

Curriculum Vitae

Kent T. Keyser, Ph.D.
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 Birmingham, AL 35294

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EDUCATION:

1972 Oberlin College, Oberlin, Ohio
 BA, Biology

1980 SUNY at Stony Brook, Stony Brook, NY
 Ph.D., Neurobiology and Behavior

EXPERIENCE:

2016-present Associate Vice President for Research
 2013-2016 Assistant Vice President for Research

2011-2013 UAB Center for Clinical and Translational Science Executive Committee
 Co-Director for Strategic Partnerships

2009-2011 Co-Director for Translational Platforms
 UAB Center for Clinical and Translational Science

2008-2011 Director, Translational Technologies and Novel Methodologies Component
 UAB Center for Clinical and Translational Science

2005-present Director, Neuroimaging Core, Alabama Neuroscience Blueprint Grant

2000-present Professor, Department of Vision Sciences, School of Optometry, University of Alabama
 at Birmingham

1999-2013 Director, Vision Science Research Center
 Secondary appointment: Department of Biomedical Engineering
 Secondary appointment: Department of Cell, Developmental, and Integrative Biology

Secondary appointment: Department of Neurobiology
 Secondary appointment: Department of Psychology

1998-2017 Director, UAB High Resolution Imaging Facility

 Scientist, UAB Comprehensive Cancer Center

 Senior Scientist, Comprehensive Arthritis, Musculoskeletal and Autoimmunity Center

 Other Center memberships: Civitan International Research Center, Nephrology
 Research and Training Center, Center for Clinical and Translational Science, Minority
 Health and Health Disparities Research Center, Hepatorenal Fibrocystic Disease Core
 Center.

12/2003-6/2004 Interim Chair, Department of Physiological Optics, University of Alabama at
 Birmingham

1996-2000 Associate Professor, Department of Physiological Optics
 Secondary appointment: Department of Neurobiology

1995-1996 Associate Research Neuroscientist, Step 2,
 Dept. of Neurosciences, UCSD, La Jolla, CA

1994-1995 Assistant Research Neuroscientist, Step 6
 Dept. of Neurosciences, UCSD, La Jolla, CA

1993-1994 Assistant Research Neuroscientist, Step 5
 Dept. of Neurosciences, UCSD, La Jolla, CA

1988-1993 Assistant Research Neuroscientist, Step 3
 Dept. of Neurosciences, UCSD, La Jolla, CA

1986-1988 Post Graduate Research Scientist, Step 4
 Dept. of Neurosciences, UCSD, La Jolla, CA

1983-1986 Research Scientist
 Dept. of Psychiatry, Health Sciences Center
 SUNY at Stony Brook, NY

1981-1983 Research Scientist
 Long Island Research Institute, Stony Brook, NY

1979-1981 Staff Fellow
 NIH, Laboratory of Experimental Pathology
 NIAMDD, Bethesda, MD

PROFESSIONAL SOCIETIES:

Society for Neuroscience
Association for Research in Vision and Ophthalmology
American Association for the Advancement of Science
Microscopy Society of America
FAAO
Society for Translational Research

OTHER PROFESSIONAL ACTIVITIES:

Member of the Editorial Board, *Visual Neuroscience*, 1993-1997.

Guest Editor, *Investigative Ophthalmology and Visual Science*, 2000, 2001

Ad hoc reviewer for a number of journals including, but not limited to, *J. Neuroscience*, *Visual Neuroscience*, *J. Comparative Neurology*, *PNAS*, *J. Neurochem.*, and agencies including NSF.

President, Birmingham Area Chapter of the Society for Neuroscience: 1997-2004.

Chair, Host Committee for the NEI LOW VISION exhibit. Official national opening: Brookwood Mall, Birmingham, AL, January 2000.

Association for Research in Vision and Ophthalmology: Anatomy and Pathology Program Committee: 1999-2002.

