

**Harvard Medical School/Harvard School of Dental Medicine  
Curriculum Vitae**

**Date Prepared:** 08/03/2017  
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**Education**

1995	MD magna cum laude	Medicine, Physiological Chemistry	University of Wuerzburg, Germany
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**Postdoctoral Training**

1992-1993	Intern	Internal Medicine	Medizinische Poliklinik, University of Wuerzburg
1993- 10/97	Research Associate	Molecular Endocrinology Prof. Dr. J. Koehrle	Medizinische Poliklinik, University of Wuerzburg
11/97 - 11/99	Postdoctoral Fellow	Genetics Prof. Dr. N. Niikawa	University of Nagasaki, Japan
03/00 - 07/07	Postdoctoral Fellow	Neurosurgery Research, Prof. Dr. R. Masland	Massachusetts General Hospital (MGH)

**Faculty Academic Appointments**

07/07 - 10/10	Instructor	Ophthalmology	Harvard Medical School (HMS)
11/10 – present	Assistant Professor	Ophthalmology	HMS

**Appointments at Hospitals/Affiliated Institutions**

08/07 - 05/09	Assistant Cell Biologist	Neurosurgery Research	MGH
07/07 - 10/10	Research Associate	Ophthalmology	Massachusetts Eye and Ear (MEE)
11/10- present	Assistant Scientist	Ophthalmology	MEE

## Committee Service

### **Local**

1994-1997	Radiation Safety 1994-1997	University of Wuerzburg Member
1996-1997	Biosafety 1996-1997	University of Wuerzburg Member
2009-2010	Laboratory Safety 2009-2010	MEE Member
2009-2011	Animal Care Committee 2009-2011	MEE Member
2011 – present	Animal Care Committee 2011 – present	Schepens Eye Research Institute (SERI) Member
2017 – 2020	ARVO	Annual Meeting Program Committee (Glaucoma section)

## Professional Societies

1996-1999	Deutsche Gesellschaft fuer Biochemie und Molekularbiologie (German Society for Biochemistry and Molecular Biology) 1996-1999	Member
1995- present	Deutsche Gesellschaft fuer Endokrinologie (German Endocrine Society) 1995-present	Member
2004 – present	Society for Neuroscience 2004 – present	Member
2006 – present	Association for Research in Vision and Ophthalmology (ARVO) 2006 – present	Member
2014 – present	International Society for Eye Research (ISER) 2014 – present	Member
2016 – present	American Association of Anatomists 2016 – present	Member
2017 – present	American Association for the Advancement of Science (AAAS)	Member

## Editorial Activities

### **Ad hoc Reviewer**

*Journal of Comparative Neurology*

*American Journal of Physiology*

*American Journal of Pathology*

*Journal of Neuroscience*

*Molecular Vision*

*Cellular and Molecular Neurobiology*

*PLOS ONE*

*Investigative Ophthalmology & Visual Science*

*Experimental Eye Research*  
*Glia*

### **Other Editorial Roles**

08/13 to present Editorial Review Board

*Molecular Vision*

### **Honors and Prizes**

1996	1 <sup>st</sup> von-Basedow Research Prize	German Endocrine Society	Cloning and characterization of the human 5'-deiodinase promoter and upstream regulatory elements
1997-1999	Full Scholarship	Japan Society for the Promotion of Science	
2012	Dolly Green Special Scholar Award	Research to Prevent Blindness	

