



# ARTHUR N. POPPER

**Title:** Professor Emeritus, Department of Biology  
Research Professor, Department of Biology

**Additional Positions:** Editor, *Acoustics Today*  
Editor, *Springer Handbook of Auditory Research*

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Acoustics Today: [www.acousticstoday.org](http://www.acousticstoday.org)  
Springer Handbook of Auditory Research: <http://www.springer.com/series/2506>

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## Research Interests

My interests focus on the effects of man-made (or anthropogenic) noise on aquatic life, with particular focus on effects of such sounds on fishes. This interest allows me to take advantage of my decades of basic research on fish hearing capabilities and mechanisms and apply them to issues that have the potential to directly affect behavior and physiology of animals as the noise levels in the aquatic environment increases.

Recent studies have included effects of very intense man-made signals (pile driving, seismic air guns) as well as general increase in background noise levels (as from shipping and aquaculture). I also am very involved in working with U.S. and international institutions in evaluating overall effects of the increase in man-made noise on animals. This includes being organizer of three international meetings on effects of noise on aquatic life. I also serve as editor of two major publications, *the Springer Handbook of Auditory Research* and the journal *Acoustics Today*.

## Professional Experience (Academic)

- 2014 – present: Professor Emeritus, Department of Biology, University of Maryland
- 2014 – present: Research Professor, Department of Biology, University of Maryland
- 2014 – 2018: Co-Director (and co-founder), Terrapin Teachers program for developing STEM k-12 teachers
- 2013 – 2016: Special Advisor for STEM, Graduate School, University of Maryland
- 2009 - 2013: Associate Dean, Graduate School, University of Maryland
- 2004 - 2009: Associate Dean, College of Chemical and Life Sciences, University of Maryland
- 1987 - 2014: Professor, Department of Biology (formerly Zoology), University of Maryland
- 1987 - 1997: Chair, Department of Zoology, University of Maryland, College Park, MD
- 1983 - 1987: Professor, Department of Anatomy and Cell Biology, Georgetown University Schools of Medicine and Dentistry
- 1978 - 1983: Associate Professor, Department of Anatomy, Georgetown University, Washington, DC
- 1973 - 1978: Associate Professor, Department of Zoology, University of Hawai'i
- 1972 - 1978: Associate Zoologist, Laboratory of Sensory Sciences, University of Hawai'i
- 1969 - 1972: Assistant Professor, Department of Zoology, University of Hawaii, Honolulu, Hawai'i
- 1966 - 1969: Teaching Assistant, Queens College and City College of the City University of New York
- 1966 - 1969: Department of Animal Behavior, American Museum of Natural History, New York. Doctoral research on auditory mechanisms and acoustic behavior of fishes

## Education

- B.A. (Biology), 1964, New York University, Bronx, NY
- Ph.D. (Biology), 1969, City University of New York

## Courses Taught

### *University of Hawaii*

- Vertebrate Zoology (comparative anatomy) (undergraduate)
- Ethology (undergraduate)
- Evolution (undergraduate/graduate)
- Animal Behavior (graduate)
- Seminar in Sensory Biology
- Seminar in Animal Communications

### *Georgetown University*

- Dental Neurobiology (organized course and was course director for 2 years)
- Medical Neurobiology (course director)
- Seminar in Computer Programming
- Seminar in Grant Writing

## ***University of Maryland***

Neural Basis of Behavior (seminar)  
Neuroethology (undergraduate and graduate)  
Principles of Biology (Freshman Biology)  
Ethics in Scientific Research  
Vertebrate Form and Function  
Noise, Life, and the Environment (Honors seminar)

## **Awards And Honors**

NIH Predoctoral Fellowship  
NIH Research Career Development Award (1978-1983)  
Fellow, American Association for the Advancement of Science (1983)  
Outstanding Administrator, special recognition award from Maryland Association of Higher Education (1991)  
Fellow, Acoustical Society of America (1994)  
Outstanding Faculty Research, College of Life Sciences, University of Maryland (1996)  
Distinguished Scholar-Teacher, University of Maryland (1999-2000)  
Federal Highway Administration 2005 Environmental Excellence Award - for Excellence in Ecosystems, Habitat, and Wildlife: Fisheries-Hydroacoustics Mitigation for San Francisco Bay Bridges/Bioacoustics Workgroup (<http://www.fhwa.dot.gov/environment/eea2005/ecosystems.htm>)  
University System of Maryland Regent's Faculty Award for Mentoring (2010) (<http://www.diamondbackonline.com/news/keeping-faculty-a-float-1.1429575>)

## **Membership In Learned And Professional Societies**

Acoustical Society of America (Fellow)  
American Association for the Advancement of Science (Fellow)  
Association for Research in Otolaryngology  
International Society for Neuroethology

## **Grant Support**

### *Current*

Living Marine Programs (LMR, US Navy) "The Effects of Underwater Explosions on Fishes" 2016-2021, Total Award \$1,250,000 (PI Peter Dahl, U. Washington, role: co-PI and project leader).

### *Past*

National Math + Science Initiative "Terrapin Teachers – A Replication of UTeach at the University of Maryland," 2014-2019, Total Award \$1,450,000 (Arthur Popper and Daniel Chazan, co-PI's)  
Various funding for "Fourth International Conference on the Effects of Noise on Aquatic Life." Dublin, Ireland, July 10-16, 2016. PI on funding from ONR, NASA, NSF, BOEM, and private organizations.  
National Institute on Deafness and Other Communication Disorders: Training Grant "Comparative and Evolutionary Biology of Hearing," 1994-1999, 1999-2004, 2004-2009, 2009-2014 (1 T32 DC 00046). Total current Award \$3,680,000. (PI, Robert Dooling Co-PI)  
Naval Postgraduate School "Third International Conference on Effects of Noise on Aquatic Life, 1/2013-4/2014 (N00244-13-1-0015) Total Award \$30,000  
National Science Foundation "Conference on Effects of Noise on Aquatic Life, 10/1/2012-3/31/2014 (OCE-1247301) Total Award \$32,730  
National Institute on Deafness and Other Communication Disorders: "Core Center," 2003-2008, 2008-20013, (2 P30 DC004664) Total award \$2,350,000 (Robert Dooling PI, Arthur Popper Co-PI)  
Mineral Management Service (MMS): "Effects of pile driving sounds on auditory and non-auditory tissues of fish: 6/9/08-1/15/13. Total Award, \$920,000. (PI, Michele Halorsen Co-PI)  
Office of Naval Research: "Second International Conference on the Effects of Noise on Aquatic Life," 10/1/2009-9/31/2010. Total Award, \$24,999. (PI)

Minerals Management Service: "Second International Conference on the Effects of Noise on Aquatic Life," 10/1/2009-12/31/2010. Total Award, \$50,000. (PI)

National Science Foundation: "EERE: Maryland Initiative on Research Ethics," 9/1/06-8/31/10, Total award \$198,344 (Arthur Popper PI, Phil DeShong and Robert Dooling Co-PI's).

National Science Foundation: "Second International Conference on the Effects of Noise on Aquatic Life," 10/1/2009-9/31/2010. Total Award, \$45,000. (PI)

Marine Mammal Commission: "Second International Conference on the Effects of Noise on Aquatic Life," 9/1/2009-12/31/2010. Total Award, \$10,000. (PI)

Department of Fisheries and Oceans (Canada, Arctic Region): "Second International Conference on the Effects of Noise on Aquatic Life," 1/1/2010-9/31/2010. Total Award, \$13,595. (PI)

Pacific Northwest Labs: "Predicting and mitigating hydroacoustic impacts on fish from pile installations," 4/1/06-3/31/09. Total Award, \$150,000.

National Science Foundation: "Working group on the effects of sound on fish and turtles," 2/1/07-1/31/09, Total Award, \$40,000 (via Mote Marine Laboratory)

Chief of Naval Operations (N45): "Effects of mid-frequency sonar on fishes," 4/1/06-3/31/08. Total Award, \$1,290,401.

National Science Foundation: "Acquisition of Analytical Spectrometers for the Creation of a Regional Electron Microscopy Facility for Research and Education," 9/1/06-8/31/07, Total award \$500,000 (L. Salamanca-Riba, PI, Arthur Popper Co-PI).

Chief of Naval Operations (Marine Acoustics Inc.): "Effects of high intensity sound," 10/03-3/07. Total Award \$672,000.

Office of Naval Research: "International Conference on the Effects of Noise on Marine Animals," 11/06/06 – 6/30/08, Total Award \$24,992.

Office of Naval Research Global: "International Conference on the Effects of Noise on Marine Animals," 11/16/06 – 8/16/08, Total Award \$15,000.