Association for Research in Vision and Ophthalmology: Anatomy and Pathology Program Committee, Anatomy Subsection Chair 2002

Association for Research in Vision and Ophthalmology: Public Relations Committee, 2002-2005

Association for Research in Vision and Ophthalmology: Chair, Public Relations Committee, 2004-5

External Advisory Committee, Bascom Palmer Eye Institute, Miami, FL. 2002-2006

Scientific Advisory Committee: Neuroscience Research Center, Tufts University Medical School, Tufts University, Boston, MS. 2003-present

Visual Neuroscience Section Co-organizer and presenter, XVI International Congress of Eye Research, Sydney Australia, 2004

Visual Neuroscience Section Co-organizer and presenter, XVIII International Congress of Eye Research, Beijing, China, 2008

Core (P30) and Infrastructure (R24) grant study section (NEI), 2004, 2005, 2007

BDPE (formerly VIS C) Study Section (NEI) *ad hoc* member 2002, 2004, 2005

UAB member of the Federal Demonstration Partnership: 2008-present

UAB rep for Council on Governmental Relations 2013-present

SCHOOL AND INSTITUTIONAL (CAMPUS-WIDE) SERVICE AT UAB

Director of the Translational Technologies and Novel Methodologies Component of the UAB Center for Clinical and Translational Science (CCTS) 2008-2012

Co-Director for Translational Platforms of the UAB Center for Clinical and Translational Science (CCTS) 2009-2012

Co-Chair of the University Community Incubator of the One Great Community component of the UAB Center for Clinical and Translational Science (CCTS) 2008-2012

Co-Leader of the research development Program, CCTS (Panels and Pilot Grant Program)

Director, Graduate Program in Vision Science 1998-2012

Director, Vision Science Research Center 1999-2012

Founder and Director, High Resolution Imaging Facility 1998-present

Chair, UAB Research Advisory Group, 2005-2008 (The group is advisory to the UAB Provost and Vice President for Research on research investments and funding programs)

UAB Research Advisory Group member, 1999-2008

Council of Center Directors (Chair Elect January 2006-December 2007; Chair January 2007-December 2008): A group established by the VP FOR Research that advises the administration on various issues, and works closely with the leadership of the new Center for Clinical and Translational Science.

Cores Committee (Chair): Developed an institutional strategy for core facilities for the VP for Research, and now directing implementation.

Minority Health and Research Center Internal Review Board Member 2002-2013

Arthritis and Musculoskeletal Disease Executive Committee, 2000-present

CCTS Executive Committee 2009-present

Hepatorenal Fibrocystic Disease Core Center SAC 2009-2014

Epitope Recognition and Immunoreagent Core Scientific Advisory Committee

School of Optometry Executive Committee, 2003-2012

UAB Committee on Postdoctoral Education 2004-2008

UAB Graduate School Advisory Committee 1998-2012

UAB Faculty Senate 1997-99

Neuroscience Theme (GBS) Curriculum Committee 2010- present

Responsible Conduct of Research AdCom 2016

Countless faculty and administrative search committees including (past 5 years):

UAB Vice President for Research

UAB School of Medicine Senior Associate Dean for Research

Department of Neurobiology, Chair

UAB School of Optometry, Dean

Department of Vision Sciences Chair, (Committee Chair)

Department of Biomedical Engineering, Chair

UAB Comprehensive Cancer Center, Director

College of Arts and Sciences, Dean

School of Dentistry, Associate Dean for Research (in progress)

COMMUNITY SERVICE

Rural Alabama Diabetes and Glaucoma Initiative: Founder, and Advisory Committee Chair

This was an outreach effort directed at the underserved population of the 17 Black Belt Counties of Alabama funded in part by a federal appropriation through the CDC

Alabama Underserved Health Partnership: Executive Committee member 2001-2005

This was a consortium of UAB Centers together with groups from other state institutions and civic organizations to coordinate minority health initiatives and federal funding requests for initiatives to serve underserved areas of Alabama.

