

Stacia A. Sower

CURRICULUM VITA

Stacia A. Sower, Professor

Director of the Center for Molecular and Comparative Endocrinology;

Department of Molecular, Cellular and Biomedical Sciences;

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Education

B.A. University of Utah, Salt Lake City, Utah, 1973

M.S. Oregon State University, Corvallis, Oregon, 1978

Ph.D. Oregon State University, Corvallis, Oregon, 1981

Professional Appointments

1973-1975 Fisheries Biologist, Peace Corps, Venezuela

1976-1980 Graduate Research Assistant, Oregon State University, Corvallis, Oregon.

1980-1983 Post-doctoral Research Associate, University of Washington, Seattle, Washington.

1984-1985 Visiting Professor, University of Cape Town Medical School, South Africa.

1982-1987 Assistant Professor, University of New Hampshire, Durham, New Hampshire.

1985-1992 Director for the UNH Protein Sequencing and Synthesis Facility

1987-1992 Associate Professor, University of New Hampshire, Durham, New Hampshire.

1992 Visiting Professor, Kitasato University, Japan.

1994 Visiting Professor, MacQuarie University, Sydney, Australia.

1996-1997 NSF IPA Rotating Program Director, Integrative Animal Biology Program, Washington, D.C.

1996-1997 Chair of BIO-POWRE Program, National Science Foundation, Washington, DC.

1999-2002 Arthur K. Whitcomb Professor

1984-present Director, Anadromous Fish and Aquatic Research Laboratory

1992-present Professor, Department of Biochemistry and Molecular Biology, University of New Hampshire, Durham, New Hampshire (departmental name changed to Department of Molecular, Cellular and Biomedical Sciences—July 1, 2008)

2002-2005 Appointed Director and PI of NIH COBRE Center of Developmental and Neural Endocrinomics

2004-present Adjunct Professor, Dept of Physiology, Dartmouth Medical School

2005-2007 Interim Associate Dean of Research and Interim Associate Director of Agricultural Experimental Station, College of Life Sciences and Agriculture, UNH

2007 Interim Associate Dean of Research and Graduate Studies, College of Life Sciences and Agriculture, UNH

July 1, 2008- Director of the Center for Molecular and Comparative Endocrinology

Professional Affiliations

The Endocrine Society

Society for Neuroscience

Society for Integrative and Comparative Biology

Member of NSF Regulatory Biology/Physiological Processes Panel (1988-1992)

Member of American Heart Assoc New Hampshire Affiliate Research Committee (1991-1994)

Member of the American Institute of Biological Sciences (AIBS) Peer Review Panel of the NOAA National Sea Grant College Program Marine Biotechnology Proposals, 1994

Member of NSF-Academic Research Infrastructure Program Panel, 1994, 1996

Member of NSF-Neuroendocrinology Panel (1995)

Member of the US National Committee for the International Union of Biological Sciences (National Academy of Sciences) (1995-2001)

Program Director of NSF Integrative Animal Biology Panel (1996-1997)

Chair of Biological Sciences NSF Biological Sciences POWRE Panel (1997)

Member of NSF-Integrative Graduate Education and Research Training Panel (1997)

Member, Board of Editors, General and Comparative Endocrinology (1998-present)

Program Officer, Society of Integrative and Comparative Biology (2002-2004)

Chair-Elect, Division of General Comparative Endocrinology, Society of Integrative and Comparative Biology (2006-2008)

Chair, Division of General Comparative Endocrinology, SICB (2008-2010)

Member of USDA NRI Reproductive Panel (2004-2006)

Member of NSF of Integrative Organismal Biology Panel (2006, 2007)

Member of NSF MRI Panel (Spring, 2008, Fall 2009)

Editorial Board of Endocrinology (Jan, 2007-Dec, 2010)

Editorial Board of International Journal of Endocrinology (2008-)

Editorial Board of Frontiers in Neuroendocrine Research (2010-)

Candidate for President of the Society of Integrative and Comparative Biology (Spring, 2010)

Teaching Experience

Comparative Endocrinology/Endocrinology, upper division and graduate course (45-55 students), semester course

General Biology, non-major introduction course (150-200 students), semester course

Biology, major introductory year core course (100-120 students), (I have taught in each of the semesters--molecular, cellular and genetics in one semester and biological diversity in the second semester)

Biology, Honors Introductory course (27-30 students), semester course

Biochemical Endocrine Techniques Laboratory course (12-20 students), semester course

Fish Aquaculture, Division of Continuing Education

Ocean Technology Course (4-9 students)

Biochemistry Graduate Seminar (22 students)

Graduate Molecular and Biochemical Neuroendocrinology Course (7-9 students)

Graduate Endocrine Disruptors Course (8-12 students)

Undergraduate Honors thesis and Independent Investigations (65 students). There have been a total of 260 students trained in my laboratory:1983-present

Awards and Honors

International Atlantic Salmon Foundation Fellowship (1980)

Liberal Arts Faculty Research Support Grant, UNH (1985)

Biomedical Research Support Grant (NIH) (1985)

Biomedical Research Support Grant (NIH) (1988)

NSF Career Development Award (1988-1989)

UNH Award for Excellence in Public Service (1991)

NSF Faculty Award for Women Scientists and Engineers (1991-1996)

Visiting Scientist Fellowship from Kitasato University, Japan (1992)

Biomedical Research Support Grant (NIH) (1993)

UNH College of Life Science Teaching Excellence Award (1998)

NSF Director's Award for Collaborative Integration (1998)
 Arthur K. Whitcomb Professorship, 1999-2002
 Distinguished Graduate Award, Oregon State University, 2004

Graduate Students and Postdoctoral Research Associates:

I have trained 30 Graduate Students, 65 Undergraduates in projects/Honors thesis, and 7 Postdoctoral Fellows Advisees:

Current Graduate Students:

Takayoshi Kosugi, Ph.D. Student
 James Gargan, B.S.-M.S. Student

Recent Graduate Students

Matt Silver, Ph.D. (successfully defended, Nov 2005)
 Emily LaFiandra, Ph.D. (co-advisor) (successfully defended Feb, 2006)
 Mike Baron, M.S. Student (successfully defended May, 2006)
 Mihael Freamat, Ph.D. (successfully defended, Aug 2007)
 Piyada Ngernsoungnern (co-international advisor) (successfully defended 2007, Thailand)
 Geoffry Bushold, M.S. Student (successfully defended, July 2008)
 Apichart Ngernsoungnern (co-international advisor)(successfully defended 2008, Thailand)
 Scott Kavanaugh, Ph.D. (Successfully defended, May 2009)

Patents

Sower S.A. and Silver M.R. Novel polynucleotide encoding lamprey GnRH-III, Patent #6949365. Filed on Jun. 12, 2002, as Appl. No. 10/170,096. Patent Issued on Sept. 27, 2005

Sower, S.A., N.V. Nucci and M.R. Silver. Cloning and Expression of Gonadotropin-Releasing Hormone (GnRH) Receptors, Patent # 7459310, Filed on April, 2005, as Appl. No. 11/103,082. Patent Issued on December 2, 2008.