## **Report of Funded and Unfunded Projects**

### **Funding Information**

#### **Past**

1995-1997	Deutsche Forschungsgemeinschaft (German Research Foundation) Wissenschaftlicher Mitarbeiter (Researcher) This project concerned the regulation of 5'-deiodinase, a key enzyme in thyroid hormone metabolism.
2000-2006	Howard Hughes Medical Institute Postdoctoral Researcher These studies aimed at correlating cell morphology with electrophysiology and molecular markers in retinal neurons.
2006-2011	Synaptic inputs to retinal ganglion cells NIH/R01-EY017169 Co-investigator to Dr. Richard Masland The goal of this study was to use an ex-vivo incubation method for adult rabbit retina and single-cell transfection methods to study the number, localization, and spatial arrangement of synaptic inputs to ganglion cells.
2009	Single-cell imaging of optic nerve astrocytes The Glaucoma Foundation PI (\$40,000) The goal of this study was to develop a mouse model of slowly-developing glaucoma which has fluorescently labeled astrocytes, and to study the optic nerves of these animals as they develop the disease.
2009-2010	Astrocyte reactions to optic nerve damage American Health Assistance Foundation PI (\$50,000)

	The goal of this study was to develop a mouse model of slowly-developing glaucoma which has fluorescently labeled astrocytes, and to study the optic nerves of these animals as they develop the disease.
2011-2012	A glaucoma model in guinea pigs International Retina Research Foundation PI (\$93,000) The goal of this project was to give an anatomical description of the glial architecture of the guinea pig optic nerve head and use microbead injection to induce glaucomatous changes in this animal.
09/13-8/14	The role of a regulatory long RNA in glaucoma Massachusetts Lions Eye Research Fund PI (\$33,800) The goal of this project was to identify the role of the regulatory RNA CDKN2BAS and the genes it regulates in normal and glaucomatous eyes.
2009-2015	Cell biology of astrocytes in the optic nerve head NIH/R01-EY019703 PI (\$1,000,000) This project was using short-term and long-term models of optic nerve damage with the overall goal of understanding “reactive gliosis” in the optic nerve more thoroughly.
2015	Macrophages in the optic nerve head Ellison Foundation PI (\$100,000) The goal of this project was to identify a population of macrophages or unusual microglia in the optic nerve head.
2016	Retinal and optic nerve microglia in a mouse with a deletion in the glaucoma susceptibility locus Ink4 Research to Prevent Blindness PI (\$38,333) The goal of this project was to study why mutations in this locus predispose to glaucoma.
2013-2016	The induction of reactivity in optic nerve astrocytes NIH/R01-EY022092 PI: Richard Masland (\$750,000) The goal of this project was to elucidate signaling mechanisms between ganglion cells and astrocytes.
<b>Current</b>	
2016-2020	Cell biology of astrocytes in the optic nerve head NIH/2R01-EY019703 PI (\$1,000,000) This project is using short-term and long-term models of optic nerve damage with the overall goal of understanding “reactive gliosis” in the optic nerve more thoroughly.
<b>Pending</b>	
	none

## **Report of Local Teaching and Training**

### **Teaching of Students in Courses**

1992	Physiological Chemistry for Medical Students	University of Wuerzburg, Germany
T. ASST.	Medical students	4 hours per week
2004-2005	The retina and the first steps in seeing; Biology 95hfm	Harvard FAS (undergraduate)
TUTOR	Harvard undergraduates	2 hours per week
2005-2006	The mammalian retina: anatomy, function, diseases; Biology 95hfm	Harvard FAS (undergraduate)
TUTOR	Harvard undergraduates	2 hours per week
2014	HMS Graduate Students	5 hours
TUTOR	Conduct of Science	
2015	SERI/MEEI students and fellows HBTM 303qc. Vision	1 hour
2017	Molecular Basis of Eye Diseases course	1 hour

### **Laboratory and Other Research Supervisory and Training Responsibilities**

2008 – present	Supervision of postdoctoral research fellows	~8 hours per week
2011-2012	Supervision of an Honors Thesis in Neurobiology	~4 hours per week
2013	Supervision of a Harvard Undergraduate project	~4 hours per week
2015	Supervision of a summer student	~4 hours per week
2015	Supervision of 2 visiting students	~ 8 hours per week
2017	Supervision of a Masters student	~ 4 hours per week