National Science Foundation: International conference on the Effects of Noise on Aquatic Animals," 12/15/06 – 8/30/08, Total Award, \$24,992.

Army Corps of Engineers (Normandeau Associates): "Evaluating the Effects of Underwater Noise on the Hearing Sensitivity of Hatchery Chinook Salmon Smolts Barged from the Snake River Basin," 4/1/05-3/31/05, Total Award \$114,250.

The Conservation Fund: "Effects of aquaculture sounds on fishes," 7/04-12/05. Total award \$50,000

National Institute on Deafness and Other Communicative Disorders: "Mechanisms of Ultrasound Detection," 2/99-7/05 (1 R01 DC03936). Total Award \$1,340,000.

National Institute on Deafness and Other Communication Disorders: "Hearing in Zebrafish," 5/2002-4/2004 (DC-05481). Total Award \$75,000 (Robert Dooling Co-PI).

Public Service Environmental Group "The Auditory System of Sciaenid Fishes," 7/00-6/02. Total Award \$104,747.

Maryland Higher Education Commission: "Enrichment of High School Biology Programs in Maryland," 1990-2000 (Dwight D. Eisenhower Mathematics and Science Education Act, P.L. 100-297) (90-03-214 214). Total award over 10 years \$1,090,994; current year: \$99,500.

National Institute on Aging: "Development and Aging in the Auditory System," 1998-1999 (AG015681). Total Award \$74,000.

National Science Foundation: "Mechanisms of Hearing by Clupeid Fishes," 1996-1999 (IBN9631354). Total Award \$170,000.

Office of Naval Research: "Sound Localization by Fish: Mechanisms and Models" 1994-1997 (N-00014-94-10410). Total Award \$340,506.

Battelle Pacific Northwest Laboratories: "The Structure of the Octavolateralis System in Salmonids: Ontogeny," 1996-1997. Total Award \$79,994.

Office of Naval Research: Workshop on Hearing and Acoustic Behavior of Cetaceans, 1995-1996 (N00014-96-1-0130). Total Award \$2,250.

National Aeronautics and Space Administration: "Evolution of Gravity Receptors in the Ear," 1992-1996 (NAG 2-787). Total Award \$155,000.

Office of Naval Research: "Effects of Sounds on Hair Cell Receptor Systems of Fish." 1992-1994 (N-00014-92-J-1889). Total Award \$167,332.

Office of Naval Research: "Acoustic Transduction in Fish, 1987-1994 (N-00014-92-J-1114). Total Award \$113,610.

Office of Naval Research: "US-Russian Workshop on Sensory Biology," 1993-1994. Total Award \$28,000.

National Science Foundation: "US-Russian Workshop on Sensory Biology," 1993-1994. Total Award \$32,000.

Office of Naval Research: "Workshop on Recent Advances in Studies of Fish Hearing, 1991-1993. Total Award \$20,000.

National Science Foundation: "Research Experience for Undergraduates in Neurobiology and Behavior," 1991-1994. Total Award \$149,000.

National Institute of Neurological and Communicative Disorders and Stroke: "Sensory Hair Cell Development in the Ear," 1984-1987 (RO1 NS-21646). Total Award \$209,003.

Office of Naval Research: "Acoustic Transduction in Fish," 1980-1986. Total Award \$223,253.

Office of Naval Research: "Electron Microscopic Examination of Biological Tissue," Multi-User Equipment Grant, 1984-1985. Total Award \$122,000

National Science Foundation: "Conference on Sensory Biology of Aquatic Animals, 1984-1986. Total Award \$10,000.

Office of Naval Research: "Conference on Sensory Biology of Aquatic Animals," 1984-1986 (N-0014-84-G-0107). Total Award \$14,999.

National Institutes of Health, Division of Research Resources: "Access to the Prophet Computing System, 1980-1987.

National Science Foundation: "Ultrastructure and Development of the Ear, 1982-1985. Total Award \$95,000.

National Science Foundation: "Ultrastructure of the Ear in Fishes, 1980-1982. Total Award \$87,356.

National Science Foundation: "Multi-user Equipment Grant for the Study of Sensory and Other Systems,@ 1980-1981 (P. Andrews, Co-P.I.). Total Award \$90,000.

National Science Foundation: "Conference on Hearing and Sound Communication in Fishes, 1980-1981 (with R. R. Fay and W. N. Tavolga). Total Award \$10,000.

National Institute of Neurological and Communicative Disorders and Stroke: "Physiological Determinations of Inner Ear Function, Research Career Development Award, 1978-1983. Total Award \$197,155.

National Science Foundation: "Ultrastructure of the Ear in Fishes," 1977-1980. Total Award \$93,400.

Deafness Research Foundation: "Hair Cell Orientation in the Ear," 1977-1979. Total Award \$9,500.

Office of Naval Research: "Sound Localization by the Bottlenose Porpoise," 1974-1977. Total Award \$123,200.

National Institute of Neurological and Communicative Disorders and Stroke: "Processing of Acoustic Information," 1970-1992. Total Award \$1.2 million (seven competing renewals).

## External Responsibilities

### *Past Responsibilities*

Editorial Board, *Experimental Biology*, 1985-1989

Committee on Low-Frequency Sound and Marine Mammals, National Research Council, 1992-1994

Acoustical Society of America, Animal Bio-Acoustics Technical Specialty Group, 1991-1998

Advisor, Committee on Hearing, Bioacoustics, and Biomechanics of the National Research Council, 1985-1995

External Reviewer, Department of Zoology, The Ohio State University, 1995

Program Committee, Association for Research in Otolaryngology, 1993-1996

Newsletter Editor, International Society for Neuroethology, 1996-1998

Chair, Ad Hoc Committee on Publications of Association for Research in Otolaryngology to look into development of society journal, 1998-1999

Editorial Board, *Hearing Research*, 1994-1999

Editorial Board, *Acta Zoologica*, 1982-2000

Chair, National Research Council Committee to Review Results of ATOC's Marine Mammal Research Program, 1995-2000

External Reviewer, Department of Biology, Rutgers University (Camden campus), 2000  
Secretary, International Society for Neuroethology, 1998-2001  
National Research Council Committee on Assessing Ambient Noise in the Ocean with Regard to Impacts on Marine Mammals, 2001-2003  
Council Delegate from Section on Biological Sciences (G) of American Association for the Advancement of Science, 2001-2004  
American Editor, *Bioacoustics*, 1987-2005  
Consulting Editor, McGraw-Hill Encyclopedia in Science with responsibility for developing neuroscience articles, 1998-2005  
Co-Chair, Publications Committee, Association for Research in Otolaryngology, 1999-2007  
Chair, Long Range Planning Committee, International Society for Neuroethology, 2001-2007  
International Organizing Committee, 4<sup>th</sup> International Otolith Symposium, Monterey, CA, Aug. 24-28, 2009.  
Member, Fisheries Hydroacoustics Working Group (California Department of Transportation), 2004-2008  
Member, Committee on Animal Bioacoustics, Acoustical Society of America, 2006-2009  
Organizer, 2<sup>nd</sup> International Conference on Effects of Noise on Aquatic Life, Cork, Ireland, August 2010  
Organizer, 10<sup>th</sup> meeting of International Society for Neuroethology, August 2012, College Park, Maryland ([www.icn2012.umd.edu](http://www.icn2012.umd.edu))  
Organizer, third international meeting on “The Effects of Noise on Aquatic Life” held in Budapest, Hungary, August 11-16, 2013 ([www.an2013.org](http://www.an2013.org))  
Co-Chair, Working Group S3/WG92 on “Effects of Sound on Fish and Turtles” of the Standards Committee S3 of the Acoustical Society of America, 2005-2014  
Editorial Board, *Bioacoustics*, 2005-2018  
Member, ASA Standards Technical Council WG3 “Measurement of radiated noise from marine pile driving” 2014-2018

### ***Current***

Editor, *Springer Handbook of Auditory Research*, 1989-present  
Member of Advisory Panel to “Discovery of Sound in the Sea” web site ([www.dosits.org](http://www.dosits.org)) 2011- present  
Member, Animal Bioacoustics Technical Committee, Acoustical Society of America, 2012- present  
Associate Editor (Animal Bioacoustics), *Journal of the Acoustical Society of America*, 2013- present  
Coordinating Editor for Animal Bioacoustics, *Journal of the Acoustical Society of America*, 2016-present  
Editorial Board (*ex officio*), Acoustical Society of America Books, 2013- present  
Editor, *Acoustics Today*, 2014- present  
Ad Hoc reviewer for numerous journals and funding agencies