Sower, S.A. and M.R. Silver, Lamprey GnRH-III polypeptides and methods of making thereof, Patent #7521057, Filed on June 30, 2005, as Appl. No. 11/172,274. Patent Issued on April 21, 2009.

Sower, S.A., N.V. Nucci and M.R. Silver. Cloning and expression of gonadotropin-releasing hormone (GnRH) receptors. Filed on Dec 1, 2008 as Application No. 12/315,229. United States Patent 7,666,994. Patent issued on Feb 23, 2010.

Internal Research Support:

1988- UNH Hubbard Endowment Fund, "Characterizations of the cDNA for the Precursor of Lamprey GnRH", 1988-1989, \$21,000, Principal Investigator.

NH Agricultural Experiment Station (Hatch #332), "Multiple Forms of GnRH", 1989-1991, \$21,500, Principal Investigator.

Sea Grant Development Grant, "Sterilization in Salmonids by Use of GnRH Analogs", 1991-1992, \$5,900, Principal Investigator.

NH Agricultural Experiment Station (Hatch), "Hormonal Control of Reproduction in Salmon", 1992-1993, \$3,500, Principal Investigator .

1993- NH Agricultural Experiment Station, (Hatch 332) "Endocrine Control of Reproduction in Lampreys", 1993-1996, \$22,500, Principal Investigator .

NH Agricultural Experiment Station, (Hatch) "Endocrine Control of Reproduction in Lampreys", 1996-

- 1999, \$22,500, Principal Investigator .
- Sea Grant Development Grant, "Sexual Development of Hagfish", 1993, \$1500.
- Sea Grant Development Grant, "Hagfish Reproductive System," \$750, 1995.
- 1996-** UNH Hubbard Funds, Characterization of Reproductive Hormones in Hagfish, 1996-1997, \$12,500, Principal Investigator.
- UNH Discretionary Funds, "Effects of Endocrine Disruptors on Reproduction in the Golden Shiner", \$6,500, Principal Investigator,
- UNH Hubbard Marine Program Endowment, "Effects of Endocrine Disruptors and Biotoxins on Reproduction, Growth and Survival in the Golden Shiner," \$10,000, Principal Investigator with Jim Haney, as Co-PI.
- UNH Sustainability Program, 1997-1998, "Frog Endocrine Disruptor Studies," 7,500.
- 1999-** NH Agricultural Experiment Station, (Hatch) "Endocrine Control of Reproduction in Lampreys", 1999-1902, \$27,000 Principal Investigator.
- Sustainability Program, Office of the Dean of COLSA, and VP Research. "Limb Deformities and Abnormal Sex Hormone Concentrations in Frogs, \$7500 Principal Investigator and Kim Babbitt as Co-Investigator. 1998-1999
- UNH Hubbard Marine Program Endowment, "Characterization of the GnRH Receptor in Lampreys", \$6,000. Principal Investigator. 1999-2000
- UNH Marine Biology Program, "Travel Funds to SICB Meetings, Denver, Co," \$300, 1999.
- 2001-** UNH Hubbard Marine Program Endowment, "Infrastructure Support: Seawater Chillers and Filters at the AFAIR LAB", \$4, 1450. Principal Investigator. 2001.
- UNH Marine Biology Program, "Travel Funds to Intl Comparative Endocrinology Congress, Sorrento, Italy," \$800, 2001
- NH Agricultural Experiment Station, (Hatch 332) "Endocrine Control of Reproduction", 2002-2005, \$30,000 Principal Investigator,
- 2005-** NH Agricultural Experiment Station, (Hatch 332) "Endocrine Control of Reproduction", 2005-2008, Principal Investigator, \$30,000.
- 2006-** UNH Provost's Strategic Initiative Fund. "Bioinformatics iNquiry System." \$40,000. 2006-2007.
- 2008-** NH Agricultural Experiment Station, (Hatch 332) "Endocrine Control of Reproduction", 2008-2011, Principal Investigator, \$22,000. (There is an addition of a NH AES Graduate RA support for 2 years)
- 2010-** NH Agricultural Experiment Station. Equipment - Milli-Q Integral 5 Water Purification System, Principal Investigator, \$18,621
- 2011-** NH Agricultural Experiment Station (H571), "Endocrine Control of Reproduction", 2011-2015, Principal Investigator, Funded

External Research Support:

- 1980-** Washington Sea Grant Program, "Endocrine Control of Smoltification and Reproduction in Salmonids", 1983-1984, \$88,989, Co-Investigator.
- Great Lakes Fisheries Commission, "Factors Regulating Reproduction in Lampreys", 1980-1983, \$63,000, Co-Investigator.
- State of Washington Department of Fisheries, "Stages of Sexual Maturity of Ocean-Caught Chinook Salmon", 1982-1983, \$4800. Principal Investigator.
- NOAA Sea Grant Program, "Endocrine Control of Reproductive and Juvenile Development in External Research Support Salmonids", 1984-1986, \$115,000 (total costs), Principal Investigator.
- Great Lakes Fisheries Commission, "Use of Hormones and their Analogues to Control Reproduction and Metamorphosis in the Sea Lampreys", 1984-1988, \$77,800 (direct costs only), Principal Investigator.
- 1986-** National Science Foundation (Regulatory Biology), DCB-8602907, "Biological Action of GnRH in Lampreys", 1986-1989, \$150,000 (indirect costs included), Principal Investigator.
- National Science Foundation (Undergraduate Research Experience Site Proposal), 1987-1988, \$40,000 (Principal investigator, Dr. Don Green, Biochemistry Dept; one of several co-principal investigators).
- National Science Foundation (Regulatory Biology: Career Development Award) Grant, DCB-8808946, "GnRH and GTH in Agnathans", 1988-1989, \$59,558, Principal Investigator.
- New Hampshire Fish and Game, "The Timing of Juvenile River Herring Downstream Migration", 1987-1989, \$21,879 (direct costs only), Principal Investigator.
- NOAA Sea Grant Program, "Endocrine Control of Reproduction in Salmonids, 1987-1990, \$103,000 (indirect costs included), Principal Investigator.
- 1990-** Great Lakes Fisheries Commission, "Collection of Lamprey Tissues for Purification of Hormones", 1990, \$12,000, Principal Investigator.
- Great Lakes Fisheries Commission, "Hormonal and Environmental Cues in Metamorphosis of *Petromyzon marinus*", 1991-1993, \$238,625 Cdn, Co-Principal investigator. (Principal Investigator, John H. Youson, University of Toronto).
- National Science Foundation Supplemental Grant, "Research Experience for Undergraduates", 1991-1992, \$5,000.
- National Science Foundation (Physiological Processes), "Biological Action of GnRH in Agnathans", 1989-1994, \$496,000, Principal Investigator.
- NOAA, Protein Engineering Equipment for Center Development, 1991. \$250,000, Principal Investigator.
- 1993-** Great Lakes Fisheries Commission, "GnRH Neuronal Migratory Mechanisms During Lamprey Brain Development", 1993-1995, \$148,689, Co-Principal Investigator. (Principal Investigator, Stuart A. Tobet, E.K. Shriver Center).