McWane Science Center, Birmingham, AL: Consultant for exhibit development 2005-2007

(This was really fun)

TEACHING EXPERIENCE:

New Course Development (while at UAB)

Developmental Neuroscience: How to build a brain. 1997-2016, (students in Neuroscience, Vision Science, Cell Biology, Behavioral Neuroscience, Neurobiology, Biomedical Engineering, and others)

Dauphin Island Sea Lab Introduction to Neuroscience: Co-developer with Paul Gamlin, PhD: 1997-Present, Laboratory-intensive residential course held at the Dauphin Island Sea Lab for 2.5 weeks for senior undergraduates and early stage graduate students.

Dauphin Island Sea Lab Introduction to Neuroscience: Co-developer with Dr Anne Theibert PhD and Christianne Strang PhD: 2011-Present, Laboratory-intensive residential course held at DISL for 2 weeks for undergraduates

Development of the Human Visual System: Offered for the first time in 2009. The course involves both didactic lectures and discussion groups and covers cellular and molecular aspects of visual system development. Clinicians, especially pediatric optometrists and ophthalmologists participate to discuss clinical observations and specific cases of developmental abnormalities.

Lecturer in courses in the following graduate and professional programs at UAB (1996-present)
Surgical Physician's Program, Neuroscience section (School of Health Related Professions)
Integrated Biomedical Sciences (School of Medicine)
Cell and Molecular Biology (School of Medicine)
Behavioral Neuroscience (Psychology)
Biomedical Engineering (School of Engineering)
Vision Science (campus-wide)
Neuroscience Graduate Training Program (campus-wide)
Medical Neuroscience
Optometry-Dentistry Neuroscience
Graduate Biomedical Sciences (Medical Center-wide)

STUDENT and POSTDOC TRAINING (since 1996)

Post Doctoral Fellows (past): Yu Wang
Nina Dmitrieva, PhD
Margot Andison, PhD
Kosta Gavrikov (Research Associate)
Christianne Strang PhD
Christianne Strang PhD (Research Instructor)

Past Students: Meghan Miller-Behavioral Neuroscience Program (M.S. 2000)
Chuan-Qing Ding-Vision Science Program (Ph.D. 2002)
Christianne Strang, M.A. -Behavioral Neuroscience Program (Ph.D. 2004)
Brian Reed-Vision Science Program (Ph.D. 2004)
Laura Brockway-Vision Science Program (Ph.D. 2004)
Jordan Renna-Vision Science Program (Ph.D. 2008)
Ryan Splittgerber-Vision Science (Ph.D. 2008)
Ye Long-Vision Science PhD (PhD 2012)
Marci Smith- Behavioral Neuroscience Program (Ph.D. 2013)

Service on doctoral dissertation committees since 1996: partial list

Catherine Fenster	Neurobiology (PhD)
Grace Zhai	Neurobiology (PhD)
Kim Gerecke	Neurobiology (PhD)
Chang-Hoon Cho	Neurobiology (PhD)