## **Major University Committees and Administrative Responsibilities**

### ***Georgetown University***

Chair, Anatomy Graduate Advisory Committee, 1980-1985  
Department of Microbiology Review Committee (member), 1982  
Department of Anatomy Personnel Committee (member), 1982-1986  
Course Director for Medical Neurobiology, 1982-1987  
Medical Center Council (governing body of Medical Center) (member), 1983  
Search Committee for Chair of Department of Ophthalmology (member), 1983  
Course Director and Organizer for Dental Neurobiology, 1982-1984  
Search Committee for Dean of the School of Medicine (member), 1984-1985  
Co-Chair, Medical School Task Force on Curriculum Revision, 1985-1986  
Student Academic Evaluation Committee, School of Dentistry (member), 1984-1987  
Faculty Senator, 1986-1987  
Search Committee for Chair of Department of Pharmacology (member), 1986-1987

Georgetown University Committee on Science (member), 1986-1987  
Chair, Department of Anatomy Personnel Committee, 1986-1987  
Faculty Senate Steering Committee, 1986-1987

***University of Maryland*** (selected, past)

Chair, Search Committee for Associate Dean for Resident Instruction, 1987-1989  
Chair, Search Committee for Director of Molecular and Cellular Biology Program, 1988-1989  
Committee on "Distinguished Lecture Series," 1988-2002  
APAC (Academic Planning Advisory Committee), 1988-1991  
Steering Committee, Faculties Master Plan for College Park Campus, 1988-1991  
Chair, Honors Program Director search committee, 1988-1990  
Department Leadership Institute Planning Committee, 1988-1989  
Local Planning Committee, ICSEB-IV, 1988-1990  
Search Committee, Director CEES, 1989-1990  
Campus Distinguished Lecture Series Committee, 1990-1995  
Review Committee-College of Library and Information Services, 1991  
Reallocation Committee, 1991  
Associate Director, Center for Neurosciences, 1989-1993; Acting Director, 1990-1991  
Presenter, UMCP New Chairs Conference, 1990-1996  
UMCP Honorary Degree Committee, 1991-1994  
Chair, Search Committee for Chair of the Department of Human Nutrition and Food Services, 1992-1993  
Search Committee, Chair of Department of Psychology, 1992-1993  
Leader, Department Chairperson Workshop, University of Maryland at College Park, August 1990-1997  
Discussant, Department Chairperson Workshop, University of Maryland System, October, 1994  
Continuing Education Coordination Committee, 1994-1995  
Grant application committee-NSF Proposal for Integration of Science and Education, 1996  
Institutional Animal Care and Use Committee (IACUC), 1997-1998  
Chair, University System of Maryland (USM) Committee on Cooperative Graduate Programs, 1998-1999  
Graduate Council Research Committee, 1998-2000  
Campus Affairs Committee of Campus Senate, 1998-2000  
College Committee on National Research Council Review, 1999-2000  
Campus Senate Nominations Committee, 1999  
Chair, Biology Department Retreat Planning Committee, 1999-2000  
Chair, Biology Department Molecular Neurobiology Search, 1999-2000  
Campus Senate, 1999-2000  
Member, Campus Bio-Science Research Review Day Committee, 2000  
Chair, Biology Department Long Range Planning Committee, 2000-2002  
Member, Campus Teaching Facilities Committee, 2000-2002  
Member, Department of Biology Faculty Advisory Committee, 2001-2002  
Member, University Senate Executive Committee, 2001-2003  
Chair, Senate PCC Committee, 2002-2003  
Campus Committee on Awards and Prizes, 1994-2002  
Chair, Institutional Animal Care and Use Committee (IACUC), 1998-2003  
Director, Neuroscience and Cognitive Science Program, 1998-2004  
Co-Chair, Graduate School's Committee on Mentorship, 2001-2003 (with R. Dooling)  
Member, Campus Research Council, 2000-2004  
Chair-Elect, University Senate, 2003-2004  
Member, President's Task Force on Academic Affairs, 2003-2004  
Member, Academic Planning and Advisory Committee, 2003-2004  
Member, Facilities Council, 2003-2004  
Chair, Department of Biology Sensory Physiology Search Committee, 2004-2005  
Co-Chair, Campus Task Force on Mentoring of Junior Faculty 2003-2005

Chair, University Senate, 2004-2005  
Member, University Senate Governmental Affairs Committee, 2003-2005  
Chair, University Senate Governmental Affairs Committee, 2005-2006  
Member, Task Force on External Funding, 2005-2007  
Oversee University preparation for Middle States accreditation, 2005-2007  
Chair, Steering and Organizational Committees, University of Maryland Middle States accreditation, 2005-2007  
Member, University Senate, 2001-2004, 2005-2008  
Member, Athletic Council, 2005-2008  
Member, Senate Executive Committee, 2005-2008  
Member, Campus Affairs Committee (University Senate), 2008-2009  
Distinguished Scholar-Teacher Selection Committee, 2008, 2009  
Council Academic Deans for Graduate Education (CADGE), 2008-2010  
Senate/President Joint Task Force on Merit Pay, 11/2009-2010  
Director of Environmental Safety Search Committee, 11/2009-2010  
Member, Council of University System Faculty (CUSF), 2008-2011  
Member, Faculty Affairs Committee (University Senate), 2009-2012  
Member (ex officio), Academic Policies and Standards (University Senate), 2010-2012  
Member (ex officio), Senate PCC, 2011-2012  
Member (liaison), Faculty Affairs Committee of Graduate Council, 2010-2012  
Member, Executive Committee, Neuroscience & Cognitive Science Program, 2010-2012  
Co-Director, Center for Comparative and Evolutionary Biology of Hearing, 2001-2014  
Member, Biology Department Awards Committee, 2010-2014  
Presenter in monthly campus-wide program in Responsible Conduct of Research training, 2009-  
Member, Graduate Council, 2013-2015  
Member, Research Council, 2013-2014

### ***University of Maryland*** (current)

Maryland Emeritus/Emerita Association (UMEEA) of the University of Maryland (College Park)  
(Founding member and member of Steering Committee), 2015-present

## **Students Supervised**

### ***University of Hawaii***

Anna-Mae Sliz, M.S., 1972, "The Role of the Swim bladder in Sound Detection"  
Elsie Gillary, M.S., 1973, "Vision in Strombid Gastropods"  
Donna McDonald-Renaud, Ph.D., 1974, "Sound Localization in The Bottlenose Porpoise, *Tursiops truncatus*"  
Nancy Clarke, M.S., 1974, "Laser Interferometric Analysis of Swim Bladder Function"  
Usanee Limbasuta, M.S., 1974, "Development of Tuna"  
John Henderson, M.S., 1974, "Visual Mechanisms in *Strombus*"  
Patrick Moore, M.S., 1975, "Sound Localization by Pinnipeds"  
Becky Houck, Ph.D., 1977, "A Morphological and Behavioral Study of Extra-Ocular Photoreception in Octopods"  
Sheryl Coombs, Ph.D., 1980, "A Comparative Study of Hearing Capabilities Among Teleost Fishes"  
Robert Moeng, Ph.D., 1980, "Auditory Responses of Sacculus Neurons of the Catfish, *Ictalurus punctatus*"

### ***Georgetown University***

William M. Saidel, Postdoctoral, 1980-1982, "Physiology and Innervation of the Ear of Fishes"  
Catherine A. McCormick, Postdoctoral, 1979-1983, "Behavioral Studies of Hearing in a Mormyrid Fish"  
Gloria Meredith, Ph.D., 1983, "The Peripheral Configuration and Primary Afferent Projections of the Inner Ear and Lateral Line in the Teleost Fish, *Astronotus ocellatus*"



Bernd Sokolowski, Ph.D., 1985, "A Microscopic Study of the Development of the Sacculle in the Toadfish, *Opsanus tau*"  
Carsten Mathiesen, Postdoctoral, 1985-1986, "Structure of the Ear in the Gar"  
Joelle C. Presson, Postdoctoral, 1985-1990, "Innervation and Development of the Teleost Ear"

