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# MICHAEL D. BEECHER

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## PERSONAL

Wife: Inger Mornestam Beecher (occupation: veterinarian)
Children: Eileen, Daniel, Devin
Home address: 2625 Perkins Lane, Seattle, WA 98199 (206/285-2040)

## EDUCATION

B.A., Reed College (1963)
Ph.D., Boston University (1969)
Postdoctoral, New England Regional Primate Center, Harvard Medical School

Awards: NSF Graduate Fellowships ('65-'69), NIH Postdoctoral Fellowship ('69-'71)

## ACADEMIC POSITIONS

1969-71 Harvard Medical School, Visiting Scientist

1971-78 Eastern Michigan University (Associate Professor 1975)
University of Michigan (adjunct)

1978- University of Washington (Professor 1987; Chair Psychology 1993-2002)

## RESEARCH AND TEACHING INTERESTS

Bird song, learning & function
Animal communication, mating & social behavior
Bioacoustics and hearing
Development of behavior

TEACHING – COURSES

Animal Behavior (PSY 200; PSY 300)
Mechanisms of Animal Behavior (BIO/PSY 409)
Evolutionary Psychology (PSY 459)
Core Concepts of Animal Behavior (PSY 502)
Sociobiology (BIO/PSY 408)
Animal Communication (PSY 416)
Animal Mind (PSY 486)
Graduate seminars

RESEARCH & TEACHING

My research and teaching programs are strongly intertwined. My research grants have always been designed to involve as well as support graduate students and in the research they function as junior colleagues, not simply as research assistants (I have a long-term research tech). Of the 15 graduate students who have completed (or will soon complete) PhDs under my supervision, 8 carried out their dissertations as junior colleagues on my grant-supported research. In some cases (when the timing was right), they participated in developing and writing the proposal sent to NSF, and in other cases we modified the research direction or design once the student embarked on the project (happily NSF is quite tolerant of deviations from the original proposal, so long as the research pursues the originally-stated intention and the modified research plan proves to be productive). Of my 7 other PhD students, 5 pursued totally independent research projects and 2 worked on research supported by other grants (NIH or RRF) in collaboration with other faculty (Eliot Brenowitz and Ed Rubel).

In addition, I have also always involved undergraduate students in my research.. From the undergraduate's perspective, this is one of the real advantages of the UW experience, and can more than compensate for the large and rather impersonal lecture classes they experience in their first few years. Generally I have 3-8 undergrads in my lab in any given quarter, typically taking Psych or Bio 499 research credit, and in recent summers I have been able to get them NSF REU summer support as well. Many of these undergrads have gone on to graduate programs (and one of them became my long-term research tech!).

One indication of the role of students in my research can be seen in my (partial) publication list below, which features 27 different student co-authors (19 graduate students, 8 undergraduate students); student authors appear on 59 papers in the list, as first author on 41 of these.

Three graduate students have gotten NSF Doctoral Dissertation Improvement grants in my lab (Cully Nordby, Chris Templeton and Çaglar Akçay).

CURRENT RESEARCH

In my lab we investigate the function of song and song learning in the song sparrow *(Melospiza melodia)*. Song function is examined in the field, via a long-term banding and recording program, radio-tracking studies and field experiments (mostly 'playback' studies). Our field research is based in Discovery Park, home to 150 or so song sparrow pairs. Because the field site is 20 min from UW, and the song sparrow population a year-round one, my students and I are

able to work there throughout the year, including when the university is in session. Our song learning studies in the field are designed to identify the ecological correlates of song learning, and in particular, to relate the bird's strategy of song learning to his strategy of territory establishment. We have recently extended this line of research to determine what sorts of singing is most attractive to young song sparrows in the song-learning stage, and also what characteristics make particular adults the best song tutors. This work requires that we band, track and record all song sparrows in the population.

In our laboratory studies of song learning, we hand-raise birds and expose them to various song 'tutoring' regimes. We have focused on social factors employing either multiple live tutors (vs. 'tape' tutors or single live tutors) and 'virtual' tutors, i.e., a computer controlling digitized song and programmed to simulate adult counter-singing birds and also capable of interacting with the young bird.

