

AARON M. THODE
Scripps Institution of Oceanography
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EXPERTISE:

Passive acoustic monitoring of marine mammals using autonomous recorders and towed arrays; acoustic propagation modeling and inversion in complex oceanic environments; three-dimensional acoustic tracking using portable array systems, automated detection and signal processing of bio-acoustic signals.

EDUCATION AND WORK HISTORY:

- July 2012- **Scripps Institution of Oceanography**, University of California, San Diego
Full Research Scientist and Senior Lecturer
- Mar 2005- **Scripps Institution of Oceanography**, University of California, San Diego
Associate Research Scientist
- Jan 2002- **Scripps Institution of Oceanography**, University of California, San Diego
Mar 2005 **Project Scientist**
- Oct 1999- **Massachusetts Institute of Technology**, Cambridge, MA
Nov 2001 **Post-Doctoral Scholar in Ocean Engineering**
- June 1999 **Scripps Institution of Oceanography**, University of California, San Diego
Ph.D. in Oceanography
Graduate Advisor: William Kuperman
Dissertation: "Localization, geophysical inversion, and source signature recovery of blue whale vocalizations". Research involved applying matched-field processing (MFP) and DIFAR sonobuoy algorithms to blue whale vocalizations, allowing 3D tracking and geophysical inversion. Demonstrated source signature recovery (propagation effect removal) on calls.
- June 1993 **Stanford University**, Palo Alto, CA
M.S. in Electrical Engineering
Major Field: Antenna and radio propagation.
- June 1993 **Stanford University**, Palo Alto, CA
B.S. in Physics (concurrent with M.S.)
- 1990-94 *Self-Initiated Research:* On own time investigated the feasibility of single-stage-to-orbit (SSTO) launch vehicle concepts. Debugged and installed rocket fuel performance code from NASA, designed and wrote rocket launch simulator, and combined both codes to demonstrate that mixed-mode propulsion techniques could increase the payload capacity of a SSTO by 10-15% with minor design changes.
Gave seminars on research results at Los Alamos and at the McDonnell Douglas Single Stage Rocket Technology Program in 1991. Paper published in 1994 (see below).

AWARDS:

- Dec 2010 Awarded the Medwin Prize in Acoustical Oceanography by the Acoustical Society of America, “for contributions to the development of acoustic methods for marine mammal research and to passive acoustic signal processing”.
- Dec 2008 Elected a Fellow at the Acoustical Society of America “for contributions to signal processing in marine mammal research”.
- Dec 2004 A.B. Wood Medal, UK Institute of Acoustics-“presented to an individual, under 35 years of age in the year of the Award, for distinguished contributions in the application of acoustics.”
- Sep 2002 Office of Naval Research Acoustic Entry-Level Faculty Award.
- Dec 1997 Best Student Paper Award in Underwater Acoustics, Acoustical Society of America Conference in San Diego.

PUBLICATIONS:

- S.B. Blackwell, C.S. Nations, T.L.McDonald, A.M. Thode, D. Mathias, K.H.Kim, G.R.Greene, Jr., “The effects of airgun sounds on bowhead whale calling rates: evidence for two behavioral thresholds,” to be submitted to PLOS One, 2014.
- J. Bonnel, A.M. Thode, S. B. Blackwell, “Range estimation of bowhead whale (*Balaena mysticetus*) calls in the Arctic using time warping on a single hydrophone,” submitted to J. Acoust. Soc. Am., (Dec, 2013).
- S. H. Abadi, A.M. Thode, S.B. Blackwell, D.R. Dowling, “Comparison of three methods of ranging bowhead whale calls in a shallow-water waveguide,” in revision, J. Acoust. Soc. Am., (Jan, 2014).
- A. Thode, L. Wild, D. Mathias, J. Straley, C. Lunsford, “A comparison of acoustic and visual metrics of sperm whale longline depredation,” J. Acoust. Soc. Am., in revision (2013).
- J.M. Straley, G.S. Schorr, A.M. Thode, J.A. Calambokidis, C.R. Lunsford, E.M. Chenoweth, V.M. O’Connell, R.D Andrews, “Local movements, habitat use, and long distance migrations across stock boundaries of depredating sperm whales in the North Pacific,” Endangered Species Research, submitted Sept. 2013.
- S.B. Blackwell, C.S. Nations, T.L. McDonald, C.R. Greene Jr., A.M. Thode, M. Guerra, A. M. Macrander, “Effects of airgun sounds on bowhead whale call detection rates in the Alaskan Beaufort Sea”, *Mar. Mammal Sci.*, **29**(4), E342-E365 (2013).
- Shane C. Walker, Caglar Yardim, Aaron Thode, and Ery Arias-Castro, "Using Fisher information to quantify uncertainty in environmental parameters estimated from correlated ambient noise," *J. Acoust. Soc. Am.* Volume 133, Issue 4, pp. EL228-EL234 (2013);
- D. Mathias, A.M. Thode, J. Straley, and R.K. Andrews. "Depth and range tracking of sperm whales in the Gulf of Alaska using a two-element vertical array, satellite and bioacoustic tags," *J. Acoust. Soc. Am.* **134**(3), Pt. 2, 2446-2461, (2013).
- D. Mathias, A.M. Thode, J. Straley, J. Calambokidis, G.S. Schorr, K. Folkert, “Acoustic and diving behavior of sperm whales (*Physeter Macrocephalus*) during natural and depredation foraging in the Gulf of Alaska,” *J. Acoust. Soc. Am.* **132**(1), 518-532, (2012).

- A. Thode, K. Kim, S. Blackwell, C. R. Greene Jr., C. Nations, T. McDonald, A. M. Macrander, "Automated detection and localization of bowhead whale sounds in the presence of seismic airgun surveys", *J. Acoust. Soc. Am.* **131**(5), 3726-3747 (2012).
- D. Ponce, A.M. Thode, M. Guerra, J. Urban, S. Swartz, "Relationship between visual counts and call detection rates of gray whales (*Eschrichtius robustus*) in Laguna San Ignacio, Mexico", *J. Acoust. Soc. Am.* **131**(4), 2700-2713 (2012).
- M. Guerra, A.M. Thode, S.B. Blackwell, A.M. Macrander, "Quantifying seismic survey reverberation off the Alaskan North Slope," *J. Acoust. Soc. Am.* **130** (5), 3046-3058 (2011).
- A.M. Thode, J.S. Skinner, P. Scott, J. Roswell, J. Straley, and K. Folkert, "Tracking sperm whales with a towed acoustic vector sensor," *J. Acoust. Soc. Am.* **128**, 2681-2694 (2010).
- A. Thode, K. Kim, C. R. Greene Jr., and E.H. Roth, "Long range transmission loss of broadband seismic pulses in the Arctic under ice-free conditions," *J. Acoust. Soc. Am.* **128**, EL181-EL187 (2010).
- D. Mathias, A. Thode, J. Straley, K. Folkert, "Relationship between sperm whale (*Physeter macrocephalus*) click structure and size derived from videocamera images of a predated whale," *J. Acoust. Soc. Am.* **125**, 3444-3453 (2009).
- A.M. Thode, J. Straley, C. Tiemann, K. Folkert, V. O'Connell, "Observations of potential acoustic cues that attract sperm whales to longline fishing in the Gulf of Alaska," *J. Acoust. Soc. Am.* **122**(2), 1265-1277 (2007).
- C. Tiemann, A. Thode, J. Straley, K. Folkert, V. O'Connell, "Three-dimensional localization of sperm whales using a single hydrophone," *J. Acoust. Soc. Am.* **120** (4), 2355-65 (2006).
- A.M. Thode, P. Gerstoft, W.C. Burgess, K. Sabra, M. Guerra, M.D. Stokes, M. Noad, and D.C. Cato, "A portable matched-field processing system using passive acoustic time synchronization," *IEEE J. Ocean. Eng.* **31**(3), 696-710 (2006).
- A.M. Thode, "Three-dimensional passive acoustic tracking of sperm whales (*Physeter macrocephalus*) in ray-refracting environments," *J. Acoust. Soc. Am.* **118**(6), 3575-3584(2005).
- K. G. Sabra, P. Roux, A. M. Thode, G. L. D'Spain, W.S. Hodgkiss and W.A. Kuperman, "Using ocean ambient noise for array self-localization and self-synchronization," *IEEE Journal of Oceanic Engineering*, **30**(2), pp. 338-347, (2005).
- A. Thode, "The derivative of a waveguide acoustic field with respect to a three-dimensional sound speed perturbation", *J. Acoust. Soc. Am.*, **115**(6), 2824-2833 (2004).
- A. M. Thode, "Tracking sperm whale (*Physeter macrocephalus*) dive profiles using a towed passive acoustic array," *J. Acoust. Soc. Am.*, **116**(1), 245-253(2004).
- S. Lee, M. Zanolin, A. M. Thode, R. T. Pappalardo and N. C. Makris, "Probing Europa's interior with natural sound sources," *Icarus*, **165**(1), 144-167, (2003).
- A. M. Thode, D.K. Mellinger, S. Stienessen, A. Martinez, K.D. Mullin, "Depth-dependent acoustic features of diving sperm whales in the Gulf of Mexico," *J. Acoust. Soc. Am.*, **112**(1) 308-321, Jul 2002.