National Science Foundation Supplemental Grant, "Research Experience for Undergraduates", 1993-1994, \$5,000

National Science Foundation (FAW), "Comparative Neuroendocrinology of Reproduction in Fish", 1991-1997, \$250,000, Principal investigator.

Great Lakes Fisheries Commission, "Effects of Lamprey GnRH-I and -III on Reproductive Processes and Behavior of Male Sea Lampreys, "1994-1995, \$92,804. Principal Investigator.

Great Lakes Fisheries Commission, "Hormonal Sterilization of Early Lamprey Larvae," 1994-1996, \$17,000. Principal Investigator.

National Science Foundation (Endocrinology/Neuroscience), "Biological Action of GnRH in Lamprey", 1994-1997, \$334,130, Principal investigator.

National Science Foundation Supplemental Grant, "Research Experience for Undergraduates," 1995-1997, \$15,000.

1997- Great Lakes Fisheries Commission, "Potential Use of GnRH Analogs for Sterilizing Male Sea Lampreys," 1997-2000, \$229,023. Principal Investigator.

National Science Foundation, "Molecular and Functional Investigations of Gonadotropin and Gonadotropin Releasing Hormone in Lamprey Reproduction, 1997-2001, \$330,000. Principal Investigator.

National Science Foundation Supplemental Grant, "Research Experience for Undergraduates", 1997-2000, \$30,000 (\$10,000 per year).

2000- Great Lakes Fisheries Commission, " Collection of Lamprey Brains and Pituitaries for Purification of Hormones," \$9188. 2000-2001. Principal Investigator.

National Science Foundation, "A Molecular Imager for Studies in Signal Transduction, \$68,550 (Clyde Denis, Principal Investigator with four co-investigators: Laue, Schaller, Sower and Tisa), 1999-2000

National Science Foundation, "Upgrading the Core Facility for DNA Sequencing at the University of New Hampshire," \$164,390 (Tom Kocher, Principal Investigator with Ann Bucklin and Stacia Sower as major users)

Center for Conservation Medicine "Frog Endocrine Disruptor Studies", 1999-2000, Rosalind Rolland, Tufts Veterinary School, principal investigator with Stacia Sower and Kim Babbitt as co-principal investigators, \$68,800

National Science Foundation, International Division-Japan (NSF #0509011), " Phylogeny of Brain/Pituitary Hormones of Agnathans," 1999-2003, \$22,813.

National Science Foundation, "Molecular Investigations of GnRH and GTH in Agnathan Reproduction, 2001-2004, \$301,000. Principal Investigator.

National Institute of Children's Health and Development, "Multiple Forms of GnRH in Primates, 2000-2003, \$144,000. Principal Investigator,

NOAA Sea Grant Program, "Age, Growth and Reproduction in Atlantic Hagfish," 2001-2003, \$173,000, Principal Investigator.

Great Lakes Protection Fund, "Utilizing a sex pheromone to increase the efficacy of the sterile male release program of the Great Lakes," 2001-2003, \$324,362, Weiming Li, Principal Investigator, Michigan State University, Co-principal Investigator

NHRC/Bentley Pharmaceuticals, Inc., "GnRH in Primates," 2001-2003, \$92,469, Principal Investigator.

US Geological Survey, Wash, "Lamprey Steroid Assays, 2001-2003, \$39,000, Principal Investigator.

National Science Foundation Supplemental Grant, "Research Experience for Undergraduates", 2002-2003, \$15,000.

National Science Foundation Supplemental Grant, "Research Experience for Undergraduates", 2003-2004, \$10,000.

2004 National Science Foundation (IBN#0421923), "Molecular and Functional Investigations of GnRH in Lamprey Reproduction, 2004-2009, \$480,000. Principal Investigator.

National Science Foundation Supplemental Grant, "Research Experience for Undergraduates", 2005-2006, \$6,000.

National Science Foundation Supplemental Grant, "Research Experience for Undergraduates", 2006-2007, \$6,000.

NHRC/Bentley Pharmaceuticals, Inc., "GnRH in Primates," 2005-2007, \$89,936, Principal Investigator.

National Science Foundation Supplemental Grant, "Research Experience for Undergraduates", 2007-2008, \$6,000.

National Science Foundation, Major Research Instrumentation 0618719, "Acquisition of a Confocal Microscope", \$403,759. Principal Investigator (includes nine major users), 2006-2009

National Science Foundation Undergraduate Research and Mentoring in the Biological Sciences Program, 2007-2012, \$1,000,000. Pre-proposal submitted Oct. 27, 2006. Principal Investigator with eleven other UNH faculty. Partnership University is Elizabeth City State University. (not funded)

National Institute of Health, "Role of N-glycosylation in *C. Elegans* dauer switching." 2004-2007. \$206,794. Stacia Sower (PI), UNH, replaced Charles E. Warren as PI as of Nov 2005 due to the death of Dr. Charles Warren.

2008 National Institute of Health, "Insight from Lamprey Genome: Structure-Function studies of GnRH Receptor and Novel GnRH receptors." 2007-2010. National Institutes of Health NCCR-R21, \$398,750.

National Science Foundation Supplemental Grant, "Research Experience for Undergraduates", 2008-2009, \$6000.

2010 National Science Foundation, "Insight from Lamprey Genome: Investigations of the GnRH-GTH System " 2009-2013, \$420,000. Principal Investigator.

National Science Foundation, Symposium Proposal, "Symposium: Insights of Early Chordate Genomics," August 1, 2009 and July 31, 2010. Principal Investigator, Stacia Sower, Co-PI, Linda Holland (UCSD). \$25,103.

National Science Foundation Supplemental Grant, "Research Experience for Undergraduates", 2009-2010, \$7500.

National Science Foundation Supplemental Grant, "Research Experience for Undergraduates", 2010-2011, \$6000.

National Institutes of Health, "Unnatural Oxepin Metabolites as Probes into the Cytochrome P450-Catalyzed Conversion of the Human Carcinogen Benzene to the Highly Toxic Metabolite Muconaldehyde", Principal Investigator, Arthur Greenberg, Co-PI, Stacia Sower, \$419,937. Submitted Oct, 2010

National Science Foundation Supplemental Grant, "Research Experience for Undergraduates," 2011-2012, \$6000.