In both our lab and field song-learning studies we are particularly interested in examining the relative importance of the young bird's directly interacting with his song tutor versus overhearing (eavesdropping on) adults engaged in singing interactions.

We examine functional correlates of song via 'playback' experiments and by attempting to correlate life history and song parameters (e.g., years on territory with degree of song sharing or song repertoire size). We examine female influence on song by examining sexual responses (solicitations) of female song sparrows evoked by song in the lab, using birds that have been taken from known field contexts (hence we can compare her response to the songs of her mate vs. those of her neighbors, etc.). We examine female influence also by examining mate choice in the field: both which males are chosen as mates, and also which males are chosen as 'extra-pair' mates (the percentage of young in a nest not belonging to the male in attendance is about 25%). We then attempt to correlate these findings with characteristics of the male (his age, when he established his territory, his aggressiveness or interactivity, and song repertoire characteristics).

We are also doing integrative, collaborative studies of the role of neural song centers in song perception and production (collaborative with Eliot Brenowitz). A current interest is the role of sex hormones in song development and crystallization.

## EXTRAMURAL RESEARCH GRANTS

1974-1977: "Characteristics of Hearing and its Evolution in Primates" Co-P.I., with W. C. Stebbins & D. B. Moody *National Science Foundation*

1977-1981: "Characteristics of Hearing and its Evolution in Vertebrates" Co-P.I., with W. C. Stebbins & D. B. Moody *National Science Foundation*

1981-1984: "Mechanisms of Kin Recognition" *National Science Foundation*

1984-1987: "Individual Recognition by Voice in Animal Communication Systems" *National Science Foundation*

1987-1988: "Bird Song: Learning, Perception and Function" *National Science Foundation*

1988-1989: "Avian spatial memory" *National Institute of Mental Health*

1988-1991: “Bird Song: Perception, Learning and Function” *National Science Foundation*

1992-1996: “Integrative Studies of Song Learning” *National Science Foundation*

1996-2001: “Integrative Studies of a Model Learning System” *National Science Foundation*

2002-2006: “Social, Ecological and Genetic Variables in a Model Learning System” *National Science Foundation*

2006-2007: “Field Studies of Passerine Learning” *National Science Foundation*

2007-2011: “Social Factors in Vocal Development” *National Science Foundation*

SELECTED PROFESSIONAL

Organizer, “Symposium on Individual and Species Recognition”, American Society of Zoologists Meeting, Seattle, Dec 1980 (and PI on support grant from NSF).

**American (Executive) Editor,* Animal Behaviour, 1994-1997

**Editorial Board,* Animal Behaviour, 1985-1988, 1997-present

*Associate Editor,* Proceedings of the Royal Society of London, B, 2010-

**President,* Animal Behavior Society, 2002 (President elect etc 1999-2003)

**Program Director,* Animal Behavior Society, 2011-2014

**Executive Committee,* Animal Behavior Society, 1994-97, 1999-2003, 2011-2014

*Fellow,* Animal Behavior Society, 1998

*Distinguished Service Award,* Animal Behavior Society, 2005

*Exemplar Award,* Animal Behavior Society, 2007

*Animal Behavior Panel,* National Science Foundation, 1992 -1995, 2001 - 2005

*Program Director,* Animal Behavior, Division of Integrative Biology, National Science Foundation 2006-2007

\ * elected positions

SELECTED TALKS

• Recent Animal Behavior Society Meetings:

2011 Indiana Univ (2 papers)

2010 Williamsburg, VA (4 papers : Beecher et al, Akcay et al, Templeton et al, Illes)

2009 Brazil (5 papers: Beecher et al, Akcay et al, Templeton et al, Illes, Billo)

2008 Snowbird, Utah (5 papers)

2007 Burlington, VT (3 papers)

2005 Snowbird, Utah (3 papers)

2004 Oaxaca, Mexico (2 papers)

2003 Boise State U (3 papers)

2002 Indiana Univ (3 papers)

2001 Oregon State (1 paper)

2000 Morehouse College, Atlanta (2 papers)

1999 Bucknell University, PA (3 papers)

• Invited Talks:

"Learning to talk, learning to sing: Parallels in humans and songbirds" (with Michael Goldstein, Cornell University). Allen L. Edwards Public Lecture Series in Psychology, February 24, 2010. http://www.uwtv.org/programs/displayevent.aspx?rID=30991&fID=4139

"Bird song repertoires: Aural peacock's tail, 'language', or something else altogether?", University of Idaho, April 28, 2009.