Thode, A.M., M. Zanolin, E. Naftali, I. Ingram, P. Ratilal and N. Makris, "Necessary conditions for a maximum likelihood estimate to become asymptotically unbiased and attain the Cramer-Rao lower bound. II. Range and depth localization of a sound source in an ocean waveguide," *J. Acoust. Soc. Am.*, **112** (5), 1890-1910 (2002).

A.M. Thode, "Source ranging with minimal environmental information using a virtual receiver and waveguide invariants", *J. Acoust. Soc. Am.* **108**(4), 1582-1594, Oct. 2000.

A.M. Thode, W.A. Kuperman, G.L. D'Spain and W.S. Hodgkiss, "Localization using Bartlett matched-field processor sidelobes," *J. Acoust. Soc. Am.*, **107** (1), 278-286 (2000).

A.M. Thode, T. Norris, J. Barlow, "Beamforming on dolphin whistles using a sparse hydrophone array", *J. Acoust. Soc. Am.*, **107**(6), 3581-3584, June 2000.

A.M. Thode, Gerald L. D'Spain, W.A. Kuperman, "Matched-field processing, source signature recovery, and geoacoustic inversion of blue whale vocalizations," *J. Acoust. Soc. America*, **107**(3), 1286-1300, Mar. 2000.

A. Thode, "The effect of mixed-mode propulsion on the Delta Clipper," *J. Practical Applications in Space*, **VI** (2), 151-192 (1994).

GRADUATE STUDENTS ADVISED

Dawn Grebner, PostDoctoral Scholar, (2010)

Melania Guerra, PhD (2011)

Delphine Mathias, PhD (2012)

Kerri Seger, co-advisor (2012)

PROFESSIONAL:

Cumulative two years field experience in the Gulf of Mexico, Baja California, and the Arctic Ocean.

Independent Reviewer, NOAA Fisheries Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammals, 2013

ASA Primary voting Representative to Committee S-3/sub-Committee 1, Animal Bioacoustics Associate Editor, Acoustical Oceanography, *Journal of the Acoustical Society of America*, 2011-

Membership Committee, Acoustical Society of America, 2010-

Reviewer, *Journal of the Acoustical Society of America*, *IEEE J. Oceanic Eng.* (listed as

Outstanding Reviewer in 2012), *Aquatic Mammals*, *Marine Mammal Science*, 1999-present.

Certified Scripps SCUBA Research Diver, 1995-98, 2003-present.

Member, The Society of Marine Mammalogy, 1999-present.

Member, IEEE, American Geophysical Union, 2000-present

Interests include backpacking, sea kayaking, acoustic guitar, and running.