### ***University of Maryland***

#### ***Completed***

Hong Y. Yan, Postdoctoral, 1989-1993, "Psychophysical determination of hearing capabilities"  
Peggy Edds, Ph.D. 1988-1994, "Central projections of the inner ear"  
Janet Chang, MS 1990-1992, "Ultrastructure of sensory hair cells"  
Antoni Lombarte, Postdoctoral, 1990-1992, "Regeneration of sensory hair cells"  
Pamela Lanford, Ph.D., 1991-1997, "Development of sensory hair cells in fishes"  
David Mann, Postdoctoral, 1995-1997, "Temporal parameters in acoustic communication"  
Jiakun Song, Postdoctoral, 1992-1997, "Efferent components of the octavolateralis system"  
Zhongmin Lu, Postdoctoral, 1994-1999, "Physiology of eighth nerve units of the ear"  
Heather Wilkins, Ph.D., 1995-2000, "Development of sensory hair cells"  
Dennis Higgs, Postdoctoral, 1999-2003, "Ultrasound detection in fish"  
Dennis Plachta, Postdoctoral, 2000-2002, "Physiology of inner ear responses"  
Kirstan Poling, Postdoctoral, 2001-2003, "Hearing by zebrafish"  
John Ramcharitar, Ph.D. program, 1998-2003, "Structure-function relationships in the auditory system of Sciaenid fish"  
Allison Coffin, Ph.D. program, 2000-2005, "Evolution of sensory hair cells"  
Michael Smith, Postdoctoral, 2002-2005, "Impact of anthropogenic sound on the auditory system"  
Eric Boger, Ph.D. program, 2003-2006 "Molecular biology of myosin XV" (co-mentored with NIH colleague Dr. Thomas Friedman)  
Jennifer Hill, Postdoctoral 2006-2007, "Development of sensory hair cells in fish"  
Diane Miller, M.S. program, 2004-2007  
Lidia Wysocki, Postdoctoral, 2004-2007, "Effects of anthropogenic sound on fishes"  
David Zeddies, Postdoctoral, 2003-2008, "Biomechanical aspects of ultrasound detection"  
Michaela Meyer, Ph.D. program 1999-2008, "Auditory mechanisms in a primitive fish"  
Michele Halvorsen, Postdoctoral, 2003-2008, "Effects of anthropogenic sound on fish"  
Xiaohong Deng, Ph.D. program (NACS), 2000-2009, "Inner ear function in deep sea fishes"  
Raymond Merritt, Ph.D. program (NACS) 2004-2009, "Genetics of the inner ear" (co-mentored with Dr. Bachara Kachar, NIH)  
Jin Liang, Ph.D. program (NACS), 2004-2010, "Regulation of development and regeneration of sensory hair cells" (co-mentored with Dr. Shawn Burgess, NIH)  
Sandra Blumenrath, Ph. D. program (BIOL), 2005-2011 "sound detection in the presence of noise" (co-mentored with Robert Dooling)  
Lale Evsen, Ph.D. program (NACS), 2004-2012, "Development of the ear" (co-mentored with Dr. Doris Wu, NIH)  
Brandon Casper, Postdoctoral, 2008-2012, "Effects of anthropogenic sound on fish"

### **Publications (Research)**

1. Jacobs, D.W., and Popper, A.N. (1968). Stimulus effectiveness in avoidance behavior in fishes. *Psychon. Sci.* 12:109-110.
2. Popper, A.N. (1970). Auditory capacities of the Mexican blind cave fish *Astyanax jordani* and its eyed ancestor *Astyanax mexicanus*. *Anim. Behav.* 18:552-562.
3. Popper, A.N. (1971). The morphology of the Weberian ossicles in two species of *Astyanax* (Ostariophysi: Characidae). *J. Morphol.* 133:179-188.
4. Popper, A.N. (1971). The effects of size on the auditory capacities of the goldfish. *J. Aud. Res.* 11:239-247.

5. Popper, A.N. (1972). Auditory thresholds in the goldfish (*Carassius auratus*) as a function of signal duration. *J. Acoust. Soc. Am.* 52:596-602.
6. Popper, A.N. (1972). Pure-tone auditory thresholds for the carp *Cyprinus carpio*. *J. Acoust. Soc. Am.* 52:1714-1717.
7. Popper, A.N., Chan, A.T.H., and Clarke, N.L. (1973). An evaluation of methods for behavioral investigations of teleost audition. *Behav. Res. Methods Instr.* 5:470-472.
8. Popper, A.N., Salmon, M., and Parvulescu, A. (1973). Sound localization by two species of Hawaiian squirrelfish, *Myripristis berndti* and *M. argyromus*. *Anim. Behav.* 21:86-97.
9. Popper, A.N., and Fay, R.R. (1973). Sound detection and processing by fish: A critical review. *J. Acoust. Soc. Am.* 53:1515-1529.
10. Demski, L., Gerald, G.W., and Popper, A.N. (1973). Central and peripheral mechanisms in teleost sound production. *Am. Zool.* 13:1141-1167.
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## Conferences and Symposia Organized

- Workshop on "Comparative Animal Communications," May, 1976, Ann Arbor, Michigan (with W. Stebbins).
- Conference on "Comparative Studies of Hearing in Vertebrates," November 1978, Honolulu Hawaii, at meeting of Acoustical Societies of America and Japan (with R. R. Fay).
- Conference on "Hearing and Sound Communication in Fishes," June, 1980, Sarasota, Florida (with W.N. Tavalga and R.R. Fay).
- Workshop on "Comparative Hearing," February 1985, St. Petersburg Beach, Florida, at meeting of Association for Research in Otolaryngology (with R. Turner).
- Conference on "Sensory Biology of Aquatic Animals," June 1985, Sarasota, Florida (with J. Atema, R.R. Fay and W.N. Tavalga).
- Conference on "Comparative Evolutionary Biology of Hearing," May, 1990, Sarasota, Florida (with R.R. Fay and D.B. Webster).
- Symposium on Animal Bioacoustics, May 1991 meeting of Acoustical Society of America, Baltimore, MD.
- Workshop on "Recent Advances in Understanding of Fish Hearing," October, 1991, Airlie House, Warrenton, VA.
- Symposium on "Evolution of Hearing" for February 1992 meeting of Association for Research in Otolaryngology, St. Petersburg Beach, FL. (with R.R. Fay and D.B. Webster).
- Symposium on "Interactions Between the Auditory and Mauthner Cell Systems" for August 1992 meeting of the International Congress of Neuroethology, Montreal, Canada (with R. Eaton).
- Workshop on Using sound to modify fish behavior at power-production and water-control facilities @ December 12-13, 1995, Portland, OR. (with T. Carlson).
- Workshop on Cetacean Acoustics at 1996 meeting of the Association for Research in Otolaryngology, St. Petersburg Beach, FL. Feb. 8, 1996 (with H. Hawkins and W. Dolphin).
- Karger Workshop, 1996 meeting of J.B. Johnston Club (Society for Neurosciences): AEvolution of Sensory Systems, November 21, 1996 (with R.R. Fay).
- Animal Behavior Society, organizer of 1997 annual meeting at University of Maryland, College Park.

- Fish Bioacoustics: Sensory Biology, Behavior, and Practical Applications, Chicago, IL, May 30-June 2, 2001 (with R. R. Fay and J. Webb).
- “International Conference on Acoustic Communication by Animals,” College Park, MD, July 27-30, 2003.
- “Workshop on Setting Standards for Sound Exposure of Fish,” multiple meetings 2005-2007 funded by National Marine Fisheries Service and other organizations and done in conjunction with Acoustical Society of America.
- “Fish Bioacoustics: A tribute to Arthur Myrberg,” symposium at the joint meeting of the Acoustical Society America and the Acoustical Society of Japan, November 29, 2006, Honolulu, HI.
- International Conference on “Effects of Noise on Aquatic Life,” Nyborg, Denmark, August 13-17, 2007.
- 2<sup>nd</sup> International Conference on “Effects of Noise on Aquatic Life,” Cork, Ireland, August 15-20, 2010.
- 10<sup>th</sup> meeting of International Congress of Neuroethology, August 2012, College Park, MD. Chair, local organizing committee. ([www.icn2012.umd.edu](http://www.icn2012.umd.edu))
- 3<sup>rd</sup> International Conference on “Effects of Noise on Aquatic Life,” Budapest, Hungary, August 11-15, 2013.
- 4<sup>th</sup> International Conference on “Effects of Noise on Aquatic Life,” Dublin, Ireland, July 10-16, 2016.
- 5<sup>th</sup> International Conference on “Effects of Noise on Aquatic Life,” Den Haag, The Netherlands, July 2-9, 2019 ([www.an-2019.org](http://www.an-2019.org)).