Zhendong Ma	Cell Biology (PhD)
Yi Pang	Vision Science (PhD)
Jennifer Williams	Behavioral Neuroscience (MS)
Gregory McGillem	Vision Science (PhD)
Thomas Rotolo	Vision Science (PhD)
Xiaochuan Guo	Vision Science (PhD)
Chengwen Zhou	Vision Science (PhD)
Goldis Malek	Vision Science (PhD)
Susan Campbell	Neurobiology (PhD)
Anisha German	Behavioral Neuroscience (PhD)
Josh Shows	Vision Science (MS)
Chris Mazzochi	Cell Biology (PhD)
Qiang Wang	Neurobiology (PhD)
Brandon White	Vision Science (PhD)
Richard Pearson	Cell Biology
Meredith Turnbough	Behavioral Neuroscience (PhD)
Brian Erkkila	Neurobiology (PhD)
YouWen Zhang	Vision Science (PhD)
John Chijuka	Vision Science (PhD)
Ferial Zeried	Vision Science (PhD)
Shanta Sarfare	Vision Science (PhD)
Sudipto Mukherjee	Vision Science (PhD)
Weiming Mao	Vision Science (PhD)
Martin LaFrance	Vision Science (PhD)
Yizhe Tang	Vision Science (PhD) Graduated 2008
Portia McCoy	Neurobiology (PhD) Graduated 2008
Martin LaFrance	Vision Science (PhD) Graduated 2008
Jordan Renna	Vision Science (PhD) Graduated 2008
Ryan Splittgerber	Vision Science (PhD) Graduated 2008
Mauro Chavez	Vision Science (PhD) Graduated 2008
David McDougal	Vision Science (PhD) Graduated 2008
Laxmikanth Kankipati	Vision Science (PhD) Graduated 2009
Rob Carter	Biochem and Mol Genetics (PhD) Graduated 2009
Shanta Sarfare	Vision Science (PhD) Graduated 2010
Michael Risner	Vision Science (PhD) Graduated 2010
Chinwe Asomugha	Vision Science (PhD) Graduated 2011
Kate Kosmac	Cell Biology (PhD) Graduated 2013
Mack Nowac	Neuroscience Theme/Vision Sciences (PhD) Graduated 2013
Alex Ward	Cell and Developmental Theme (PhD) Graduated 2015
Hieu D Hoang	Cell and Developmental Theme (PhD) Graduated 2015

McNair Fellows (Minority): Crystal Gardner
Rachael Cowan
Anayi Reynolds

GRANT SUPPORT (in chronological order; details available on request):

Completed

Various competitively awarded scholarships and honors during graduate school and postdoctoral training.

Association for Research in Vision and Ophthalmology Travel Fellowship, 1987

National Eye Institute Research Award, RO1-EY07845, PI, 1988-1993 \$400,000

Tobacco Related Disease Research Program Award, PI, 1992-1994 \$450,000

National Eye Institute Research Award, RO1-EY07845, PI, 1993-1998

Mississippi-Alabama Sea Grant Consortium, Neurobiology Course Development, PI, 1997

Mississippi-Alabama Sea Grant Consortium, Neurobiology Course Development, PI, 1998

NIH NCRR Award, 1 S10 RR12930-01, MRC Krypton/Argon Imaging System, PI, 1998-2000

UAB Health Services Foundation Award, Imaging Facility 1998-2000 (Keyser, P.I.) \$221,000

National Cancer Institute, P30 CA13148, Comprehensive Cancer Center-Imaging Core PI, (LoBuglio-PI),
1998-2003 \$125,000/YR

UAB Health Services Foundation Award (Supplement), Imaging Facility 2000-2002 (Keyser, P.I.) \$150,000

National Science Foundation, IBN-0090388, Neurobiology Research Experience for Upper Level
Undergrads, PI, 2000-2001 \$50,000

Provost's Educational Foundation Award, PI, 2001 \$150,000

National Eye Institute Training Grant T35 EY07084, PI, 2001-2006 \$58,000

National Institute of Arthritis, Musculoskeletal & Skin Disease, P30 AR48311, Imaging Core PI, (Kimberly-
PI), 2001-2006 \$60,00/yr

Lions Clubs International Foundation Award: Rural Alabama Glaucoma and Diabetes Initiative, 2002 (PI,
with Christopher Girkin, MD; Dennis Pillion, PhD; Mary Jean Sanspree, PhD) \$50,000

Central Alabama Community Foundation Award: Rural Alabama Glaucoma and Diabetes Initiative, 2002-
2008 (PI, with Christopher Girkin, MD; Dennis Pillion, PhD; Mary Jean Sanspree, PhD)

Total funding including CDC award: \$700K

National Eye Institute Research Award, RO1-EY07845 2004-2009 (Keyser, P.I.)
Total Award: 348,159

NIAMS: Skin Diseases Research Center P30, Pilot and Feasibility Study, PI, 2005-2007
\$25,000

NEI: National Eye Institute Training Grant T32 EY07033 (Keyser, P.I.) \$250,000/yr (renewed twice)