### **Formal Teaching of Peers (e.g., CME and other continuing education courses)**

1994-1997	Radiation Safety University of Wuerzburg	Twice yearly Germany
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### **Local Invited Presentations**

2008	Ganglion cell remodeling in a mouse model of glaucoma / Talk at MEE Summer Meeting MEE
2010	Optic nerve astrocytes in glaucoma / Talk at MEE Summer Meeting MEE
2010	Learning about glaucoma through cell biology / Talk MEE (The Glaucoma Foundation)

- 2011 Astrocytes and axons in the optic nerve head / Talk  
HMS (Dept. of Neurobiology)
- 2013 The morphology of astrocytes in a glaucomatous optic nerve / Talk at MEE Faculty  
Retreat  
MEE
- 2015 Optic Nerve Astrocytes in Glaucoma / Talk at the MEE Minisymposium  
MEE/SERI

## **Report of Regional, National and International Invited Teaching and Presentations**

### **Invited Presentations and Courses**

Those presentations below sponsored by outside entities are so noted and the sponsor is identified.

#### **Regional**

- 2009 Imaging of Optic Nerve Astrocytes in normal and glaucomatous mice / Talk  
Lasker Initiative, Woods Hole, MA
- 2015 Reversible Reactivity of Optic Nerve Astrocytes / Talk  
Lasker Initiative, Janelia Farm, MD

#### **National**

- 2010 The murine optic nerve head and its implications for glaucoma / Talk  
Vision Research Conference, Ft. Lauderdale
- 2011 Reactive astrocytes in the optic nerve / Talk  
Washington University, St. Louis, MO
- 2014 Astrocyte reactions in response to elevated intraocular pressure / Talk  
XXI Biennial ISER Congress, San Francisco, CA
- 2014 Reactive astrocytes in the optic nerve  
University of North Texas Health Science Center, Ft. Worth, TX
- 2015 Optic nerve head astrocytes in glaucoma / Talk  
Fox Center for Vision Restoration, University of Pittsburgh, Pittsburgh, PA
- 2017 Ocular phenotype of a mouse with a deletion in the glaucoma susceptibility locus Ink4  
Santen Symposium, San Francisco, CA (sponsored by Santen, Inc.)

#### **International**

- 2010 Normal and reactive astrocytes in the optic nerve head of the mouse / Talk  
XIX Biennial ISER Meeting, Montreal, Canada
- 2010 Optic nerve astrocytes in a mouse model of glaucoma / Talk  
Form and Function Meeting, Halifax Canada
- 2011 Glial architecture of the optic nerve head in health and disease / Talk  
ARVO Conference in Optic Nerve Degeneration, Protection, and Autoimmunity,  
Oberurgl, Austria
- 2012 Glial architecture of the optic nerve / Talk  
XX Biennial ISER Meeting, Berlin, Germany
- 2013 Astrocytes / Talk  
World Glaucoma Congress, Vancouver, Canada
- 2014 Reversible reactivity in optic nerve head astrocytes / Talk  
The Oberurgl Optic Nerve Meeting, Oberurgl, Austria

