCH

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NAME: Manns, Fabrice

eRA COMMONS USER NAME (credential, e.g., agency login): fmanns

POSITION TITLE: Professor and Chair of Biomedical Engineering and Professor of Ophthalmology

EDUCATION/TRAINING (Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
ENSERB, University of Bordeaux, France	Ing (BS)	1991	Electrical Engineering
University of Bordeaux, France	DEA (MS)	1991	Microelectronics
University of Miami, Coral Gables, FL	PhD	1996	Biomedical Engineering
Bascom Palmer Eye Institute, Miami, FL	Postdoc	1996-97	Biomedical Optics/Lasers

A. Personal Statement

My experience with the development of optical technology for ophthalmic applications started in the early 1990s, with the development of one of the first experimental beam delivery system and algorithm for flying-spot laser refractive surgery, the topic of my dissertation work. I completed a one year post-doctoral fellowship at Bascom Palmer Eye Institute sponsored by Fight for Sight, focusing on ophthalmic laser applications and the use of low-coherence interferometry for corneal biometry. I was subsequently offered a joint faculty position in the Departments of Ophthalmology and Biomedical Engineering at the University of Miami. In recent years, my research has focused on two areas: a) the optics of the eye, with a focus on understanding the mechanism of accommodation and presbyopia and the optics of the lens, and b) the development of Optical Coherence Tomography and other imaging technology for ocular biometry. I have served as the PI, key investigator or collaborator on several projects on topics related to the proposal, including the development of an OCT system with extended-depth for imaging the dynamics of accommodation, an intraoperative microscope-mounted wavefront sensor based autorefractor, as well as several eye models including models to develop wavefront guided corneal ablation patterns and models to predict the performance accommodating IOLs. I have worked closely with several clinicians at Bascom Palmer Eye Institute on the application of various custom-designed OCT systems for clinical and research use under IRB-approved protocols.

Ongoing and recently completed projects relevant to the proposed topic area:

1 R01 EY030063-01A1 Biomechanics of lens accom	Larin, Manns, Scarcelli (MPI) modation	09/30/20 - 06/30/25
1R21EY027957-01A1 NIH-National Eye Institute Intraoperative OCT-based w Role on project: Key investig	Ruggeri (PI) avefront aberrometer ator	03/01/18-02/28/21
R01EY14225-13 NIH / National Eye Institute Optomechanical characterist	Manns (PI) ics of lens accommodation.	09/30/17-08/31/21
R01EY021834-01A1 NIH-National Eye Institute Optics of the growing crystal	Manns (PI) line lens	06/01/12-05/31/18

Citations:

- Natarajan R, Maceo Heilman B, Ruggeri M, Ho A, Singh VM, Augusteyn R, Parel JM, Vaddavalli PK, Manns F. Age dependence of the average refractive index of the isolated human crystalline lens. Biomed Opt Express. 2024;15(10):5901-5911.
- 2. Durkee H, Ruggeri M, Rohman L, Williams S, Ho A, Parel JM, **Manns F**. Dynamic refraction and anterior segment OCT biometry during accommodation. Biomed Opt Express. 2024;15(5):2876-2889.
- 3. Ruggeri M, Belloni G, Chang YC, Durkee H, Masetti E, Cabot F, Yoo SH, Ho A, Parel JM, **Manns F**. Combined anterior-segment OCT and wavefront-based autorefractor using a shared beam. Biomedical Optics Express 2021; 12; 6746-6661..
- 4. Ruggeri M, Uhlhorn S, De Freitas C, Ho A, **Manns F**, Parel JM. Imaging and full-length biometry of the eye during accommodation using Spectral-Domain OCT with an optical switch. Biomedical Optics Express, 2012; 3(7):1506-1520.

B. Positions, Scientific Appointments, and Honors

Professional Positions and Employment

1/91-9/91: Research Assistant, IXL Microelectronics Laboratory, University of Bordeaux, France.