National Science Foundation, "Molecular Mechanisms of Ligand Interaction with Three Gonadotropin-Releasing Hormone Receptors, Principal Investigator, \$746,601, Submitted Jan 5, 2011

National Science Foundation, MRI: Acquisition of an Illumina HiSeq 2000. Principal Investigator, W. Kelley Thomas. \$745,000. Submitted Jan 2011, One of several major users

Publications (Refereed Articles):

- 1982-** 1. Sower, S.A., C.B. Schreck, and E.M. Donaldson. 1982. Hormone induced ovulation of coho salmon (*Oncorhynchus kisutch*) held in seawater and fresh water. *Can. J. Fish Aquat. Sci.* 39:627-632.
2. Sower, S.A. and C.B. Schreck. 1982. Steroid and thyroid hormones during sexual maturation of coho salmon (*Oncorhynchus kisutch*) in seawater or fresh water. *Gen. Comp. Endocrinol.* 47:42-53.
3. Sower, S.A. and C.B. Schreck. 1982. *In vitro* induction of final maturation of oocytes from coho salmon. *Trans. Amer. Fish. Soc.* 111:399-403.
4. Sower, S.A. and C.B. Schreck. 1982. Sexual maturation of coho salmon (*Oncorhynchus kisutch*): accelerated ovulation and circulating steroid hormone and ion levels of salmon in freshwater and seawater. *Proc. North Pacific Aquaculture Symp., Alaska; Oregon.* Alaska Sea Grant Publication. 82-2 January, pp. 227-235.
- 1983-** 5. Sower, S.A., C.B. Schreck, and M. Evenson. 1983. Effects of steroids and steroid antagonists on growth, gonadal development, and RNA/DNA ratios in juvenile steelhead trout. *Aquaculture* 32:243-254.
6. Plisetskaya, E., S.A. Sower, and A. Gorbman. 1983. The effects of insulin insufficiency on plasma thyroid hormones and some metabolic constituents in Pacific hagfish, *Eptatretus stouti*. *Gen. Comp. Endocrinol.* 49:315-319.
7. Martin, R.W., J. Myers, S.A. Sower, D. Phillips, and C. McAuly. 1983. Ultrasonic imaging, a potential tool for sex determination of live fish. *North American Journal of Fisheries Management* 3: 258-264.
8. Sower, S.A., W.W. Dickhoff, A. Gorbman, J.E. Rivier, and W.W. Vale. 1983. Ovulatory and steroid responses in the lamprey following administration of salmon gonadotropin and agonistic and antagonistic analogues of GnRH. *Can. J. Zool.* 61:2653-2659.
- 1984-** 9. Sower, S.A., R.N. Iwamoto, W.W. Dickhoff, and A. Gorbman. 1984. Ovulatory and steroidal responses in coho salmon and steelhead trout following administration of salmon gonadotropin and D-Ala⁶,des Gly¹⁰gonadotropin-releasing hormone ethylamide (GnRH_a). *Aquaculture* 43:35-46.
10. Sower, S.A., W.W. Dickhoff, J. Mighell, T. Flag, and C. Mahnken. 1984. Effects of estradiol

- and diethylstilbesterol on sex reversal and mortality in Atlantic salmon (*Salmo salar*). *Aquaculture* 43:75-82.
11. Sower, S.A., C.V. Sullivan, and A. Gorbman. 1984. Changes in plasma estradiol and effects of triiodothyronine on plasma estradiol during smoltification of coho salmon, *Oncorhynchus kisutch*. *Gen. Comp. Endocrinol.* 54:486-492.
- 1985-** 12. Sower, S.A., E. Plisetskaya, and A. Gorbman. 1985. Changes in plasma steroid, thyroid hormones, and insulin during final maturation and spawning of the sea lamprey, *Petromyzon marinus*. *Gen. Comp. Endocrinol.* 58:259-269.
13. Buckingham, J.C., J.H. Leach, E. Plisetskaya, S.A. Sower, and A. Gorbman. 1985. Corticotrophin-like bioactivity in the pituitary gland and brain of the Pacific hagfish, *Eptatretus stouti*. *Gen. Comp. Endocrinol.* 57:434-437.
14. Dickhoff, W.W., S.A. Sower, and A. Gorbman. 1985. Hepatic estrogen binding during vitellogenesis in Pacific hagfish, *Eptatretus stouti*. *Current Trends in Comparative Endocrinology* (eds. B. Lotts and W. Holmes, Hong Kong University Press) 1:347-349.
15. Sherwood, N.M. and S.A. Sower. 1985. A new family member for gonadotropin-releasing hormone. *Neuropeptides* 6:205-214.
16. Sower, S.A., E. Plisetskaya, and A. Gorbman. 1985. Steroid and thyroid hormone profiles following a single injection of partly purified salmon gonadotropin or GnRH analogues in male and female sea lamprey. *J. Exp. Zoology* 235:403-408.
17. Sower, S.A. and R.N. Iwamoto. 1985. The identification of the sex steroid, testosterone, in various commercial salmon diets. *Aquaculture* 49:11-17.
- 1986-** 18. Sherwood, N.M., S.A. Sower, D.R. Marshak, B.A. Fraser, and M.J. Brownstein. 1986. Primary structure of gonadotropin-releasing hormone in lamprey brain. *J. Biol. Chem.* 15:4812-4819.
- 1987-** 19. Sower, S.A., J.A. King, R.P. Millar, N.M. Sherwood, and D.R. Marshak. 1987. Comparative biological properties of lamprey gonadotropin-releasing hormone in vertebrates. *Endocrinology* 120:773-779.
20. Linville, J., L. Hansen, and S.A. Sower. 1987. Endocrine events associated with spawning behavior in the sea lamprey (*Petromyzon marinus*). *Hormones and Behavior* 21:105-107.
21. Sower, S.A. 1987. Biological action of lamprey gonadotropin-releasing hormone in lampreys. *Proceedings of the Third International Symp. Reprod. Physiol. of Fish. St. John's Newfoundland, Canada 2-7, August, 1987* pg 40-41.
22. Ho, M.S., D. Press and S.A. Sower. 1987. Identification of an estrogen receptor in the testis of the sea lamprey, *Petromyzon marinus*. *Gen. Comp. Endocrinol.* 67:119-125.
- 1988-** 23. Stopa, E.G., S.A. Sower, C.N. Svendsen, and J.C. King. 1988. Polygenic expression of gonadotropin-releasing hormone (GnRH) in human? *Peptides.* 9:419-423.
24. King, J. C., S.A. Sower, and E.L.P. Anthony. 1988. Neuronal systems immunoreactive with antiserum to lamprey gonadotropin-releasing hormone in the brain of *Petromyzon marinus*. *Cell Tissue Research.* 253:1-8.
25. Lane, T., H. Kawauchi, and S.A. Sower. 1988. Arginine vasotocin from the pituitary gland of the lamprey (*Petromyzon marinus*): Isolation and amino acid sequence. *Gen. Comp. Endocrinol.* 70:152-157.
26. Carolsfeld, J., N.M. Sherwood, H. Kreiberg, and S.A. Sower 1988. Induced sexual maturation of herring using GnRH "Quick Release" cholesterol pellets. *Aquaculture* 70:169-181.
- 1989-** 27. Sower, S.A. 1989. Effects of lamprey gonadotropin-releasing hormone and analogs on steroidogenesis and spermiation in male sea lampreys. *Fish Physiol. and Biochem.* 7:101-107.
28. Borghetti, J.R., R.N. Iwamoto, R.W. Hardy, and S.A. Sower. 1989. The effects of naturally-occurring androgens in practical diets fed to normal-sired and jack-sired progeny of coho

salmon (*Oncorhynchus kisutch*). *Aquaculture* 77:51-60.