"How song sparrows communicate via song"; "Bird song learning as a social process", Cornell University, March 26 & 27, 2009.

"Different song-learning strategies in eastern and western song sparrows?". Invited paper in symposium *Individual adaptation, population differentiation, and conservation of adaptive variation in song sparrows.* American Ornithologists' Union, Portland, OR, July 2008

"Bird song learning is a social process". Invited paper in symposium *Cognitive Ecology II*, Animal Behavior Society, Burlington, Vermont, July 2007.

"Social factors in song learning". Plenary talk in symposium *Animal Social Learning*, St. Andrews University, Scotland, June 2005.

"Social factors in song learning in the song sparrow". Fellows Address, Animal Behavior Society Meeting, Indiana University, Bloomington, Indiana, July 2002.

"Social factors in song Learning in the song sparrow". Plenary Address, Eastern Bird Song Meeting, Rockefeller University, Millbrook, NY, July 2002.

"Bird song learning as an evolved strategy". Invited paper in symposium *Characterizing Psychological Adaptations*. Ciba Foundation, London, England, October 1996.

"The song learning strategy of the song sparrow". Invited paper in symposium *Bird song, brain and behavior.* International Ornithological Congress, Vienna, Austria, August 1994.

"Song perception and song learning: Intersecting views from the field and the laboratory". Invited paper in symposium *Cognitive Ecology*, Animal Behavior Society, Seattle, July 1994.

"Correlation of song learning and territory establishment strategies in a songbird", International Society of Behavioral Ecology, Princeton, NJ, August 1992.

"Song learning strategy of the song sparrow". Invited paper in *Animal communication: evolution, ecology & development,* Univ of California, Davis, June 1992.

"Song repertoires and neighbor recognition in song sparrows", International Society of Behavioral Ecology, Uppsala, Sweden, August 1990.

"Successes and failures of parent-offspring recognition", "Song repertoires and individual recognition in songbirds". Invited papers, Distinguished Speakers Series, Cornell University, April 1989.

"Kin Recognition in birds". Invited paper in *Kin recognition in animals: Empirical studies & conceptual issues*, American Society of Zoologists, New Orleans, Dec 1987.

"Evolution of parent-offspring recognition in swallows". International Ethological Congress, Madison, Wisconsin, Aug 1987.

Invited papers, Winter Animal Behavior Conference, Park City, Utah, Jan 1982, 1983, 1984, 1985, 1987.

Acoustic adaptations for individual recognition in birds: Field and laboratory studies. Invited paper in Symposium *Comparative perception of complex sounds,* Association for Research in Otolaryngology, Clearwater, Feb 1985.

Evolutionary theory and psychology. Invited address, Division 6, APA Meetings, Anaheim, Aug 1983.

Organizer of the Symposium, "From individual to species recognition: Theories and mechanisms," American Society of Zoologists Meetings, Dec 1980

SELECTED PUBLICATIONS

*graduate students at the time of the research

† undergraduate students at the time of the research

Harrison, J. M. & Beecher, M. D. (1969). Control of responding by the location of an auditory stimulus: Role of rise time of the stimulus. Journal of the Experimental Analysis of Behavior, **12**, 217-227.

Beecher, M. D. & Harrison, J. M. (1971). Rapid acquisition of an auditory localization discrimination by rats. Journal of the Experimental Analysis of Behavior, **16**, 193-199.

Beecher, M. D. (1971). Operant conditioning in the bat *Phyllostomus hastatus*. Journal of the Experimental Analysis of Behavior, **16**, 219-223.

Beecher, M. D. (1974). Pure-tone thresholds of the squirrel monkey (*Saimiri sciureus*). Journal of the Acoustical Society of America, **33**, 196-198.

Beecher, M. D. (1974). Hearing in the owl monkey (*Aotus trivirgatus*): Auditory sensitivity. Journal of Comparative and Physiological Psychology, **86**, 898-901.