## **Report of Scholarship**

### **Publications**

#### **Peer reviewed publications in print or other media**

##### **Research Investigations**

1. **Jakobs TC**, Koehler MR, Schmutzler C, Glaser F, Schmid M, and Koehrle J; Structure of the human type I iodothyronine 5`-deiodinase gene and localization to chromosome 1p32-p33. (1997) *Genomics* 42, 361-363
2. Dreher I, **Jakobs TC**, and Koehrle J; Cloning and characterization of the human selenoprotein P promoter. Response of selenoprotein P expression to cytokines in liver cells. (1997) *J Biol Chem.* 272, 29364-29371
3. **Jakobs TC**, Schmutzler C, Meissner-Weigl J, and Koehrle J; The promoter of the human type I 5`-deiodinase gene: mapping of the transcription start site and identification of a DR+4 thyroid hormone responsive element. (1997) *Eur J Biochem.* 247, 288-297
4. Winzer R, Schmutzler C, **Jakobs TC**, Ebert R, Rendl J, Reiners C, Jakob F, and Koehrle J; Reverse Transcriptase-Polymerase Chain Reaction Analysis of Thyrocyte-Relevant Genes in Fine-Needle Aspiration Biopsies of the Human Thyroid. (1998) *Thyroid* 8, 981-987
5. Schmutzler C, Brtko J, Winzer R, **Jakobs TC**, Meissner-Weigl J, Simon D, Goretzki P, and Koehrle J; Retinoid and thyroid hormone receptors in human thyroid carcinoma cell lines and tissues. (1998) *Int J Cancer* 76, 368-376
6. Sugawara H, Egashira M, Harada N, **Jakobs TC**, Yoshiura K, Kishino T, Ohta T, Niikawa N, and Matsumoto N; Breakpoint analysis of a familial balanced translocation t(2;8)(q31;p21) associated with mesomelic dysplasia. (2002) *J Med Genet* 39(7):E34
7. **Jakobs TC**, Mentrup B, Schmutzler C, Dreher I, Glaser F, and Koehrle J; Proinflammatory cytokines inhibit the expression and function of human type I 5`-deiodinase in HepG2 hepatocarcinoma cells. (2002) *Eur J Endocrinol.* 146(4), 559-566
8. **Jakobs TC**, Ben Y, and Masland RH, CD15 immunoreactive amacrine cells in the mouse retina. (2003) *J Comp Neurol.* 465, 361-371
9. Koizumi A, **Jakobs TC**, and Masland RH, Inward rectifying currents stabilize the membrane potential in dendrites of mouse amacrine cells: patch-clamp recordings and single-cell RT-PCR. (2004) *Mol Vis* 10, 328-340
10. Lin B, **Jakobs TC**, and Masland RH; Different functional types of bipolar cells use different gap junctional proteins. (2005) *J Neurosci.* 25(28), 6696-6701
11. **Jakobs TC**, Libby RT, Ben Y, John SWM, and Masland RH; Retinal ganglion cell degeneration is topological but not cell type specific in DBA/2J mice. (2005) *J Cell Biol* 171(2), 313-325
12. Enoki R, **Jakobs TC**, and Koizumi A; Horizontal slice preparation of the retina. (2006) *J Vis Exp* Nov 20;(1):108
13. Koizumi A, Zeck G, Ben Y, Masland RH, and **Jakobs TC**; Organotypic culture of physiologically functional adult mammalian retinas. (2007) *PLoS ONE* 2(2): e221. doi:10.1371/journal.pone.0000221
14. Lye-Barthel M, **Jakobs TC**, Masland RH, and Koizumi A; Organotypic culture of adult rabbit retina. (2007) *J Vis Exp* 3:190
15. **Jakobs TC**, Ben Y, and Masland RH; Expression of mRNA for Glutamate Receptor Subunits Distinguishes the Major Classes of Retinal Neurons, but is Less Specific for Individual Cell Types. (2007) *Molecular Vision* 13, 933-948
16. Howell GR, Libby RT, **Jakobs TC**, Phalan FC, Barter JW, Barbay JM, Smith RS, Whitmore AV, Masland RH, and John SWM; Axons of retinal ganglion cells are insulated in the lamina early in an inherited mouse model of glaucoma. (2007) *J Cell Biol* 179(7), 1523-1537