National Rosacea Society Research Grant 2006-2007 \$27,500

NIH: Alabama Neuroscience Blueprint Award, 2006-2011 (Roth, PI)
Neuroimaging Core, PI 2006-2011: \$1.8 million over five years

EyeSight Foundation of Alabama 2010-2013 (Keyser, P.I.) \$57,000

NCRR: Center for Clinical and Translational Science, (Guay-Woodford, PI) Total Award: \$ 15,438,151
2008-2013
Keyser, Co-Leader Translational Technologies and Novel Methodologies, Executive Council
member, Co-Leader for Strategic Partnerships

Active:

NIAMS: Rheumatic Disease Core Center (John Mountz, PI) 2013-2018
Recommended total costs: \$ 2,944,375
(Keyser, Co-PI) Analytical Imaging and Immunoreagent Core, Executive Council member

NCI: Comprehensive Cancer Center Core Support Grant (Partridge, PI) 2017-2021
Recommended total costs: \$13,756,420
(Keyser, PI) High Resolution Imaging Shared Resource

NCATS: Center for Clinical and Translational Science, (Robert P. Kimberly, PI) 2014-2018
Recommended total costs: \$29,724,501.00
Keyser, Co-Leader Pilots and Panels Program, Executive Council member

HONORS AND AWARDS (since 1999):

UAB President's Award for Excellence in Teaching (nominee): 1999, 2000

UAB President's Award for Excellence in Teaching: 2001

Association for Research in Vision and Ophthalmology Fellow (Silver): 2009

Sam Brown Bridge Builder Award: 2011

University Professor: 2013-present

INVITED TALKS

Selected talks:

Winter Retina Conference '96: Physiology, Computation, and Neuromorphic Engineering for Vision.
Jackson Hole, Wyoming, USA

Title: Structural and functional heterogeneity of nicotinic acetylcholine receptors in the visual system.
January 1996.

Avian Brain and Behavior Conference, Tihany, Hungary. August 25, 1996.

Title: Nicotinic acetylcholine receptors in the retina and retinorecipient areas of birds.

Max Planck Institute for Brain Research, Frankfurt, Germany

Dept. of Neuroanatomy. August 30, 1996.

Title: Structural and functional heterogeneity of nicotinic acetylcholine receptors in the visual system.

Ruhr-Universität, Bochum, Germany

Dept. of Biopsychology, September 2, 1996.

Title: Structural and functional heterogeneity of nicotinic acetylcholine receptors in the visual system.

University of Lausanne, Lausanne, Switzerland,

Institut d'Anatomie, September 5, 1996.

Title: Structural and functional heterogeneity of nicotinic acetylcholine receptors in the visual system.

The University at Stony Brook, Stony Brook, NY,

Department of Neurobiology and Behavior, December 4, 1996.

Title: Structural and functional heterogeneity of nicotinic acetylcholine receptors in the visual system.

The University of Tennessee Health Sciences Center

Department of Anatomy and Neurobiology October 2000

Title: Structural and functional heterogeneity of nicotinic acetylcholine receptors in the visual system.

Tufts Center for Vision Research, Tufts New England Medical Center, March 2003

Title: Structural and functional heterogeneity of nicotinic acetylcholine receptors in the visual system.

New England Eye Center, March 2004

Title: Structural and functional heterogeneity of nicotinic acetylcholine receptors in the visual system,
and The UAB Vision Science Research Center

XVI International Congress of Eye Research; September 2004

Title: Direct and Indirect Modulation of Retinal Ganglion Cell Responses Mediated
by Cholinergic Receptors

Session organizer

XVIII International Congress of Eye Research; September 2004

Title: Cholinergic signaling in the mammalian retina

Session organizer

Ohio State University College of Optometry
Title: Cholinergic signaling in the mammalian retina 2010

At UAB:

Department of Neurobiology, January 1997
Title: Structural and functional heterogeneity of nicotinic acetylcholine receptors in the visual system.

Department of Physiology and Biophysics, December, 1998
Title: Structural and functional heterogeneity of nicotinic acetylcholine receptors in the visual system.