### Abstracts and Presentations (Selected)

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- Popper, A.N., and Hoxter, B. (1985). Sensory and non-sensory ciliated epithelia in the lamprey ear. Conference on "Sensory Biology of Aquatic Animals," Sarasota, FL., June 24-29.
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## Invited Presentations (Selected)

- “Sonic mechanisms in fish.” Symposium on “Sound Production Mechanisms in Vertebrates.” American Association for the Advancement of Science, December 1972.
- “The structure and function of the elasmobranch auditory system.” Symposium on “Elasmobranch Biology,” American Society of Zoologists, June 1976.
- “Organizations of the inner ear and auditory processing.” Symposium on “CNS and Behavior of Bony Fishes,” Society for Neuroscience. 1977
- “A comparative study of the otolithic organs in fishes.” Workshop on Sensory Organs. Scanning Electron Microscopy 1978 meeting.
- “Structure and function in teleost auditory systems.” Symposium on “Comparative Studies of Hearing in Vertebrates.” Joint meeting of the Acoustical Society of America and Acoustical Society of Japan, Honolulu, HI, November 1978.
- “Behavioral measures of odontocete hearing.” NATO Advanced Study Institute, “Animal Sonar Systems,” Isle of Jersey, UK, April 1979.
- “Acoustic Detection by Fishes.” NATO Advanced Study Institute on “Environmental Physiology of Fishes,” Bishop's University, Lennoxville, Quebec, Canada, July 1979.
- “Structure and function in the ear.” Symposium on “Hearing and Sound Communication in Fishes,” Sarasota, FL, April 1980.
- “Morphological basis of sound reception in Actinopterygian fishes.” In symposium on “Evolutionary Morphology of Actinopterygian Fishes,” Meeting of American Society of Zoologists, Seattle, WA, December 1980.
- “Comparative observations on the fine structure of the fish ear, and experiments on temporal neural coding in the fish auditory system.” Symposium on “Perspectives on Modern Auditory Research: A Conference in Honor of E.G. Wever,” Princeton, NJ, May 23-25, 1982.
- “Problems and perspectives on hearing in fish.” Symposium on “International Conference on Comparative Physiology: Comparative Physiology of Sensory Systems,” Crans Montana, Switzerland, June 14-18, 1982.
- “The role of the fish ear in sound processing.” Conference on “Sensory Biology of Aquatic Animals,” Sarasota, FL, June 24-29, 1985.
- “Inner ear and lateral line functional relations to supracellular organization.” Symposium on “Neurobiology and Evolution of the Lateral Line,” Bielefeld, West Germany, August 31 to September 4, 1987.
- “Peripheral anatomy of the auditory system: structure, function, innervation and post-embryonic development.” Swammerdam Lecture at the Royal Dutch Academy of Science, September 20, 1989.
- “The evolution of the ear in fish: A hairy enigma.” Invited lecture in honor of the 50th anniversary of the Parmlly Hearing Institute, Loyola University of Chicago, June 11, 1993.
- “Postembryonic regeneration and generation of sensory hair cells in the octavolateralis system of bony fishes.” In symposium on “Hearing Research Trust Workshop: Repair and Regeneration in the Inner Ear,” Kent, UK, July 8-11, 1993.
- “The not-so-silent world of fishes.” Invited presentation to Washington, DC, Regional Chapter of the Acoustical Society of America, October 20, 1994
- “Determining the effects of low-frequency sound on the fish auditory system.” In symposium on Animal Bioacoustics: Research Methodology, December 1994 meeting of Acoustical Society of America (Hastings, M.C., Finneran, J.J., Popper, A.N., and Lanford, P.J.)
- “The octavolateralis system in fishes: Structure and function.” In symposium on “A Sensory Ecology and Physiology of Zooplankton,” Honolulu, HI, January 7, 1995.
- “Sensory hair cells of the ear: A hairy enigma.” BUMP Program at Marine Biological Laboratory, Woods Hole, MA, March 9, 1995.
- “Hair cell heterogeneity in fishes: A new perspective on the evolution of the vertebrate ear.” NIDCD, August 8, 1995.
- “Perspectives on the role of the department chair.” University of Maryland System Chairperson's Conference, Baltimore, MD, October 27, 1995.

- “Moths, herring, and hearing.” J. B. Johnston Club Annual Meeting, New Orleans, LA, October 24, 1997.
- “Hair cells, herring, and hake: Insights into the evolution of hearing.” Bloedel Center, University of Washington, Seattle, WA, October 1997.
- “Hair cells, herring, and hake: Insights into the evolution of hearing.” Department of Biological Sciences, University of Aarhus, Aarhus, Denmark, February 4, 1998.
- “Hearing and non-hearing effects of noise.” Office of Naval Research meeting on Effects of Human-Generated Noise on Marine Animals, February 10-12, 1998, Arlington, VA.
- “Structure and function in the teleost auditory system.” Institute for Zoology, University of Vienna, Vienna, Austria, May 4, 1998.
- “Hair cells and the evolution of vertebrate hearing,” Neuroscience Program, University of Vienna, Vienna, Austria, May 7, 1998.
- “Structure and function in the teleost auditory system.” Department of Biology, University of Bonn, Bonn, Germany, June 12, 1998.
- “Fish hearing and the evolution of the vertebrate auditory system.” Institute of Animal Bioacoustics, Odense University, Odense, Denmark, June 18, 1998.
- “Structure-function relationships in fish auditory systems.” Keynote talk at Second International Meeting on Fish Otolith Applications and Research, Bergen, Norway, June 21, 1998.
- “Hair cells, herring, and the evolution of the vertebrate auditory system.” 1999 Gilbert Lecture, Cornell University, Ithaca, NY, March 4, 1999.
- “Sound detection and processing by fish: recent advances.” Plenary talk at First International Conference on Sensory Processing of the Aquatic Environment, Heron Island, Australia, March 1999.
- “Fish and the evolution of the vertebrate auditory system.” Gordon Research Conference on Neuroethology: Behavior, Evolution, and Neurobiology, Oxford, UK, September 1999.
- “Hair cells, herring, and hearing.” Department of Biology, Villanova University, Philadelphia, PA, October 28, 1999.
- “Vignettes on a theme of fish hearing.” Department of Biology, Dalhousie University, Halifax, Nova Scotia, November 4, 1999.
- “Herring hearing.” Tel Aviv University, Tel Aviv, Israel, January 11, 2000.
- “Evolution of hair cells.” In Symposium on Evolution of Hearing at ARO Meeting, February 23, 2000.
- “How not to be mentored.” Department of Communications, University of Maryland, College Park, MD, March 30, 2000.
- “Scientific Integrity: Mentoring and other issues.” Committee on the History and Philosophy of Sciences, University of Maryland, College Park, MD, May 4, 2000.
- “Hair cells, herring, and evolution of hearing.” Institute of Experimental Medicine, Czech Academy of Sciences, Prague, Czech Republic, July 28, 2000.
- “Ultrasound detection by fishes: Hearing capabilities and structural basis.” 12th International Symposium on Hearing, Mierlo, The Netherlands, August 4-9, 2000.
- “Fish bioacoustics: An overview.” Workshop on Effects of Seismic Signals, Halifax, Nova Scotia, Canada, September 7-8, 2000.
- Discussant on impact of air-guns and other seismic disturbances on marine organisms. Ad Hoc Meeting of Biologists for Seismic Studies, Newport Beach, CA, December 6-7, 2000.
- “Auditory mechanisms of teleost fishes: What we can learn from zebrafish and herring.” Marine Biological Laboratory, Woods Hole, MA, March 30, 2001.
- “Sound detection by fishes.” University of Rome at Tor Vergata, Rome, Italy, May 3, 2001.
- “The ear of teleost fishes: Form and function.” Anatomisches Institut, Graduate School of Neural and Behavioural Sciences, Universität Tübingen, Tübingen, Germany, August 8, 2001.
- Discussant on effects of pingers and other underwater sound sources on marine organisms. Workshop on Mitigation of Interactions Between Dolphins and Fisheries Through the Use of Acoustic Harassment Devices: Effectiveness, Impact, and Possible Alternatives, Rome, Italy, May 4-5, 2001
- “The enigma of fish ear diversity.” Acoustical Society of America meeting, Fort Lauderdale, FL, December 3-7, 2001.