- 1990-** 29. Sower, S.A. 1990. Gonadotropin-releasing hormone in primitive fishes. *Progress in Clinical and Biological Research*. 342:73-78.
30. Sower, S.A. 1990. Neuroendocrine control of reproduction in lampreys. *Fish Physiol. and Biochem.* 8:365-374.
31. Fahien, C.M. and S.A. Sower. 1990. Relationship between brain gonadotropin-releasing hormone and final reproductive period of the adult male sea lamprey, *Petromyzon marinus*. *Gen. Comp. Endocrinol.* 80:427-437.
32. Hines, G.A., S.A. Watts, S.A. Sower and C.W. Walker. 1990. Sex steroid extraction from echinoderm tissues. *J. Liquid Chromat.* 13:2489-2498.
- 1991-** 33. Sower, S.A. and L.O. Larsen. 1991. Plasma estradiol and progesterone after hypophysectomy and substitution with pituitary in female sea lampreys (*Petromyzon marinus*). *Gen. Comp. Endocrinol.* 81:93-96.
34. Sower, S.A. and R.S. Fawcett. 1991. Changes in gill Na⁺,K⁺-ATPase, thyroxine and triiodothyronine of coho salmon held in two different rearing densities during smoltification. *Comp. Biochem. Physiol.* 99A:85-89.
35. Youson, J.H. and S.A. Sower. 1991. Concentration of brain gonadotropin-releasing hormone during metamorphosis in the lamprey, *Petromyzon marinus*. *J. Exp. Zool.* 259: 399-404.
- 1992-** 36. Lewis, K.M. and S.A. Sower. 1992. Effects of dietary testosterone on growth and sex ratio of juvenile Atlantic salmon (*Salmo salar*). *Fish. Physiol. Biochem.* 9: 513-517.
37. Sower, S.A., K.H. Karlson, and R.S. Fawcett. 1992. Changes in plasma thyroxine, estradiol-17 β , and 17 α ,20 β -dihydroxy-4-pregnen-3-one during smoltification of coho salmon. *Gen. Comp. Endocrinol.* 85:278-285.
38. Bolduc, T.G. and S.A. Sower. 1992. Changes in brain gonadotropin-releasing hormone, plasma estradiol 17- β and progesterone during the final reproductive cycle of the female sea lamprey, *Petromyzon marinus*. *J. Exp. Zool.* 264:55-63.
39. Hines, G.A., S.A. Watts, S.A. Sower and C.W. Walker. 1992. Sex steroid levels in the testes, ovaries, and pyloric caeca during the annual reproductive cycle of the sea star, *Asterias vulgaris*. *Gen. Comp. Endocrinol.* 87:451-460.
40. Lewis, K.M., P. Swanson, and S.A. Sower. 1992. Changes in brain salmon gonadotropin-releasing hormone, plasma gonadotropin I, and plasma thyroxine in chinook salmon (*Oncorhynchus tshawytscha*) during smoltification. *Gen. Comp. Endocrinol.* 87:461-470.
41. Murray, M.K. and S.A. Sower. 1992. Estrogen- and progesterone-dependent secretory changes in the uterus of the sheep. *Biol. Reprod.* 47:917-924..
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 143. A. Ngernsoungnern, P. Ngernsoungnern, S.I. Kavanaugh, S.A. Sower, P. Sobhon, and P. Sretarugsa. 2008. The identification and distribution of gonadotropin-releasing hormone-like peptides in the central nervous system and ovary of the giant freshwater prawn, *Macrobrachium rosenbergii*. Invert Neurosci. Mar;8(1):49-57.
 144. Freamat, M. and S.A. Sower. 2008. A sea lamprey glycoprotein hormone receptor similar with Gnathostome thyrotropin hormone receptor. J. Molec Endocrinol. 41:219-228
 145. Freamat, M. and S.A. Sower. 2008. Glycoprotein hormone receptors in sea lamprey *Petromyzon marinus*. Zoological Science 25: 1037-1044
- 2009:**
146. Sower, S.A., M. Freamat, and S.A. Sower. 2009. Origins of the hypothalamic-pituitary-gonadal (HPG) and hypothalamic-pituitary-thyroid endocrine systems: New insights from Lampreys Gen. Comp. Endocrinol 161:20-29.
 147. Kawauchi, H., Sower, S., Moriyama, H., 2009. The neuroendocrine regulation of prolactin and somatolactin in secretion in fish. In: Bernier, N., Van Der Kraak, G., Farrell, A., Brauner, C. (Eds.), Fish Neuroendocrinology, vol. 28. Academic Press, Amsterdam, pp. 197-234
 148. Denver, R.J., Hopkins, P.M., McCormick, S.D., Propper, C.R., Riddiford, L., Sower, S.A. and Wingfield, J. 2009. Comparative endocrinology in the 21st century. Integrative and Comparative Biology Integr. Comp. Biol. 49: 339-348
 149. Sower, S. A., M. Freamat, and S. I. Kavanaugh. 2009. Insight from lamprey genomics: brain and pituitary reproductive hormones of lampreys. Pages 57–70 in L. R. Brown, S. D. Chase, M. G. Mesa, R. J. Beamish, and P. B. Moyle, editors. Biology, management, and conservation of

- lampreys in North America. American Fisheries Society, Symposium 72, Bethesda, Maryland
- 2010:** 150. Mesa, M. G., J. M. Bayer, M.B. Bryan and S.A. Sower. 2010. Annual sex steroid and other physiological profiles of Pacific lampreys (*Lampetra tridentata*). *Comp. Bchm. Physiol.- Part A: Molecular and Integrative Physiology*. 155:56-63.
151. Kosugi, T. and S.A. Sower. 2010. A role of Histidine¹⁵¹ in the lamprey gonadotropin-releasing hormone receptor 1 (lGnRHR-1): Functional insight of diverse amino acid residues in the position of Tyr of the DRY motif in GnRHR from an ancestral type II receptor. *Gen. Comp. Endocrinol.* 166:498-503.
152. Freamat, M and S.A. Sower. 2010. Functional divergence of glycoprotein hormone receptors. *Integr. and Comp. Biol.* 50:110-123.
153. Holland, L.Z. and S.A. Sower. 2010. "Insights of Early Chordate Genomics: Endocrinology and Development in Amphioxus, Tunicates and Lampreys": Introduction to the symposium. *Integr. and Comp. Biol.* 50:17-21.
154. Sower, S.A. and H. Kawauchi. 2010. Reproduction in Agnathan Fishes: Lampreys and Hagfishes. In *Hormones and Reproduction of Vertebrates*. Editors: D.O. Norris and K. H. Lopez. Academic Press. Vol 1, Chapt 10.
155. Uchida, K., S. Moriyama, H. Chiba, T. Shimotani, K. Honda, M. Miki, A. Takahashi, S.A. Sower and M. Nozaki. 2010. Evolutionary origin of a functional gonadotropin in the pituitary of the most primitive vertebrate, hagfish. *Proc. Natl Acad Sci U.S.A.* 07(36):15832-15837
156. Clemens, B.J., T. Binder, M. Docker, M.L. Moser and S.A. Sower. 2010. Similarities, Differences, and Unknowns in Biology and Management of Three Parasitic Lampreys of North America. *Fisheries*. 35:580-596.
- 2011** 157. Sower, S.A., E. Balz, A. Aquilina-Beck and S.I. Kavanaugh. 2011. Seasonal changes of brain GnRH-I, -II, and -III during the final reproductive period in adult male and female sea lamprey. *Gen. Comp. Endocrinol.* 170:276-82.
158. Patiño R, Barton B, Maule A, Mesa M, Redding J, Rodnick K and Sower SA (2010) Profiles in Comparative Endocrinology: Carl B. Schreck Howard Bern Lecturer, Annual Meeting of Society of Integrative and Comparative Endocrinology, Seattle, January 5, 2010. *Gen Comp Endocrinol.* In Press. *Epub ahead of print*
159. Kim, D.K., E.B. Cho, M.J. Moon, S. Park, J.I. Hwang, O. Kah, S.A. Sower, H. Vaudry and J.Y. Seong. 2011. Revisiting the evolution of gonadotropin-releasing hormones and their receptors in vertebrates: Secrets hidden in genomes. *Gen. Comp. Endocrinol.* 170:68-78.