Cardiac Rhythm Management Laboratory, February, 1999
Title: The UAB High Resolution Imaging Facility

Comparative Medicine, September, 1999
Title: The UAB High Resolution Imaging Facility

Division of Clinical Immunology and Rheumatology, January, 2000
Title: The UAB High Resolution Imaging Facility

Behavioral Neuroscience Program January, 2000
Title: The UAB High Resolution Imaging Facility

Department of Dermatology, June, 2000
Title: Structural and functional heterogeneity of nicotinic acetylcholine receptors in the visual system and other tissues

Gene Therapy Center seminar series, October 2001
Title: New technologies for detecting changes in gene expression

Skin Disease Research Center seminar series February 2007
Nicotine-evoked increases in intracellular Ca^{2+} in human dermal microvascular endothelial cells

Recent publications that are not primary research reports:

1. Keyser, KT & Strang, CE, (2009) Optical Imaging of Cancer: Enhancing Detection and Resection, in Optical Imaging in Cancer, Rosenthal EN & Zinn, KR, Eds. Springer, New York.
2. Keyser, KT, Wotring VE, & Strang, CE, (2010) The Role of Acetylcholine and its Receptors in Retinal Processing. 204. Invited paper in: Encyclopedia of the Eye, Vol 4 p 153. Besharse, J., Co- Editor, Dartt, D, Editor-in-Chief. Elsevier, Oxford, UK. ISBN-13: 978-0-12-374198-1
3. Keyser, KT, Wotring VE, & Strang, CE. (2016) The Role of Acetylcholine and its Receptors in Retinal Processing. Invited review. Reference Module in Neuroscience, Neuroscience and Biobehavioral Psychology, Elsevier.

SELECTED RESEARCH PUBLICATIONS

- (1) Keyser, K.T. and Lent, C.M. (1977). On neuronal homologies within the central nervous system of leeches. *Comparative Biochemistry and Physiology A*, 58:285-297.
- (2) Lent C.M., Ono, J., Keyser, K.T. and Karten, H.J. (1979). Identification of serotonin within vital-stained neurons from leech ganglia. *Journal of Neurochemistry* 32:1559-1564.
- (3) Keyser, K.T. and Lent, C.M. (1982). The Leydig cells within the central nervous system of the leech. *Journal of Comparative Physiology* 146:379-392.
- (4) Reiner, A., Krause, J.E., Keyser, K.T., Eldred, W.D., and McKelvey, J.F. (1984). Substance P distribution in the turtle nervous system: A immunohistochemical and radioimmunoassay study. *Journal of Comparative Neurology* 226:50-75.
- (5) Walcott, B., Keyser, K.T., and Sibony, P. (1985). Association of nerves and plasma cells in a tear gland. In *Leukocytes and Host Defense*. Edited by Oppenheim and Jacobs, Alan R. Liss Inc. p227-247.
- (6) Jones, Paul S., Tesser, Paul, Keyser, Kent T., Quitschke, Wolfgang, Samadi, Ramin, Karten, Harvey J., and Schecter, Nisson. (1986). Immunohistochemical localization of origin in the goldfish optic nerve: Specific molecular markers for optic nerve structures. *Journal of Neurochemistry* 47: 1226-1234.
- (7) Berman, P., Gray, P., Chen, E., Keyser, K., Ehrlich, D., Karten, H., LaCorbiere, M., Esch, F., and Schubert, D. (1987). Sequence analysis, cellular localization, and expression of a neuroretina adhesion and cell survival molecule. *Cell* 51: 1135-142.
- (8) Keyser, K.T., Karten, H.J., Katz, B., and Bohn, M.C. (1987) Catecholaminergic horizontal and amacrine cells in the ferret retina. *Journal of Neuroscience* 7:3996-4004.
- (9) Ehrlich, D., Keyser, K.T., and Karten, H.J. (1987) The distribution of substance P-like immunoreactive retinal ganglion cells and their pattern of termination in the optic tectum of the chick (*Gallus gallus*). *Journal of Comparative Neurology* 266:220-233.
- (10) Britto, L.R.G., Keyser, K.T., Hamassaki, D.E., and Karten, H.J. (1988) Catecholaminergic subpopulation of retinal displaced ganglion cells projects to the accessory optic nucleus in the pigeon (*Columba livia*). *Journal of Comparative Neurology* 269:109-117.
- (11) Keyser, K.T., Hughes, T.E., Whiting, P.J., Lindstrom, J.M., and Karten, H.J. (1988) Cholinergic neurons in the retina of the chick: An immunohistochemical study of the nicotinic acetylcholine receptors. *Visual Neuroscience* 1:349-366.
- (12) Walcott, B., Sibony, P., and Keyser, K.T. (1989) Neuropeptides and the innervation of a lacrimal gland. *Investigative Ophthalmology and Visual Science* 30:1666-1674.