Beecher, M. D. & Jackson, D. E. (1976). Rate-dependent effect of amphetamine: Extension to between-subjects effect. Psychopharmacologica, **46**, 307-309.

Beecher, M. D. (1976). Studies on the hearing of the owl monkey (*Aotus trivirgatus*). In N. King & A. Jones (Eds.), "Symposium on the Owl Monkey", Laboratory Animal Science, **26**, 1068-1072.

Moody, D. B., Beecher, M. D. & Stebbins, W. C. (1976). Behavioral methods in auditory research. In D. Smith & J. Vernon (Eds.), Handbook of Auditory Research, Charles C. Thomas: Springfield, Ill.

*Sinnott, J. M., Beecher, M. D., Moody, D. B. & Stebbins, W. C. (1976). Speech sound discrimination by monkeys and humans. Journal of the Acoustical Society of America, **60**, 687-695.

*Brown, C. H., Beecher, M. D., Moody, D. B., & Stebbins, W. C. (1978). Localization of pure tones by Old World monkeys. Journal of the Acoustical Society of America, **63**, 1484-1492.

*Brown, C. H., Beecher, M. D., Moody, D. B., & Stebbins, W. C. (1978). Localization of primate calls by Old World monkeys. Science, **201**, 753-754.

*Petersen, M. R., Beecher, M. D., Zoloth, S. R., Moody, D. B., & Stebbins, W. C. (1978). Neural lateralization of species-specific vocalizations by Japanese macaques. Science, **202**, 324-327.

Beecher, M. D., *Petersen, M. R., Zoloth, S. R., Moody, D. B., & Stebbins, W. C. (1979). Perception of conspecific vocalizations by Japanese macaques: Evidence for selective attention and neural lateralization. Brain, Behavior & Evolution, **16**, 443-460.

*Brown, C. H., Beecher, M. D., Moody, D. B., & Stebbins, W. C. (1979). Locatability of vocal signals in Old World monkeys: Design features for the communication of position. Journal of Comparative and Physiological Psychology, **93**, 806-819.

Zoloth, S. R., *Petersen, M. R., Beecher, M. D., Green, S., Marler, P., Moody, D. B., & Stebbins, W. C. (1979). Species-specific processing of vocal sounds by monkeys. Science, **204**, 870-873.

Beecher, M. D. & Beecher, I. M. (1979). Sociobiology of bank swallows: Reproductive strategy of the male. Science, **205**, 1282-1285.

*Brown, C. H., Beecher, M. D., Moody, D. B., & Stebbins, W. C. (1980). Localization of noise bands by Old World monkeys. Journal of the Acoustical Society of America, **68**, 127-132.

Beecher, M. D., Beecher, I. M., & †Lumpkin, S. (1981). Parent-offspring recognition in bank swallows (*Riparia riparia*): I. Natural history. Animal Behaviour, **29**, 86-94.

Beecher, M. D., Beecher, I. M., & †Hahn, S. (1981). Parent-offspring recognition in bank swallows (*Riparia riparia*): II. Acoustic basis. Animal Behaviour, **29**, 95-101.

Beecher, M. D. (1981). Development of parent-offspring recognition in birds. In Aslin, R., Alberts, J., & Petersen, M. R. (Eds.), Development of Perception, Academic, pp. 45-61.

Beecher, M. D. (1982). From individual to species recognition: Theories and mechanisms. American Zoologist, **22**, 475-476.

Beecher, M. D. (1982). Signature systems and kin recognition. American Zoologist, **22**, 477-490.

Beecher, I. M. & Beecher, M. D. (1983). Sibling recognition in bank swallows. Zeitschrift fur Tierpsychologie (Ethology), **62** , 145-150.

*Stoddard, P. K. & Beecher, M. D. (1983). Parental recognition of offspring in the Cliff Swallow. Auk, **100**, 795-799.

*Petersen, M. R., Beecher, M. D., Zoloth, S. R., Green, S., Marler, P., Moody, D. B., & Stebbins, W. C. (1984). Neural lateralization of vocalizations by Japanese macaques: Communicative significance is more important than acoustic structure. Behavioral Neuroscience, **98**, 779-790.