- 9/91-12/91: Research Engineer, IXL Microelectronics Laboratory, University of Bordeaux, France.
- 2/92-5/96: Research Assistant, Dept of Biomedical Engineering, University of Miami College of Engineering, Coral Gables, FL.
- 5/96-9/97: Post-doctoral Associate, Dept of Ophthalmology, University of Miami School of Medicine, Miami, FL.
- 5/96-9/97: Adjunct Instructor, Dept of Biomedical Engineering, University of Miami College of Engineering, Coral Gables, FL.
- 10/97-pres: Professor (6/13-pres), Associate Professor (tenured) (6/06-6/13), Assistant Professor (tenure-track) (8/00-6/06), and Research Assistant Professor (10/97-8/00), Department of Biomedical Engineering and Department of Ophthalmology, University of Miami, FL.
- 4/08-pres: Chair (3/17-pres); Associate Chair (4/08-2/17); Graduate Program Director (9/09-2/17), and Acting Chair (8/13-5/14), Department of Biomedical Engineering, University of Miami, FL.
- 6/22-pres: Interim Associate Dean for Research, College of Engineering, University of Miami.

Other Experience and Professional Memberships

- 1993-pres: Member, Association for Research in Vision and Ophthalmology (ARVO) (1993-pres); International Society for Optical Engineering (SPIE) (1994-pres); Optical Society of America (OSA) (1995-pres); American Society for Engineering Education (ASEE) (2000-pres); Biomedical Engineering Society (BMES) (2000-pres).
- 1997-2020: Chair, Ophthalmic Technologies Conference, SPIE Photonics West, San Jose, CA
- 2002-2016: Chair (6/2016-pres) and Ad-hoc member (2002-2016); NIH-CSR ETTN-G 12, Small Business: Aging and Development, Auditory, Vision and Low Vision Technologies and Adhoc member of other NIH study sections.
- 2008-pres: Program Committee Member, ARVO-ISIE (International Society for Imaging in the Eye)
- 2014-2020: Associate Editor, Biomedical Optics Express
- 2014/11: Study Section Member, NEI Audacious Goals Initiative (ZEY1 VSN 05)

Honors

- 1996 Award of Academic Merit, University of Miami Graduate School
- 1996-97 Fight for Sight Postdoctoral Fellow, The Research Division of Prevent Blindness America
- 2002: ASEE Southeastern Section New Faculty Research Award (2nd place award).
- 2013&16 Johnson A. Edosomwan Researcher of the Year Award; Univ of Miami College of Engineering
- 2016 Outstanding Faculty Leadership Award, Univ of Miami Dept of Biomedical Engineering
- 2016 Provost Funding Award, University of Miami
- 2017 Provost Scholarly Productivity Award, University of Miami
- 2019 Fellow, American Institute for Medical and Biological Engineering
- 2021 Silver Fellow, ARVO
- 2021 Fellow, SPIE

C. Contributions to Science

Full list of peer-reviewed published work as found in Pubmed: https://pubmed.ncbi.nlm.nih.gov/?term=manns%20f&sort=date