Book Review:

Sower, S.A. 1982. *Reproduction in Farm Animals*, E.S.W. Hafez, ed. Lea and Febiger, Philadelphia, 1980. *Gen. Comp. Endocrinol.* 47:399.

Published Articles (Non-refereed, invited papers, book chapt, and abstr):

- 1981** Sower, S.A. and C.B. Schreck. 1981. Sexual maturation of coho salmon (*Oncorhynchus kisutch*): induced ovulation and serum hormone and ion levels of salmon in fresh versus salt water. Washington Sea Grant Publication. Terry Nosh, Editor. WSG-WO 80-1, pg. 46.
- Sower, S.A., W.W. Dickhoff, and R. Iwamoto. 1981. Hormone induced ovulation in coho salmon, steelhead trout hybrids, and Atlantic salmon. Washington Sea Grant Publication. Terry Nosh, Editor. WSG-WO 80-1, pp. 81-82.
- 1982** Sower, S.A., W.W. Dickhoff, A. Gorbman, W.W. Vale, and J.E. Rivier. 1982. Actions of analogues of luteinizing hormone-releasing hormone (LH-RH) in the sea lamprey. *American Zoologist* 22:855. Abstr.

- 1983** Sower, S.A., N.M. Sherwood, and E. Plisetskaya. 1983. Gonadotropin-releasing hormone in two cyclostomes, the sea lamprey (*Petromyzon marinus*) and hagfish (*Eptatretus stouti*). *American Zoologist* 23: 882. Abstr.
- 1984** Plisetskaya, E., S.A. Sower, and A. Gorbman. 1984. Profiles of plasma thyroid hormones and insulin during the upstream spawning migration of the sea lampreys, *Petromyzon marinus*. *Gen. Comp. Endocrinol.* 53:451. Abstr.2
- Sower, S.A. and R.N. Iwamoto. 1984. Prologue. *Aquaculture* 43:x.
- Iwamoto, R.N. and S.A. Sower. 1984. Acknowledgements. *Aquaculture.* 43:ix.
- 1985** Sower, S.A. and R.N. Iwamoto. 1985. Roundtable Discussions. *Salmonid Reproduction, An International Symposium; Washington Sea Grant Publication, WSG-WO 85-2*(eds. R.N. Iwamoto and S.A. Sower), pp. 136-141.
- 1986-** Sower, S.A., J.A. King, R.P. Millar, W.W. Dickhoff, and P. Swanson. 1986. Comparative biological properties of lamprey gonadotropin-releasing hormone in vertebrates. *American Zoologist* 26:29A. Abstr.
- 1987-** Stopa, E.G., S.A. Sower, C.N. Svendsen, and J.C. King. 1987. Immunocytochemical evidence for a lamprey-like gonadotropin-releasing hormone in human brain. *Society for Neuroscience* 13:437.8. Abstr.
- Sower, S.A., E.L.P. Anthony, and J.C. King. 1987. Neuronal perikarya immunoreactive with lamprey LHRH antiserum project to the neurohypophysis third ventricle, surface of the brain of *Petromyzon marinus*. *Society for Neuroscience* 13:437.9. Abstr.
- 1988-** Sower, S.A. and C.M. Fahien. 1988. Changes in brain GnRH, and plasma estradiol-17 β , and progesterone of male sea lampreys, *Petromyzon marinus*, during their upstream spawning migration. *American Zoologist* 28:54A. Abstr.
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- 1989-** Sower, S.A. 1989. Cyclostome workshop. *Fish Physiol. and Biochem.* 7:407.
- Murray, M.K. and S.A. Sower. 1989. Steroid-dependent secretory and morphological changes in the sheep uterus. *Biol. Reprod.* 40:247.
- Bolduc, T.G. and S.A. Sower. 1989. Gonadotropin-releasing hormone activity during the final reproductive period of female sea lamprey, *Petromyzon marinus*. *American Zoologist.* 29:94A. Abstr.
- Calvin, J.L., A.P. Laudano and S.A. Sower. 1989. Characterization of an antibody to lamprey gonadotropin-releasing hormone. *American Zoologist.* 29:94A. Abstr.
- 1990-** Sower, S.A., T.G. Bolduc and Y.H. Youson. 1990. Changes in gonadotropin-releasing hormone during metamorphosis and final maturation in sea lamprey. *Society for Neuroscience* 16:168.10. Abstr.
- Hines, G.A., S.A. Watts, S.A. Sower and C.W. Walker. 1990. Sex-steroid levels in the testes, ovaries and pyloric caeca during the annual reproductive cycle of the sea star *Asterias vulgaris*. *American Zoologist.* 30:81A. Abstr.9

- 1991-** Youson, J.H., Wright G.M. and S.A. Sower. 1991. Immunoreactivity of brain of larval and metamorphosing lampreys, *Petromyzon marinus*, to an antilamprey GnRH antiserum. Gen. Comp. Endocrinol. 82:226(#162) Abstr.
- Knox, C.J. and S.A. Sower. 1991. Multiple forms of gonadotropin-releasing hormone (GnRH) in four species of teleosts. American Zoologist. 31:20A. Abstr.
- Wang, S.W. and S.A. Sower. 1991. Functional anatomical relationship between the hypothalamus and adenohypophysis in sea lamprey: diffusion hypothesis. American Zoologist. 31:20A. Abstr.
- Perry, K.A., J. Pardo, J.G. Abrams and S.A. Sower. 1991. Effects of dietary testosterone on growth, gonadal development, plasma testosterone and seawater transfer during smoltification in Atlantic salmon. American Zoologist. 31:67A. Abstr.
- 1992-** Perry, K.A. and S.A. Sower. 1992. Effect of estradiol on brain GnRH in adult female sea lamprey. American Zoologist. 32:26A.
- Knox, C.J., S.K. Boyd, and S.A. Sower. 1992. Characterization of gonadotropin-releasing hormone binding sites in the pituitary of the sea lamprey (*Petromyzon marinus*). American Zoologist. 32:16A
- Vertebrate Sex Determination/Differentiation Workshop, Report to the Great Lakes Fishery Commission, Aug., 1992. 33 pgs. Stacia A. Sower and Lee H. Hanson.
- 1993-** Takahashi, A., S.A. Sower, Y. Ishikawa, M. Nozaki, and H. Kawauchi. 1993. A new glycoprotein produced in the rostral pars distalis of lamprey pituitary gland. XII Internat Congress of Comp Endocrinol. Toronto, Canada, May, 1993. Abstr.
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- Ishijima, K, A. Takahasi, S.A. Sower, and H. Kawauchi. 1993. Isolation and primary structures of lamprey melanotropins. XII Internat Congress of Comp Endocrinol. Toronto, Canada, May, 1993. Abstr.
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- 1994-** Sower, S.A., M. Nozaki, A. Gorbman, J.H. Youson and S.A. Tobet. 1994. Distribution of lamprey gonadotropin-releasing hormone-III in lamprey brains. Soc. for Neuroscience. 20:1420. Abstr.
- S.A. Sower. 1994. Gonadotropin-releasing hormones in lampreys and hagfish. Amer. Zool., 34:4A. Abstr.
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- Gazourian, L. and S.A. Sower. 1994. Pituitary Responsiveness to perfused lamprey GnRH-I or -III and analogs in the adult male sea lamprey, *Petromyzon marinus*. Amer. Zool., 34:23A. Abstr.
- Deragon, K.L. and S.A. Sower. 1994. *In vivo* and *in vitro* effects of lamprey gonadotropin-releasing hormone-III in the adult sea lamprey. Amer. Zool., 34:23A. Abstr.
- 1995-** Robinson, T.C., S.A. Tobet, and S.A. Sower. 1995. Gonadotropin-releasing hormones in the teleost,