Beecher, M. D., *Stoddard, P. K., & *Loesche, P. (1985). Recognition of parents' voices by young cliff swallows. Auk, **102**, 600-605.

*Medvin, M. B., & Beecher, M. D. (1986). Parent-offspring recognition in the barn swallow. Animal Behaviour, **34**, 1627-1639.

Beecher, M. D., *Medvin, M. B., *Stoddard, P. K., & *Loesche, P. (1986). Acoustic adaptations for parent-offspring recognition in swallows. Experimental Biology, **45**, 179-193.

*Medvin, M. B., Beecher, M. D. & *Andelman, S. A. (1987). Extra adults at the nest in barn swallows. Condor, **89**, 179-182.

Beecher, M. D. (1988). The adaptationist approach to learning. In Bolles, R. C. & Beecher, M. D. (Eds.) , Evolution and Learning, Erlbaum.

Bolles, R. C. & Beecher, M. D. (1988). Evolution and Learning, Erlbaum.

*Stoddard, P. K., Beecher, M. D. & †Willis, M. S. (1988). Response of territorial male song sparrows to song types and variations. Behavioral Ecology and Sociobiology, **22**, 125-130.

Beecher, M. D. (1988). Kin recognition in birds. Behavior Genetics, **18**, 465-482.

Beecher, M. D. (1988). Spectrographic analysis of bird vocalizations: Implications of the uncertainty principle. Bioacoustics, **1**, 187-208.

Beecher, M. D. (1989). Signaling systems for individual recognition: an information theory approach. Animal Behaviour, **38**, 248-261.

Beecher, M. D., *Loesche, P., *Stoddard, P. K. & *Medvin, M. B. (1989). Individual recognition by voice in swallows: signal or perceptual adaptation? In Dooling, R. J. & Hulse, S. H. (Eds.), The Comparative Psychology of Audition: Perceiving Complex Sounds, Erlbaum.

Beecher, M. D. (1989). Evolution of parent-offspring recognition in swallows. In D. A. Dewsbury (Ed.), Contemporary issues in Comparative Psychology, pp. 360-380, Sunderland, Mass.: Sinauer.

Beecher, M. D. & *Stoddard, P. K. (1990). The role of bird song and calls in individual recognition: Contrasting field and laboratory perspectives. In Berkley, M. & Stebbins, W. C. (Eds.), Comparative Perception--Vol. II: Complex Signals, pp. 375-408, New York: Wiley.

*Stoddard, P. K., Beecher, M. D., †Horning, C. H. & †Willis, M. S. (1990). Strong neighbor-stranger discrimination in song sparrows. Condor, **97**, 1051-1056.

Beecher, M. D. (1991). Successes and failures of parent-offspring recognition systems in animals. In P. G. Hepper (Ed.), Kin Recognition, pp. 94-124, Cambridge University Press.

Schwagmeyer, P. L., Mock, D. W., *Lamey, T. C., *Lamey, C. S. & Beecher, M. D. (1991). Effects of sibling conflict on hatch timing in an asynchronously hatching bird. Animal Behaviour, **41**, 887-894.

*Stoddard, P. K., Beecher, M. D., †Horning, C. H. & †Campbell, S. E. (1991) Recognition of individual neighbors by song in the song sparrow, a bird with song repertoires. Behavioral Ecology and Sociobiology, **29**, 211-215.

*Loesche, P., *Stoddard, P. K., †Higgins, B. J. & Beecher, M. D. (1991). Signature vs. perceptual adaptations for individual vocal recognition in swallows. Behaviour, **118**, 15-25.

*Medvin, M. B., *Stoddard, P. K. & Beecher, M. D. (1992). Signals for parent-offspring recognition: Strong sib-sib call similarity in cliff swallows but not barn swallows. Ethology, **90**, 17-28.

*Loesche, P., Beecher, M. D. & *Stoddard, P. K. (1992). Perception of cliff swallow calls by birds and humans. Journal of Comparative Psychology, **106**, 239-247.

*Stoddard, P. K., Beecher, M. D., *Horning, C. H. & †Campbell, S. E. (1992). Song type matching in the song sparrow. Canadian Journal of Zoology, **70**, 1440-1444.