- 1. Instrumentation and optics for laser corneal refractive surgery: One of my first contributions to the field of eye research was in the area of optics and technology for refractive surgery. As part of my dissertation work, I developed of one of the early laser beam delivery systems and theoretical algorithms for flying-spot laser refractive surgery. At the time, laser refractive surgery systems relied on broad-beam ablations, which provided limited flexibility in terms of ablation patterns. Flying-spot ablations provide the opportunity for customized ablations that allow correction of aberrations. These studies produced methods to measure the ablation rate and models that helped evaluate the effect of design parameters (energy, spot size, spot overlap, repetition rate) on the quality and duration of the ablations. The project also produced a method to calculate aspheric corneal ablation profiles for correction of spherical aberrations.
 - a. **Manns F**, Ho A, Parel JM, Culbertson W. Ablation profiles for wavefront-guided correction of myopia and primary spherical aberration. Journal of Cataract and Refractive Surgery; 2002; 28:766-774.
 - b. Shen J, Joos K, Manns F, Denham D, Ren Q, Fankhauser F, Soderberg P, Parel JM; Ablation rate of cornea and PMMA with a frequency-quintupled Nd:YAG laser; Lasers in Surgery and Medicine; 1997; 21:179-185.
 - c. **Manns F**, Rol P, Shen J, Soderberg P, Matsui T, Parel JM; Optical profilometry of poly(methylmethacrylate) (PMMA) surfaces after reshaping with a scanning photorefractive keratectomy (SPRK) system; Applied Optics; 1996; 35:3338-3346.
 - d. **Manns F**, Shen J-H, Söderberg P, Matsui T, Parel J-M; Development of an algorithm for corneal reshaping with a scanning beam; Applied Optics; 1995; 34:4600-4608.
- 2. Dynamic OCT imaging of accommodation: I have served as one of the lead investigators in a project to develop instrumentation to synchronously image the dynamic changes in the crystalline lens and ciliary muscle during accommodation. When this project started, the imaging depth of OCT systems was limited to a few millimeters, insufficient to measure the entire lens or anterior segment. We developed and demonstrated an approach using an optical switch that increases the imaging depth and allows us to image the entire anterior segment dynamically during accommodation, and at the same time provides sufficient imaging depth to allow axial eye length measurements. We demonstrated that the OCT beam has sufficient depth of focus to allow acquisition of images of the entire eye without having to resort to a dual or dynamic focusing approach. These studies led to patented technology that has been licensed to a commercial OCT company. The system was combined with a second OCT system that images the ciliary muscle through the sclera. The combined system produced the first synchronous data on dynamic accommodation and presbyopia and evaluate the function of accommodating intraocular lenses.
 - a. Cabeza-Gil I, **Manns F**, Calvo B, Ruggeri M. Quantification of scleral changes during dynamic accommodation. Exp Eye Res. 2023 May;230:109441.
 - b. Ruggeri M, de Freitas Č, Williams S, Hernandez VM, Cabot F, Yesilirmak N, Alawa K, Chang YC, Yoo SH, Gregori G, Parel JM, Manns F. Quantification of the ciliary muscle and crystalline lens interaction during accommodation with synchronous OCT imaging. Biomedical Optics Express; 2016; 7 (3); 1351-1364
 - c. Ruggeri M, Hernandez V, de Freitas C, **Manns F**, Parel JM. Biometry of the ciliary muscle during dynamic accommodation assessed with OCT. In Ophthalmic Technologies XXIV, Proceedings SPIE Vol. 8930:89300W; 2014. (Winner of the best conference paper out of 57 submissions, Pascal Rol Award)
 - d. Ruggeri M, Uhlhorn S, De Freitas C, Ho A, **Manns F**, Parel JM. Imaging and full-length biometry of the eye during accommodation using Spectral-Domain OCT with an optical switch. Biomedical Optics Express, 2012; 3(7):1506-1520.
- 3. Optics of the crystalline lens: I have served as one of the lead investigators on studies using experimental technique and eye models to characterize the optics of the crystalline lens and its changes with age, both *in vitro* and *in vivo*. We have developed instrumentation to measure the lens shape, lens power, lens aberrations both on- and off-axis and we have collaborated with Prof. Susan Marcos and her team on the development of methods to reconstruct the lens refractive index gradient. These techniques were used by our collaborators at the LV Prasad Eye Institute in Hyderabad, India, to produce the first data on the refractive

index gradient of the lens measured using OCT, the first data on the peripheral optical properties of the lens, and an improve method to calculate lens power in vivo from OCT-based ocular biometry.

- a. Heilman BM, Mohamed A, Ruggeri M, Williams S, Ho A, Parel JM, **Manns F**. Age-dependence of the peripheral defocus of the isolated human crystalline lens. Investigative Ophthalmology and Vision Science 2021; 62(3):15.
- b. de Castro A, Birkenfeld J, Heilman BM, Ruggeri M, Arrieta E, Parel JM, Manns F, Marcos S. Off-axis optical coherence tomography imaging of the crystalline lens to reconstruct the gradient refractive index using optical methods. Biomedical Optics Express 2019; 10 (7): 3622-3634
- c. Ruggeri M, Williams S, Maceo-Heilman B, Yao Y, Chang YC, Mohamed A, Sravani NG, Durkee H, Rowaan C, Gonzalez A, Ho A, Parel JM, **Manns F**. System for on- and off-axis volumetric OCT imaging and ray tracing aberrometry of the crystalline lens. Biomedical Optics Express; 2018; 9 (8): 3834-3851.
- d. Hernandez VM, Cabot F, Ruggeri M, Ho A, Yoo S, Parel JM, **Manns F**. Calculation of crystalline power using a modification of the Bennett method. Biomedical Optics Express; 2015; 6 (11); 4501-4515.