- Catostomus commersoni*. Amer. Zool., 35:23A. Abstr.
- Evans, E.L. and S.A. Sower. 1995. Steroid feedback in the male sea lamprey, *Petromyzon marinus*. Amer. Zool., 35:22A. Abstr.
- MacIntyre, J.K., R. Gamble, T.W. Chickering, S.A. Sower and S.A. Tobet. 1995. Developmental relationship of neurons containing γ -aminobutyric acid to neurons containing gonadotropin-releasing hormone in the sea lamprey. Amer. Zool. 35:22A. Abstr.
- 1996-** Materne, O.L.I. and S.A. Sower. 1996. Characterization of the gonadotropin-releasing hormone receptors in the pituitary gland of the developing ammocoete, juvenile, and sexually maturing adult lamprey. Soc. for Neuroscience. 22:84 Abstr.
- 1997-** Ebersole, T.L., J.M. Conlon, S.A. Sower, and S.K. Boyd. 1997. Isolation and purification of multiple GnRH-like molecular forms from the brain of a caecilian amphibian. Amer. Zool. 37: 117A. Abstr.
- Maruska, K.P., P.M. Forlano, J.A. King, S.A. Sower, and T.C. Tricas. 1997. Chicken II GnRH in the elasmobranch midbrain: support for the ancestral vertebrate condition. Soc. for Neuroscience. 23: 1797 Abstr.
- 1998-** Yu, W.H., S. Karanth, A. Walczewska, S.A. Sower, J. Hiney, W.L. Dees, A. Parlow and S.M. McCann. 1998. FSH-releasing factor is lamprey LHRH-III or closely related peptide. Soc. for Neuroscience. 24: 270 Abstr.
- Suzuki, K., R.L. Gamble, K.L. Reed and S.A. Sower. 1998. Polymorphism of lamprey GnRH-I cDNA. Amer. Zool. 38:112A. Abstr.
- Sower, S.A., K. Suzuki and K.L. Reed. 1998. Perspective: Evolution of enteropancreatic and central nervous system hormones. Amer. Zool. 38: 140A. Abstr.
- 2000** Reed, K.L., K.J. Babbitt, and S.A. Sower. 2000. Limb deformities and abnormal sex hormone concentrations in frogs. Amer Zool. 19:141A. Abstr.
- 2001** Silver, M.R., K. J. Lee, A. Takahashi, H. Kawauchi, J. Joss, M. Nozaki, and S. A. Sower. 2001. Molecular phylogenetic analysis within the Petromyzontiforme lineage using the cDNA for lamprey gonadotropin releasing hormone-III. Amer. Zool. 41:1587. Abst.
- Lee, K., M. Powell, K. Reed, K. Suzuki, A. Takahashi, S. Moriyama, H. Kawauchi, and S. A. Sower. 2001. Progress in cloning of a cDNA encoding gonadotropin from the sea lamprey, *P. marinus*. Amer. Zool. 41: 1503. Abst.
- Nucci N.V., K. L. Reed, K. J. Lee, C. A. Bourn, B. E. Troskie, and S. A. Sower. 2001. Molecular Cloning of the GnRH Receptor cDNA in the Sea Lamprey, *Petromyzon Marinus* . Amer Zool. 41: 1541 Abst.
- Powell, M. L., T. Heyl , A. Baukus and S. A. Sower. 2001. Gonad Development in the North Atlantic hagfish, *Myxine glutinosa*, Amer Zool. 41: 1560 Abst.
- Powell, M.L. and S. A. Sower. 2001. Seasonal Estradiol Production in Three Size Classes of Atlantic Hagfish, *Myxine glutinosa*. Amer Zool. 41: 1560 Abst.
- Kavanaugh, S.I., M. L. Powell, J. E. Davis, and S. A. Sower. 2001. Sexuality and Embryogenesis of the Atlantic Hagfish, *Myxine glutinosa*. Amer. Zool. 41: 1490-1491. Abst.

- 2002** Silver, M.R. and S.A. Sower. 2002. The lamprey lineage: a phylogenetic perspective. *Integr. Comp. Biol.* 42: 1313.
- Root, A. R., N.V. Nucci, B.S. Rubin, V.L. Trudeau, and S.A. Sower. 2002. The relationship between GABA and GnRH in the brain of the sea lamprey using in situ hybridization. *Integr. Comp. Biol.* 42: 1302-1303.
- Powell, M.L. and S.A. Sower. 2002. The identification of corpus luteum and determination of reproductive steroids in the gonad of the Atlantic hagfish, *Myxine glutinosa*. *Integr. Comp. Biol.* 42: 1296-1297.
- Freamat, M. and Sower, S.A. 2002. Progress in molecular cloning of a cDNA encoding the gonadotropin hormone receptor in the sea lamprey. *Integr. Comp. Biol.* 42:1232.
- Powell, M.L., S.I. Kavanaugh, and S.A. Sower. 2002. Seasonal gonadal development in the Atlantic hagfish, *M. glutinosa*. *Integr. Comp. Biol.* 42:1297.Abst.
- Sower, S.A., N. Nucci, and M.R. Silver. 2002. The physiology and molecular evolution of GnRH and GnRH receptors in lampreys. IN: Proceedings of the International Congress on the Biology of Fish. Ed by M. Moser, J. Bayer and D. MacKinlay. Vancouver, BC, July 2002. Amer Fish Soc.
www.fishbiologycongress.org
- 2003** Freamat, M. and S.A. Sower. 2003. A putative gonadotropin hormone receptor from sea lamprey (*Petromyzon marinus*) testes. *Integr. Comp. Biol.* 43:812.
- Powell, M.L., S.I. Kavanaugh, and S.A. Sower. 2003. Reproductive hormone concentrations in the Atlantic hagfish *Myxine glutinosa*. *Integr. Comp. Biol.* 43:814.
- Kavanaugh, S.I., A. Gorbman, and S.A. Sower. 2003. The distribution of gonadotropin releasing hormone in the urochordate *Ciona intestinalis*. *Integr. Comp. Biol.* 43:883.
- Lafiandra, E.M., K.J. Babbitt, and S.A. Sower. 2003. Morphological and reproductive abnormalities in wild caught *Rana clamitans*, *Rana pipiens* and *Rana utricularia* metamorphs. *Integr. Comp. Biol.* 43: 1021.
- 2007:** Freamat, M, and S.A. Sower. 2007. Identification and Cloning of a Second Glycoprotein Hormone Receptor (TSH-like Receptor) in Sea Lamprey. *Integr. Comp. Biol* 47 (supple 1); pp e80 (P3.98)
- Okamoto, K., M. Freamat, and S.A. Sower. 2007. Characterization of the lamprey GnRH receptor. *Integr. Comp. Biol* 47 (supple 1):
- Sower, S.A., S.I. Kavanaugh, and M. Freamat. 2007. Insight from Lamprey Genomics: Brain and Pituitary Reproductive Hormones in Lampreys. *Integr. Comp. Biol* 47 (supple 1):e122 (O11.1)
- Kavanauagh, S.I and S.A. Sower. 2007. Isolation of a cDNA encoding a third form of Gonadotropin-Releasing Hormone from the Sea Lamprey. Society of Integrative and Comparative Biology, Phoenix Arizona. Jan 3 -7.