*Stoddard, P. K., Beecher, M. D., *Loesche, P. & †Campbell, S. E. (1992). Memory does not constrain individual recognition in a bird with song repertoires. Behaviour, **122**, 274-287.

*Medvin, M. B., *Stoddard, P. K. & Beecher, M. D. (1993). Signals for parent-offspring recognition: A comparative information analysis of the calls of cliff swallows and barn swallows. Animal Behaviour, **45**, 841-850.

*Horning, C. L, Beecher, M. D., *Stoddard, P. K. & Campbell, S. E. (1993). Song perception in the song sparrow: Importance of different parts of the song in song type classification. Ethology, **94**, 46-58.

*Marean, G. C., *Burt, J., Beecher, M. D. & Rubel, E. W (1993). Hair cell regeneration in the European starling (Sturnus vulgaris): Recovery of pure-tone detection threshold. Hearing Research, **71**, 125-136.

Beecher, M. D., Campbell, S. E. & *Stoddard, P. K. (1994). Correlation of song learning and territory establishment strategies in the song sparrow. Proceedings of the National Academy of Sciences, **91**, 1450-1454.

Beecher, M. D., Campbell, S. E. & *Burt, J. (1994). Song perception in the song sparrow: Birds classify by song type but not by singer. Animal Behaviour, **47**, 1343-1351.

*Marean, G. C., Cunningham, D., *Burt, J., Beecher, M. D. & Rubel, E. W (1995). Regenerated hair cells in the European starling: Are they more resistant to kanamycin ototoxicity than original hair cells? Hearing Research, **82**, 267-276.

Beecher, M. D., *Stoddard, P. K., Campbell, S. E., & *Horning, C. L. (1996). Repertoire matching between neighbouring song sparrows. Animal Behaviour, **51**, 917-923.

Beecher, M. D. (1996). Bird song learning in the laboratory and the field. In D. E. Kroodsma & E. L. Miller (Eds.), Ecology and Evolution of Acoustic Communication in Birds, pp. 61-78, Ithaca, NY: Cornell.

O'Loghlen, A. L. & Beecher, M. D. (1997). Sexual preferences for mate song types in female song sparrows. Animal Behaviour, **53**, 835-841.

*Smith, G. T., Brenowitz, E. A., Beecher, M. D. & Wingfield, J. C. (1997). Seasonal changes in testosterone, neural attributes of song control nuclei, and song structure in wild songbirds. Journal of Neuroscience, **17**, 6001-6010.

Beecher, M. D., Campbell, S. E. & *Nordby J. C. (1997). Bird song learning as an evolved strategy. In M. Daly (Ed.), Characterizing Psychological Adaptations, pp. 269-281, Chichester, UK: Wiley.

Owings, D. H., Beecher, M. D. & Thompson, N. S. (Eds.) (1997). Perspectives in Ethology, Vol. 12: Communication. New York: Plenum Press.

Beecher, M. D., *Nordby J. C., Campbell, S. E, *Burt, J. M., *Hill, C. E. & O'Loghlen, A. O. (1997). What is the function of song learning in songbirds? In Owings, D. H., Beecher, M. D. & Thompson, N. S. (Eds.), Perspectives in Ethology, Vol. 12: Communication, pp. 77-97, New York: Plenum Press.

Beecher, M. D., Campbell, S. E. & *Nordby J. C. (1998). The cognitive ecology of song communication and song learning in the song sparrow. In R. Dukas (Ed.), Cognitive Ecology, pp. 175-199, Chicago: Univ. of Chicago Press.

*Marean, G. C., *Burt, J., Beecher, M. D. & Rubel, E. W. (1998). Auditory perception following hair cell regeneration in the European starling (Sturnus vulgaris): Frequency and temporal resolution. Journal of the Acoustical Society of America, **103**, 3567-3580.

*Nordby J. C. , Campbell, S. E & Beecher, M. D. (1999). Ecological correlates of song learning in song sparrows. Behavioral Ecology, **10**, 287-297.

O'Loghlen, A. L. & Beecher, M. D. (1999). Mate, neighbour and stranger songs: a female song sparrow perspective. Animal Behaviour, **58**, 13-20.