- (13) Schoepfer, R., Whiting, P., Luther, M., Keyser, K., Karten, H., and Lindstrom, J. (1989) Structure of muscle and neuronal acetylcholine receptors. In: *Molecular Biology of Receptors and Ion Channels*, (A. Maelicke, Ed.), NATO-ASI Series, Springer-Verlag, Berlin, Heidelberg Vol. H32:37-53.
- (14) Karten, H.J., Keyser, K.T. and Brecha, N. (1989) Biochemical and morphological heterogeneity of retinal ganglion cells. In: *Vision and the Brain*, B. Cohen and I. Bodis-Wollner (Eds.) Research Publications: Association for Research in Nervous and Mental Disease, Vol. 67. Raven Press, New York.
- (15) Britto, L.R.G., Hamassaki, D.E., Keyser, K.T. and Karten, H.J. (1989) Neurotransmitters, receptors and neuropeptides in the accessory optic system: An immunohistochemical survey in the pigeon (*Columba livia*). *Visual Neuroscience* 3(5):463-475.
- (16) Britto, L.R.G., Keyser, K.T., Hamassaki, D.E., Shimizu, T. and Karten, H.J. (1989) Axonal collateralization of chemically-specific retinal ganglion cells in the pigeon (*Columba livia*). *Visual Neuroscience* 3(5):477-482.
- (17) Ehrlich, D., Keyser, K.T., Manthorpe, M., and Karten, H.J. (1990) Differential effects of axotomy on Substance P-containing and nicotinic acetylcholine receptor containing ganglion cells: Time course of degeneration and effects of nerve growth factor. *Neuroscience*, 36(3):699-723.
- (18) Keyser, K.T., Britto, L.R.G., Woo, J.I, Park, D.H. Joh, T.H., and Karten, H.J. (1990) Presumptive catecholaminergic ganglion cells in the pigeon retina. *Visual Neuroscience* 4(3):225-235.
- (19) Sanna, P.P., Keyser, K.T., Battenberg, E., and Bloom, F.E. (1990) Parvalbumin immunoreactivity in the rat retina. *Neuroscience Letters* 118:136-139.
- (20) Whiting, P.J., Schoepfer, R., Conroy, W.G., Gore, M.J., Keyser, K.T., Shimasaki, S., Esch, F. and Lindstrom, J. (1991) Expression of nicotinic acetylcholine receptor subtypes in the brain and retina. *Molecular Brain Research* 10:61-70.
- (21) Hamassaki-Britto, D.E., Brzozowska-Prechtel, A., Karten, H.J. and Keyser, K.T. (1991) GABA-like immunoreactive cells containing nicotinic acetylcholine receptors in the chick retina. *Journal of Comparative Neurology* 313:394-408.
- (22) Sanna, P.P., Keyser, K.T., Deerinck, T.J., Ellisman, M.H. Karten, H.J. and Bloom, F.E. (1991) Distribution and ontogeny of parvalbumin immunoreactivity in the chicken retina. *Neuroscience* 47 (3):745-751.
- (23) Britto, L.R.G., Keyser, K.T., Lindstrom, J.M. and Karten, H.J. (1992) Immunohistochemical localization of nicotinic acetylcholine receptor subunits in the mesencephalon and diencephalon of the chick (*Gallus gallus*). *Journal of Comparative Neurology* 317:325-340.
- (24) Britto, L.R.G., Hamassaki-Britto, D.E., Ferro, E.S., Keyser, K.T., Karten H.J. and Lindstrom, J.M. (1992) Neurons of the chick brain and retina expressing both α -bungarotoxin-sensitive and β -bungarotoxin-sensitive nicotinic acetylcholine receptors: An immunohistochemical analysis. *Brain Research*, 590:193-200.