- “The impact of anthropogenic sounds on fishes.” Acoustical Society of America meeting, Fort Lauderdale, FL, December 3-7, 2001.
- “An ichthyocentric view of vertebrate hearing.” Seminar, Australian Museum Department of Fish, Sydney, Australia, April 10, 2002.
- “Form and function in the fish auditory system.” Seminar, Department of Biology, University of Western Australia, Nedlands, Australia, April 17, 2002.
- “Form and function in the fish auditory system.” Seminar, Department of Physics, Curtin University, Perth, Australia, April 24, 2002.
- “Sound detection by fishes: Why and how.” Seminar, Institute of Taste, Smell, and Vision, University of Queensland, Brisbane, Australia, May 1, 2002.
- “Sound detection by fishes: Why and how.” Seminar, School of Biological Sciences, University of Auckland, Auckland, New Zealand, May 6, 2002.
- “Listening in the deep.” Keynote talk at Ecology, Ethology, and Evolution of Fishes, Quebec, Canada, August, 2002.
- “Sound detection by coral reef fishes.” First Pan-American/Iberian Meeting on Acoustics and Acoustical Society of America, Cancun, Mexico, December 5, 2002. *J. Acoust. Soc. Am.* 112:2203.
- “History of animal bioacoustics.” Keynote speech (with R. Dooling) at First Pan-American/Iberian Meeting on Acoustics and Acoustical Society of America, Cancun, Mexico, December 5, 2002. *J. Acoust. Soc. Am.* 112:2368.
- “An ichthyocentric view of the evolution of vertebrate hearing.” School of Marine Sciences, University of South Florida, St. Petersburg, FL, January 24, 2003.
- “Fish bioacoustics: A response to Dave Barry.” Monday Night at Mote series, Mote Marine Laboratory, Sarasota, FL, January 27, 2003.
- “The effects of anthropogenic sound on fish.” First International Conference on Acoustic Communication by Animals, College Park, MD, July 25, 2003.
- “Fish hearing.” Guest lecturer, course in “Acoustic Communication,” University of Southern Denmark, Odense, Denmark, August 15, 2003.
- “Anthropogenic sound in the marine environment,.” Guest lecturer, course in “Acoustic Communication,” University of Southern Denmark, Odense, Denmark, August 15, 2003.
- “Anthropogenic sound and other tales about fish hearing,” Virginia Bloedell Hearing Center, University of Washington, Seattle, February 16, 2004.
- “Auditory capabilities and mechanisms of teleost fishes,” NOAA, Seattle WA April 28, 2004.
- “Effects of noise on the auditory system of fishes,” National Aquarium in Baltimore, September 23, 2004.
- “Fish bioacoustics,” University of Lund, Sweden, October 18, 2004.
- “Effects of anthropogenic sounds on fishes,” University of Windsor, Canada, November 12, 2004.
- “Effects of anthropogenic sound on fishes,” Aquarium of the Pacific, Long Beach, CA Dec. 17, 2004.
- “A fish-ear view of vertebrate hearing,” Invited keynote talk at 4th Annual Eastern Auditory Retreat, July 15, 2005.
- “What do we know about pile driving and fish?” invited talk at 2005 International Conference on Ecology and Transportation, San Diego, CA, August 30, 2005.
- “Auditory mechanisms of fishes,” Distinguished Lecture, Hatfield Marine Laboratory, Oregon State University, Newport, OR, June 26, 2006.
- “Anthropogenic sound in the marine environment,” invited lecture at 2006 course in Animal Bioacoustics, Kerteminde, Denmark, August 27, 2006.
- “Effects of seismic air-guns on fish,” invited lecture at International workshop on “Impacts of Seismic Survey Activities on Whales and Other Marine Biota,” Dessau, Germany, September 6-7, 2006.
- “Effects of high intensity sonar on fish,” Keynote talk at conference on “Effects of Mid-Frequency Sonar on Marine Fishes,” at Duke University, April 19-20, 2007.
- “Comparative and Evolutionary Biology of Fish Hearing,” invited seminar George Washington University, Department of Biology, October 26, 2007.
- “Effects of Active Sonar on Fish,” invited lecture, Washington DC Chapter of the Acoustical Society of America, November 14, 2007.

- “Fish hearing: From evolution to application,” invited seminar, Dept. of Hearing and Speech Science, University of Maryland, November 20, 2007.
- “Effects of human-generated sound on fish,” invited lecture, Shanghai Fisheries University, Shanghai, China, November 30, 2007.
- “Effects of human-generated (anthropogenic) sound on fish,” invited lecture, Chinese Academy of Sciences (Institute for Zoology), December 6, 2007.
- “Anthropogenic sounds – Potential effects on fish,” invited talk, Acoustics '08, Paris, France, June 30, 2008.
- “Effects of Human-Generated Sound on Fish,” invited keynote talk, ASA Meeting on Animal Acoustics, August 12, 2008.
- “Effects of Noise on Aquatic Life,” invited talk, Oil and Gas Producers Assn. meeting, October 15, 2008.
- “Effects of Human-Generated Sound on Fish: Experimental Studies” (A. N. Popper and M. B. Halvorsen), invited talk, Fifth International Conference on Bio-Acoustics, Loughborough, UK, April 1, 2009.
- “The Future of Fish Bioacoustics,” Acoustical Society of America meeting on Fish Bioacoustics, Portland, OR, May 18, 2009.
- “Why Otoliths? The Rest of the Story!” keynote talk at 4<sup>th</sup> International Otolith Symposium, Monterey, CA, August 24, 2009.
- “Effects of Airgun Seismic Activity on Riverine Fishes.” Cott, P.A., A.N. Popper, D.A. Mann, and J.K. Jorgenson. Invited presentation Canadian Conference for Fisheries Research. Winnipeg, MB January 7-9, 2010.
- “Current laboratory research on effects of pile-driving sound on fish and current NCHRP results” Popper, A.N., Song, J., Carlson, T., Sanderson, D., Halvorsen, M., Transportation Research Board symposium, Jan.12, 2010.
- “Translational Fish Bioacoustics” presentation at closing of Parmlly Hearing Institute, Loyola Univ. of Chicago, April 17, 2010.
- ”Effects of mid-frequency sonar on fish” Halvorsen, M. B., Zeddies, D. A., Ellison, W., Song, J., Chicoine, D. R., and Popper, A. N. (2010). *J. Acoust. Soc. Am.* (abst.), 127:1755.
- ”Preliminary analysis of effects of pile driving sounds on fish” Popper, A. N., Casper, B. N., Song, J., Sanderson-Kilchenstein, D., Carlson, T., and Halvorsen, M. B. (2010). *J. Acoust. Soc. Am.* (abst), 127:1753
- ”Anthropogenic noise: Is it an issue for elasmobranch fishes?” Casper, B. M., and Popper, A. N. (2010). *J. Acoust. Soc. Am.*, 127, 1753-1754.
- ”Translational Bioacoustics: From Hawaiian Squirrelfish to the Tappan Zee Bridge” invited seminar, Feb. 3, 2011, Department of Biomedical Engineering, The Johns Hopkins University.
- “Effects of Noise Pollution on Fish Behavior and Physiology” invited talk at the Animal Behavior Society and International Society for Ethology in Bloomington, IN on August 2, 2011.
- “Overview on the Effects of Anthropogenic Sounds on Animals” invited talk at the 10<sup>th</sup> meeting of the International Bioacoustics Congress in La Rochelle, France on September 13, 2011.
- “Fishes vs. Wind Farms (and Other Things that Make Noise in the Sea” invited talk Boston University Department of Biomedical Engineering, April 20, 2012.
- “Effects of Man-Made Sound on Fishes” plenary talk at “Fish Passage 2012,” Amherst MA, June 5, 2012. <http://fishpassage.ecs.umass.edu/Conference2012/>.
- “From Blind Cave Fish to the Tappan Zee Bridge – A Tale of “Translational Neuroethology,” plenary talk, International Congress of Neuroethology, College Park, MD, August 6, 2012.
- “Effects of Anthropogenic sound on Fishes,” invited lecture, University of Leiden (Netherlands), October 16, 2012.
- “Recent Advances in Fish Hearing” invited lecture, University of Leiden (Netherlands), October 18, 2012.
- “Barotrauma Effects on Fishes in response to Impulsive Pile Driving” Invited lecture, Transportation Research Board 92<sup>nd</sup> meeting (Washington, D.C), January 14, 2013.
- “Ears, Hearing (and Zebrafish)” keynote talk at Zebrafish Husbandry Workshop, Aquaculture 2013 Meeting, Nashville, TN Feb. 25, 2013.