17. **Jakobs TC**, Koizumi A, and Masland RH; The spatial distribution of glutamatergic inputs to dendrites of retinal ganglion cells. (2008) *J Comp Neurol* 510, 221-236
18. Sun D, Lye-Barthel M, Masland RH, and **Jakobs TC**; The morphology and spatial arrangement of astrocytes in the optic nerve head of the mouse. (2009) *J Comp Neurol* 516, 1-15
19. Sun D, Lye-Barthel M, Masland RH, and **Jakobs TC**; Structural remodeling of fibrous astrocytes after optic nerve injury. (2010) *J Neurosci.* 30(42), 14008-14019
20. Koizumi A, **Jakobs TC**, and Masland RH; A Mosaic of Synaptic Contacts among Three Retinal Neurons. (2011) *J Comp Neurol*, 519(2), 341-357
21. Sun D and **Jakobs TC**; Structural remodeling of astrocytes in the injured CNS. (2012) *Neuroscientist*, 18(6), 567-588
22. Lye-Barthel M, Sun D, and **Jakobs TC**; Morphology of astrocytes in a glaucomatous optic nerve. (2013) *Invest Ophthalmol Vis Sci*, 54, 909-917
23. Sun D, Qu J, and **Jakobs TC**; Reversible reactivity by optic nerve astrocytes. (2013) *Glia*, 61(8), 1218-1235
24. Qu J and **Jakobs TC**; The time course of gene expression during reactive gliosis in the optic nerve. (2013) *PLoS ONE*, 8(6) e67094
25. Choi HJ, Sun D, and **Jakobs TC**; Isolation of intact astrocytes from the optic nerve head of adult mice. (2015) *Exp Eye Res*, 137, 103-110
26. Choi HJ, Sun D, and **Jakobs TC**; Astrocytes in the optic nerve head express putative mechanosensitive channels. (2015) *Mol Vis*, 21, 749-766
27. Berry RH, Qu J, John SWM, Howell GR, and **Jakobs TC**; Synapse loss and dendrite remodeling in a mouse model of glaucoma. (2015) *PLoS ONE*, 10(12) e0144341
28. Gao S and **Jakobs TC**; Mice homozygous for a deletion in the glaucoma susceptibility locus *Ink4* show increased vulnerability of retinal ganglion cells to elevated intraocular pressure. (2016) *Am J Pathol*, 186(4), 985-1005
29. Wang R, Seifert P, and **Jakobs TC**; Astrocytes in the optic nerve head of glaucomatous mice display a characteristic reactive phenotype. (2017) *Invest Ophthalmol Vis Sci*, 58(2), 924-932
30. Sun D, Moore S, and **Jakobs TC**; Optic nerve astrocyte reactivity protects function in experimental glaucoma and other nerve injuries. (2017) *J Exp Med*, 214(5), 1411-1430

### [Non-peer reviewed scientific or medical publications/materials in print or other media](#)

1. **Jakobs TC** (1994) Charakterisierung der b-Kette des menschlichen Interleukin-2 Rezeptors und Expression seiner Extrazellulaeren Domaene in E.Coli. Inaugural-Dissertation, Med. Fakultat der Universitaet Wuerzburg
2. Dreher I, **Jakobs TC**, and Koehrl J (1998) Humanes Selenoprotein P: Promotercharakterisierung und Expressionsmuster. In: Koehrl (ed.) Mineralstoffe und Spurenelemente - Molekularbiologie - Interaktion mit dem Hormonsystem - Analytik. Stuttgart, Wiss. Verlagsgesellschaft
3. Koehrl J, Baur A, Dreher I, Hesse K, **Jakobs TC**, Lex B, Moerk H, Schmutzler C, Schuetze N, and Jakob F (1998) Regulation und Funktion neuer Selenoproteine. In: Meissner D (ed.) Spurenelemente. Stuttgart, Wiss. Verlagsgesellschaft
4. **Jakobs TC** (2014) Analysis of morphology and structural remodeling of astrocytes. In: Bakota L, Brandt R (eds.) Neuromethods 87. Laser scanning microscopy and quantitative image analysis of neuronal tissue. New York, Springer
5. **Jakobs TC**; Differential gene expression in glaucoma. (2014) Cold Spring Harbor Perspectives in Medicine, 4(7) a020636
6. **Jakobs TC**; Research Highlight: Ex-vivo imaging of the murine optic nerve head. (2017) *Invest Ophthalmol Vis Sci*, 58(2), 734
7. Choi HJ, Wang R, and **Jakobs TC**; Single-cell dissociation and characterization in the murine retina and optic nerve. In: **Jakobs TC** (ed.) Neuromethods (*in press*). Glaucoma: Methods and Protocols. New York, Springer