- (25) Catsicas, S., Keyser, K.T., Karten, H.J., Wilson, M.C., and Milner, R.J. (1992) Differential expression of the presynaptic protein SNAP-25 in the mammalian retina. *Journal of Neuroscience Research*, 331-9.
- (26) Sanna, P.P., Keyser, K.T., Celio, M.R., Karten, H.J. and Bloom, F.E. (1993) Distribution of parvalbumin immunoreactivity in the vertebrate retina. *Brain Research*, 600:141-150.
- (27) Keyser, K.T., Britto, L.R.G., Schoepfer, R., Whiting, P.J., Cooper, J., Anand, R., Brzozowska-Prechtl, A., Karten, H.J. and Lindstrom, J.M. (1993) Three subtypes of α -bungarotoxin-sensitive nicotinic acetylcholine receptors are expressed in chick retina. *Journal of Neuroscience*, 13:442-454.
- (28) Hamassaki-Britto, D.E., Gardino, P.F., Hokoç, J.N., Keyser, K.T., Karten, H.J., Lindstrom, J.M. and Britto, L.R.G. (1994) Differential development of α -bungarotoxin-sensitive and α -bungarotoxin-insensitive nicotinic acetylcholine receptors in the chick retina. *Journal of Comparative Neurology* 347:161-170.
- (29) Britto, L.R.G., Torrão, A., Hamassaki-Britto, D.E., Mpodozis, J., Keyser, K.T., Lindstrom, J.M. and Karten, H.J. (1994) Effects of retinal lesions upon the distribution of nicotinic acetylcholine receptor subunits in the chick visual system. *Journal of Comparative Neurology* 350:473-484.
- (30) Gamlin, Paul D.R., Reiner, A., Keyser, K.T., and Karten, H.J. (1996). The projection of nucleus pretectalis to a retinorecipient tectal layer in the pigeon (*Columba livia*). *Journal of Comparative Neurology* 368:424-438.
- (31) Wang, F., Gerzanich, V., Wells, G.B., Anand, R., Peng, X., Keyser, K.T., and Lindstrom, J. (1996). Assembly of the human neuronal nicotinic receptor $\alpha 3$ subunit with $\alpha 2$, $\alpha 4$, and $\alpha 5$ subunits. *Journal of Biological Chemistry* 271(30):17656-17665.
- (32) Wang, F., Nelson, M.E., Kuryatov, A, Olale, F., Cooper, J., Keyser, K.T., and Lindstrom, J. (1998). Chronic nicotine treatment upregulates human $\alpha 3\alpha 2$, but not $\alpha 3\alpha 4$ AChRs stably transfected in human embryonic kidney cells. *Journal of Biological Chemistry* 273 (44):28721-28732.
- (33) Langloh, A.L.B., Berdiev, Bakhrom, Ji, Honglong, Keyser, K.T., Stanton, B.A., and Benos, D.J. (2000) Charged residues in the M2 region of $\alpha 7$ ENaC play a role in channel conductance. *American Journal of Physiology Cell Physiology* 278:C277-C291.
- (34) Keyser, K.T., MacNeil, M.A., Dmitrieva, N., Wang, F., Masland, R.H., and Lindstrom, J.M. (2000) Amacrine, ganglion and displaced amacrine cells in the rabbit retina express nicotinic acetylcholine receptors. *Visual Neuroscience*, 17:743-752.
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