*Hill, C. E., Campbell, S. E., *Nordby, J. C., *Burt, J. M. & Beecher, M. D. (1999). Song sharing in two populations of song sparrows. Behavioral Ecology & Sociobiology, **46**, 341-349.

*Burt, J. M., Lent, K. L, Beecher, M. D. & Brenowitz, E. A. (2000). Lesions of avian song nucleus lMAN in female canaries affect song perception in an operant task. Journal of Neurobiology, **42**, 1-13.

Beecher M. D., Campbell, S. E., *Burt, J. M., *Hill, C. E. & *Nordby, J. C. (2000). Song-type matching between neighbouring song sparrows. Animal Behaviour, **59**, 21-27.

Beecher, M. D., Campbell, S. E. & *Nordby J. C. (2000). Territory tenure in song sparrows is related to song sharing with neighbors, but not to repertoire size. Animal Behaviour, **59**, 29-37.

*Nordby, J. C., Campbell, S. E., *Burt, J. M. & Beecher M. D. (2000) Social influences during song development in the song sparrow: a laboratory experiment simulating field conditions. Animal Behaviour, **59**, 1187-1197.

Peters, S., Searcy, W. A., Beecher, M. D. & Nowicki, S. (2000) Geographic variation in the organization of song sparrow repertoires. Auk, **117**, 936-942.

*Nordby, J. C., Campbell, S. E. & Beecher M. D. (2001) Late song learning in song sparrows. Animal Behaviour, **61**, 835-846.

*Burt, J. M., Campbell, S. E. & Beecher, M. D. (2001) Song type matching as threat: a test using interactive playback. Animal Behaviour, **62**, 1163-1170.

*Nordby, J. C., Campbell, S. E. & Beecher M. D. (2002) Adult song sparrows do not alter their song repertoires. Ethology, **108**, 39-50.

*Burt, J. M., *Bard, S. C., Campbell, S. E. & Beecher, M. D. (2002) Alternative forms of song matching in song sparrows. Animal Behaviour, **63**, 1143-1151.

*Reeves, B. J., Brenowitz, E. A. & Beecher, M. D. (2003) Seasonal changes in avian song control circuits do not cause seasonal changes in song discrimination in song sparrows. Journal of Neurobiology, **57**, 119-129.

Beecher, M. D. & Burt, J. M. (2004) The role of social interaction in bird song learning. Current Directions in Psychological Science, **13**, 224-228.

Beecher, M. D. & Brenowitz, E. A. (2005) Functional aspects of song learning in birds. Trends in Ecology & Evolution, **20**, 143-149.

Brenowitz, E. A. & Beecher, M. D. (2005) Song learning in birds: Diversity and plasticity, opportunities and challenges. Trends in Neuroscience, **28**, 127-132.

Beecher, M. D. & Campbell, S. E. (2005) The role of unshared songs in singing interactions between neighbouring song sparrows. Animal Behaviour, **70**, 1297-1304.

Beecher, M. D., Burt, J. M., O'Loghlen, A. L., *Templeton, C. N. & Campbell, S. E. (2007) Bird song learning in an eavesdropping context. Animal Behaviour. **73**, 929-935.

Burt, J. M., O'Loghlen, A. L., *Templeton, C. N., Campbell, S. E. & Beecher, M. D. (2007) Assessing the importance of social factors in bird song learning: A test using computer-simulated tutors . Ethology, **113**, 917-925.

*Nordby, J. C., Campbell, S. E. & Beecher M. D. (2007) Selective attrition and individual song repertoire development in song sparrows. Animal Behaviour, **74**, 1413-1418.

Beecher, M. D. (2008) Function and mechanisms of song learning in song sparrows. Advances in Animal Behavior, **38**, 167-225.

Burt, J. M. & Beecher, M. D. (2008) The social interaction role of song in song sparrows: implications for signal design. Comparative Cognition & Behavior Reviews, **3**, 86-98.

Beecher, M. D. (2008) Function and mechanisms of song learning in song sparrows. Advances in Animal Behavior, **38**, 167-225.

Beecher, M. D. & Burt, J. M. (2008) More on the cognitive ecology of song communication and song learning in the song sparrow. In R. Dukas & J. Ratcliffe (eds.), Evolutionary ecology of learning, memory & information use, Univ. of Chicago, in press.

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