## Abstracts, Poster Presentations and Exhibits Presented at Professional Meetings

1. Gao S, **Jakobs TC**. Mice homozygous for a deletion in the glaucoma susceptibility locus Ink4 show increased vulnerability of retinal ganglion cells to elevated intraocular pressure. (2016) ARVO Conference, Seattle, WA

## Narrative Report

I am a research scientist who specializes in degenerative eye diseases, especially glaucoma. After completing my medical training at the University of Wurzburg/Germany in 1995, I worked in the laboratory of Prof. Josef Koehrlé at the Clinical Research Group of the Medical Policlinic of the University of Wurzburg on thyroid hormone metabolism. The work I completed there was awarded the First European von Basedow Research Prize in 1996. After two years in the Department of Human Genetics at the University of Nagasaki, I joined the laboratory of Dr. Richard Masland at Massachusetts General Hospital in March 2000 as a postdoctoral fellow. In 2007 I was appointed HMS Instructor in Ophthalmology and became Assistant Professor in 2010.

### *Area of Excellence*

I have been conducting bench research on the role of glial cells in glaucoma since 2009, currently at the Schepens Eye Research Institute. My laboratory work focuses on understanding the role of optic nerve glia in the progression of glaucoma by using transgenic animals, immunohistochemistry, visual function tests and electroretinography, and electron microscopy. We characterize molecular changes in reactive astrocytes by microarray screening and RNA sequencing. In 2009, I received an R01 grant from the NIH to study the cell biology of astrocytes in the optic nerve. At the beginning of the first grant period, very little was known about the morphology and gene expression profile of optic nerve astrocytes. We conducted several morphological studies and then turned our attention to gene expression and mechanism. During the first grant period, we published 9 original papers, 2 reviews, and one book chapter. This grant was renewed in 2016. In this second period, we are focusing on the regulation of astrocyte reactivity in glaucomatous nerves by signaling molecules and transcription factors. In addition, I have received several grants from research foundations, such as the Glaucoma Foundation, the Bright Focus Foundation, the Ellison Foundation, the Massachusetts Lions, and Research to Prevent Blindness. I have used these smaller grants to initiate new projects, for example a study that aims at understanding why genetic variants that have been associated with glaucoma in genome-wide association studies have this effect. Our result indicates that retinal and optic nerve microglia may be the cells that are primarily affected by the mutation. We have published our initial findings on this project in 2016 and are now following up with a study on gene expression in normal and mutant microglia.

### *Teaching and Education*

I have been actively involved in teaching and supervising four postdoctoral research fellows, four joint PhD students, one technician, and several undergraduate students from Harvard FAS and Tufts University. Two of the PhD students have already returned to China and graduated with publications in IOVS and the American Journal of Pathology based on the work they did in my lab. The first postdoc who ever joined my lab has recently been promoted to Instructor and has obtained his first independent grant support. An HMS student, who did work for his Honors Thesis in my lab, graduated with a first-author publication. I also teach retinal anatomy in the Molecular Basis of Eye Diseases course.

Since my promotion to Assistant Professor, I have authored 11 original research papers, three invited reviews or commentaries, and two book chapters. I am the editor of an upcoming volume on methods in glaucoma research, to be published by Springer this year. Through my lecturing at a local/regional, national and international level, my bench research, and my involvement with ARVO (as a member of the program committee) and ISER I have sought to improve our understanding of the pathogenesis of glaucoma.