- “My scientific ‘evolution’ over 50 years - from blind cave fish to the Tappan Zee Bridge (with various digressions!)” Department of Entomology, University of Maryland, March 1, 2013.
- “Effects of Man-Made Sounds on Fishes” University of Bonn, Germany, March 12, 2013.
- “Sound and Aquatic Animals” U.N. Workshop on Underwater Noise and its Impacts on Marine and Coastal Biodiversity, 25 - 27 February 2014, London, UK.
- “Effects of Man-Made Noise on Fishes and Invertebrates: Gap Analysis - Research Priorities” U. N. Workshop on Underwater Noise and its Impacts on Marine and Coastal Biodiversity, 25 - 27 February 2014, London, UK.
- Dahl, P. H., Reinhall, P.G., Popper, A. N., Hastings, M. C., and Ainslie, M. A. (2014). Underwater sound from pile driving: what it is and why does it matter. Hot Topics in Acoustics. Meeting of the Acoustical Society of America, Providence, RI, May 7, 2014. *Journal of the Acoustical Society of America*, 135:2312.
- Lucke, K., Winter, E., Lam, F.-P., Scowcroft, G., Hawkins, A. D., and Popper, A. N. (2014). International harmonization of approaches to define underwater noise exposure criteria. Meeting of the Acoustical Society of America, Providence, RI, May 9, 2014. *Journal of the Acoustical Society of America*, 135:2404.
- The Potential Effects of Man-Made Sounds on Industry (2014). Invited talks (2) to BP in Anchorage and Prudhoe Bay, August 11 and 13, 2014.
- Popper, A. N., Casper, B. M., Halvorsen, M. H., and Carlson, T. (2015) Injury responses in the hybrid striped bass as a function of number of pile driving strike exposures. *Oceanoise2015*, Barcelona, Spain, May 13, 2015.
- Popper, A. N., Martin, B., Racca, R., MacDonnell, J. (2015) Noise levels in shallow waters near the Hudson River’s Tappan Zee Bridge. *Oceanoise2015*, Barcelona, Spain, May 11, 2015.
- Popper, A. N. (2015). Man-made noise and aquatic life: Data, data gaps, and speculation. Invited tutorial, Acoustical Society of America, May 18, 2015.
- Popper, A. N. (2018). Fish bioacoustics and effects of man-made
- Popper, A. N. and Hawkins, A. D. (2018). A brief history of fish bioacoustics. Invited talk, Acoustical Society of America, Minneapolis, MN. May 8, 2018.
- Popper, A. N. (2018) Fish bioacoustics and anthropogenic sound. U.S. Geological Survey, Columbia, MO, invited talk, August 15, 2018.
- Popper, A. N. (2019). Fish Bioacoustics and anthropogenic sound. Invited presentation, Fisheries and Oceans, Canada, Canadian Science Advisory Secretariat, Halifax, Nova Scotia, Canada (via webEX), May 28, 2019.

Additional invited research seminars at various colleges and universities include City College of New York, Lehigh University, University of Tennessee, University of California at Berkeley, University of California at Santa Barbara, San Francisco State University, University of Maryland (Dept. of Psychology), University of Maryland at Baltimore County, Georgetown University (Dept. of Biology), SUNY (Downstate Medical Center), George Washington University, Hawaii Institute of Marine Biology, University of Chicago, Harvard University, Indiana University, Oregon State University, Georgetown University, University of Washington, University of Southern Denmark, and University of South Florida.

## **Recent Public Service and Consulting**

- Montgomery County Noise Control Advisory Board, member, 1993-1995; chair, 1995-1998.
- Review and analysis of use of sound for controlling behavior of salmon for Office of Technology Assessment, U. S. Congress (1994).
- “Do fish hear with an ear?” Keynote address, Thirty-Fifth Connecticut Junior Science and Humanities Symposium, University of Connecticut, Storrs, CT, March 21, 1994.
- “Hearing in fish and humans.” Invited talk, Jewish Community Center of Greater Washington science and technology class, Rockville, MD, October 17, 1994,
- Review and analysis of use of fish sensory response and prospects for developing behavioral guidance technologies for Office of Technology Assessment, US Congress, 1995.

Guest Lecturer to 21st Century Biology Class, Sidwell Friends School, Washington, DC, November 28, 2000.

New England Aquarium, Science Advisory Panel for “Sounds of the Sea” exhibit, 1997-2000.

Review and analysis of SURTASS LFA for U.S. Navy, 1999-2000.

Review of “A Marine Seismic Surveys: Analysis and Propagation of Air-gun Signals; and Effects of Air-Gun Exposure on Humpback Whales, Sea Turtles, Fishes and Squid” for Australian Petroleum Production and Exploration Association, 1999-2000.

Advisory Panel, Events-Based-Science-II project, Montgomery County Public Schools, 1995-2000.

Reviewer, Connecticut State high school science assessment exam, 1994-2006.

Review and analysis of SURTASS LFA Supplemental Environmental Impact Statement, U. S. Navy, 2006-2008.

Review of effects of seismic air guns on snow crabs, Department of Fisheries and Oceans, New Brunswick, Canada, 2004-2007.

Review of effects of underwater sound on murrelets, SAIC, 2011.

Review of development of Atlantic and Pacific training facilities, Naval Undersea Warfare Center (NUWC), 2011.

Development of Environmental Impact Statement, Tappan Zee Bridge, New York, 2010 – 2012.

Workshop on Effects of Noise on Fish, Fisheries, and Invertebrates in the U. S. Atlantic and Arctic from Energy Industry Sound-Generating Activities. For Bureau of Ocean Energy Management (BOEM), under contract to Normandeau Associates, 2011-2012

U.S. Representative at United Nations meeting: Expert Workshop on Underwater Noise and its Impacts on Marine and Coastal Biodiversity, 25 - 27 February 2014, London, UK

U.S. Geological Service, “Fish hearing and the effects of underwater noise,” invited seminar Sept. 15, 2018].

New York State Wind Far Meeting (NYSERDA), “Fish Hearing and Effects of Underwater Noise, invited presentation, Nov. 12-14, 2018

Webinar, “Potential Effects of Sound on Marine Fishes,” Nov. 27, 2018. <https://dosits.org/decision-makers/webinar-series/webinars-2018/potential-effects-sound-fishes/>

## Recent Reports

Hastings, M. C. and Popper, A. N. (2005). Effects of sound on fish. California Department of Transportation Contract 43A0139 Task Order, 1. <https://www.nrc.gov/docs/ML1434/ML14345A573.pdf>

Popper, A. N. (2005). A review of hearing by sturgeon and lamprey. U.S. Army Corps of Engineers, Portland District. [Link](#)

Popper, A. N., Carlson, T. J., Hawkins, A. D., Southall, B. L., and Gentry, R. L (2006). *Interim Criteria for Injury of Fish Exposed to Pile Driving Operations: A White Paper* [Link](#)

Popper, A. N. and Casper, B. M. (2012) Analysis of tissues of fish exposed to pile driving. AECOM Pile Installation Demonstration Project, Tappan Zee Bridge. [Report Link](#)

AKRF, AECOM, Popper, A. N. (2012). Biological assessment for the Tappan Zee Hudson River Crossing Project. Prepared for Federal Highway Administration. [Report Link](#)

Krebs, J, Jacobs, J., and Popper, A. N. (2012). Presence of Acoustic-Tagged Atlantic Sturgeon and Potential Avoidance of Pile-Driving Activities During the Pile Installation Demonstration Project (PIDP) for the Tappan Zee Hudson River Crossing Project. Submitted to the New York State Thruway Authority.

Hawkins, A.D., and Popper, A.N. (2012). Effects of noise on fish, fisheries, and invertebrates in the U.S. Atlantic and Arctic from energy industry sound-generating activities: Literature synthesis. BOEM Contract M11PC00031by Normandeau Associates, Inc. [Report Link](#)

Normandeau Associates, Inc. 2012. Effects of Noise on Fish, Fisheries, and Invertebrates in the U.S. Atlantic and Arctic from Energy Industry Sound-Generating Activities. A Workshop Report for the U.S. Dept. of the Interior, Bureau of Ocean Energy Management. Contract # M11PC00031. 72 pp. plus Appendices. <http://ter.ps/4v4>

Popper, A.N. 2012. Fish Hearing and Sensitivity to Acoustic Impacts. Appendix J. Atlantic OCS Proposed Geological and Geophysical Activities, Mid-Atlantic and South Atlantic Planning Areas, Draft

- Programmatic Environmental Impact Statement. OCS EIS/EA BOEM 2012-005. March 2012. 2 vols.  
[Report Link](#)
- Popper, A. N., Carlson, T. J., Gross, J., and Young, J. (2012). Effects of Seismic Surveys in Lake Sakakawea on Pallid Sturgeon and Other Key Fish Species. Prepared for Hess Corporation by CSA International.  
[Report link](#)
- Popper, A. N., Halvorsen, M. B., Casper, B. M., and Carlson, T. J. (2013). U. S. Dept. of the Interior, Bureau of Ocean Energy Management, Headquarters, Herndon, VA. Effects of Pile Sounds on Non-Auditory Tissues of Fish. OCS Study BOEM 2012-105. 60 pp. [Link - reference](#) OCS Study BOEM 2012-105
- Luke, K., Winter, E., Lam, F.-P., Scowcroft, G., Hawkins, A., and Popper, A. N. (2013). Report of the workshop on international harmonization of approaches to define underwater noise exposure criteria (Budapest, Hungary, August 17, 2013). Report C197.13, IMARES, Wageningen UR for Rijkswaterstaat Noordzee, Martine Graafland, De Hague, The Netherlands
- Doolling, R. J. and Popper, A.N. (2016). Technical Guidance for Assessment and Mitigation of the Effects of Highway and Road Construction Noise on Birds. Caltrans  
[http://www.dot.ca.gov/hq/env/noise/pub/caltransBirdReport\\_6\\_15\\_2016.pdf](http://www.dot.ca.gov/hq/env/noise/pub/caltransBirdReport_6_15_2016.pdf)
- Popper, A. N. and Hawkins, A. D. (2018). White Paper Investigation of the Potential Use of Sound to Guide Outmigrating American Eels Near Iroquois Dam and the Beauharnois Power Canal on the St. Lawrence River. EPRI, Palo Alto, CA 3002014636. <https://www.epri.com/#/pages/product/3002014636/>

## Recent News & Quotes

- [http://news.nationalgeographic.com/news/2005/11/1103\\_051103\\_whale\\_sonar.html](http://news.nationalgeographic.com/news/2005/11/1103_051103_whale_sonar.html)
- [http://news.nationalgeographic.com/news/2005/11/1107\\_051107\\_croaker.html](http://news.nationalgeographic.com/news/2005/11/1107_051107_croaker.html)
- About mentoring - <http://betweenthecolumns.umd.edu/2008/09/10/teaches/>
- Sonar studies - <http://www.physorg.com/news102869243.html>
- Noise and fish - <http://www.sciencedaily.com/releases/2003/02/030210075908.htm>
- Administrating science - <http://www.the-scientist.com/article/display/57537/>
- Noise meeting - <http://newsdesk.umd.edu/global/release.cfm?ArticleID=2212>
- Noise and fish - <http://www.newscientist.com/blogs/shortsharpscience/2011/05/constant-noise-of-offshore-win.html>
- Noise and fish - <http://news.discovery.com/animals/fish-human-noise-110516.html>
- Ocean noise - [http://seattletimes.nwsources.com/html/localnews/2015040407\\_oceannoise13m.html](http://seattletimes.nwsources.com/html/localnews/2015040407_oceannoise13m.html)
- Ocean noise (NPR audio) - <http://media.aprn.org/2011/ann-20110519-07.mp3>
- Noise and squid: <http://www.miamiherald.com/2011/05/19/2224080/in-an-ocean-of-noise-sea-life.html>
- Retirement: [Senior Professors: Not When to Retire, but How](#) (Chronicle of Higher Education)
- Ocean noise: <http://stateimpact.npr.org/texas/2012/03/22/with-noise-pollution-growing-at-sea-a-team-in-texas-looks-for-answers/>
- Effects of noise on humans: [http://www.huffingtonpost.com/seth-shostak/loud-music-effects\\_b\\_1764562.html](http://www.huffingtonpost.com/seth-shostak/loud-music-effects_b_1764562.html)
- Fish sounds and effects of environmental noise (7/31/2013) WYPR 88.1 FM in Baltimore and affiliated stations: <http://www.wypr.org/stationprogram/environment-focus-tom-pelton-2>
- 'Bubble curtains' guard fish from hammering sound waves (12/27/2013) USA Today
- *Acoustics Today* editorship: <http://ter.ps/AcoustToday>
- Terrapin Teachers (U Teach Replication): <http://cmns.umd.edu/news-events/news/1739>
- Terrapin Teachers (Diamondback): [http://www.diamondbackonline.com/news/campus/article\\_e10499f4-9926-11e3-a678-0017a43b2370.html](http://www.diamondbackonline.com/news/campus/article_e10499f4-9926-11e3-a678-0017a43b2370.html)
- “Why do we hear”? <http://www.prx.org/pieces/128308-700-fathoms-under-the-sea> (under Promo + Web Extra Tab) – interview on PRX.org
- “A tribute to Eugenie Clark (May 4, 1922 – Feb. 25, 2015), UMD Professor Emerita in Biology.” <https://cmns.umd.edu/news-events/features/2829>
- Inside Science (August 5, 2015): “Are Ocean Creatures Tormented by human-Made Noise”? <http://www.insidescience.org/content/are-ocean-creatures-tormented-human-made-noise/3081>
- “The Not-So-Silent World,” Physics Central Buzz Blog (Sept. 11, 2015)  
<http://www.physicscentral.com/buzz/blog/index.cfm?postid=2745010119530994649>
- *Sports Fishing Magazine* (January 13, 2017) <http://www.sportfishingmag.com/noise-factor-fishing-skills#page-4>
- *Hakai Magazine* (April 4, 2018) <https://www.hakaimagazine.com/news/marine-noise-is-mentally-and-physically-disturbing-fish/>
- *The Scientist* (May 11, 2018) <https://www.the-scientist.com/?articles.view/articleNo/54547/title/Proposed->

- [Seismic-Surveys-Raise-Concern-Over-Health-of-Marine-Life/](https://cmns.umd.edu/news-events/features/4376)  
*CMNS Web Site* (March 15, 2019) <https://cmns.umd.edu/news-events/features/4376>

## Courses Taught at University of Maryland

Semester	Course Number	Course Name	Number of Students
Spring, 1988	Zool. 608	Seminar in Sensory Biology	10
Spring, 1989	Zool. 328V Zool. 708	Neuroethology (with Dr. Ottinger)	25
Spring, 1991	Zool.328V	Neuroethology (with Dr. Ottinger)	25
Fall, 1991	Biol. 105	Principles of Biology 1 (with Dr. Olek)	400
Spring, 1992	Biol. 105	Principles of Biology 1 (with Dr. McMillan)	350
Fall, 1992	Biol. 105	Principles of Biology 1 (with Dr. Benson)	400
Spring, 1993	Zool. 328V Zool. 708	Neuroethology (with Dr. Ottinger)	20
Fall, 1993	Biol. 105	Principles of Biology 1 (with Dr. Benson)	420
Spring, 1994	Biol. 105	Principles of Biology 1 (with Dr. Benson)	400
Fall, 1994	Biol. 105	Principles of Biology 1 (with Dr. Ades)	440
Spring 1995	Zool. 608B	Bioethics Seminar (with Dr. Dooling)	10
Fall, 1995	Biol. 105	Principles of Biology I (with Dr. Presson)	400
Spring 1996	Zool. 328F	Vertebrate Structure and Function (with Dr. Infantino)	40
	Zool. 708	Ethics in Biological Research (with Dr. Dooling)	10
Spring, 1997	Zool. 328F	Vertebrate Form and Function (with Dr. Infantino)	35
	Zool. 600	Ethics in Scientific Research (with Dr. Dooling)	10
1997-1998		Sabbatical	
Fall, 1998	Biol. 105	Principles of Biology I (with Dr. Jarvis)	325
Spring, 1999	Zool. 328F	Vertebrate Structure and Function (with Dr. Infantino)	40
Fall, 1999	Biol. 105	Principles of Biology	340
Spring, 2000	Zool. 328F	Vertebrate Form and Function (with Dr. Infantino)	60
	Zool. 600	Ethics in Scientific Research	10
Fall, 2000	BSCI 105	Principles of Biology	350
Spring, 2001	BSCI 34	Vertebrate Form and Function (with Dr. Infantino)	60
	BIOL. 600	Ethics in Scientific Research (with Dr. Dooling)	20
Fall, 2001	BIOL. 608W	Scientific Writing	10
Spring, 2002	BIOL. 600	Ethics in Scientific Research (with Dr. Dooling)	15
Spring 2003	BSCI 105	Principles of Biology	350
	BIOL. 600	Ethics in Scientific Research (with Dr. Dooling)	15
Spring 2004	BSCI 105	Principles of Biology (with Dr. Ades)	350
	BIOL. 600	Ethics in Scientific Research (with Dr. Dooling)	15
Spring 2005	BSCI 105	Principles of Biology (with Dr. O'Connor)	350
	BIOL. 600	Ethics in Scientific Research (with Dr. Dooling)	15
Spring 2006	BSCI 207	Diversity and Integrative Biology of Life (with Dr. Kent)	150
	BIOL 600	Ethics in Scientific Research (with Dr. Dooling)	15
Spring 2007	BIOL 600	Ethics in Scientific Research (with Dr. Dooling)	15
Spring 2008	BIOL 600	Ethics in Scientific Research (with Dr. Jane Clarke)	18
Spring 2009	BIOL 600	Ethics in Scientific Research (with Dr. Dooling)	24
Spring 2009	BIOL 600	Ethics in Scientific Research (with Dr. DeShong)	14
Spring 2010	BIOL 600	Ethics in Scientific Research (with Dr. DeShong)	19
Spring 2011	BIOL 600	Ethics in Scientific Research (with Dr. Moss)	11
Fall 2011	HONORS 2690	Noise, the Environment, and Life	10
Spring 2012	BIOL 600	Ethics in Scientific Research (with Dr. Moss)	11
Spring 2014	BIOL 600	Ethics in Scientific Research (with Dr. Moss)	12