Professional Activities

Invited to the following international meetings:

- North Pacific Aquaculture Symposium, Anchorage Alaska; Newport, Oregon, August, 1980
- International Symposium on Salmon and Trout Reproduction, Seattle, 1983.
- Endocrinology of Salmonid Development, Osmoregulation, Reproduction and Migration, 2 joint seminars between United States and Japan, Hawaii, 1984 (Unable to attend).
- Evolution of Primitive Fishes, Bamfield, Vancouver Island, Canada, 1985.
- 10th International Symposium on Comparative Endocrinology, Copper Mountain, Colorado, USA, 1985.
- Third International Symposium on Reproductive Physiology of Fish, St. John's, Newfoundland, Canada, 1987.
- First International Symposium on Fish Endocrinology, Edmonton, Canada, 1988.
- 11th International Symposium on Comparative Endocrinology, Malaga, Spain, 1989 (invited to present state-of-art lecture).
- Satellite Symposium on the "Endocrinology and Reproduction of Cyclostomes", Malaga, Spain, 1989.
- 2nd International Symposium in Fish Endocrinology, France, 1992.
- Advances of Fish Pituitary Hormone Research, Japan, 1992 (Invited to present state-of-the-art lecture)
- Symposium on Perspective of Fish Pituitary Hormone Research, Japan, 1992
- 12th International Symposium on Comparative Endocrinology, Toronto, Canada 1993
- 1995 Annual Meeting of Endocrinology, Washington, D.C. June, 1995 (Invited Symposium State-of-Art-Speaker)
- Sixth International Symposium on Reproductive Physiology of Fish, Texas, July, 1995 (Invited State-of-Art-Speaker)
- 3rd International Symposium on Fish Endocrinology, May 27-31, 1996, Hokodate, Hokkaido, JAPAN (Invited State-of-Art Speaker--Unable to Attend)
- 12th International Congress on Comparative Endocrinology, Yokohama, Japan Nov. 16-21, 1997.
- Satellite Congress, "Molecular Ancestry of Vertebrate Peptide Hormones, Japan, Nov, 1997 (invited to present state-of-art lecture).
- 4th International Symposium on Fish Endocrinology, July 31-Aug, 4, 2000. Seattle, Washington. Overview Speaker and Organizer of Agnathan-Chondrichthyes Symposium.
- Sea Lamprey International Symposium II, Aug 14-19, 2000, Saul St. Marie, Canada. Invited speaker.
- 13th International Congress on Comparative Endocrinology, Sorrento, Italy May, 2001.
- Second International Symposium on GnRH in Penang, Malaysia in May 2001 Invited State of the Art Speaker (unable to attend)
- Intl Congress of Comparative Biochemistry and Physiology, Chobe, Africa in July 2001. Invited State of the Art Speaker (unable to attend)
- Fish Biology Congress, Vancouver, BC, Canada, July, 2002 (Invited Speaker of Symposim)
- 5th International Symposium on Fish Endocrinology, 2004. Spain (Invited Speaker—unable to attend).
- 15th International Congress of Comparative Endocrinology, May, 2005 (Invited Plenary Speaker)
- 2005 Special Ceremony in Tokyo (Fish Endocrinology of the New Century), one of six invited plenary speakers, Dec. 2005, Tokyo Japan
- Howard Bern Lecturer, Jan. 2006, Annual Meeting of Society of Integrative and Comparative Biology, Orlando, Florida
- Key Note Speaker, BIOMAN07, Northeast Biomanufacturing Center and Collaborative, July 22-27, 2007 New Hampshire Community Technical College, Portsmouth, New Hampshire
- International Congress of the Biology of Fish, July 25-Aug 1, 2008, Portland, Oregon (Invited Symposium speaker)
- 6th International Symposium on Fish Endocrinology , June 22-28, 2008, Calgary Canada (Invited Symposium Speaker)
- 16th International Congress of Comparative Endocrinology Invited Symposium Speaker: S.A. Sower A. Aquilina-Beck, T. Kosugi ,S.I. Kavanaugh , M. Wilmot and M. Freamat. "Molecular Evolution of the Reproductive Neuroendocrine axis in Vertebrates." Hong Kong. June 22-26, 2009.
- Annual Meeting of Society of Integrative and Comparative Biology, Jan 3 to Jan 7, 2010, Seattle,

Washington (Invited Symposium speaker)
 14th International Congress of Endocrinology: ICE2010 - March 26-30, 2010 Kyoto Japan (Invited Symposium Speaker)

Committee appointments (Regional, National and International):

Organizing Committee, Western Regional Conference on Comparative Endocrinology, Seattle, 1982.
 Co-organizer and Co-technical Program Chairperson, International Symposium on Salmon and Trout Reproduction, Seattle, 1983.
 Ad-Hoc Research Review Committee of Great Lakes Fisheries Commission Lamprey Research, Chicago, 1983.
 Co-organizer, 13th New England Endocrine Conference, Durham, New Hampshire, 1985.
 Chairperson, Committee to Evaluate the Best Student Paper for the Division of Comparative Endocrinology at the American Society of Zoology Meetings, December, 1986.
 Nominated and selected for Secretary, Division of Comparative Endocrinology, American Society of Zoology, December, 1987 (1988-1989; 2-year term).
 Member of NSF Physiological Processes Panel (1988-1992).
 Organizer and Chair, Cyclostome Workshop, First International Symposium of Fish Endocrinology, Edmonton, Alberta, June, 1988
 Member of Technical Program Committee for 2nd International Fish Endocrinology Symposium, France, 1992.
 Member of Great Lakes Fishery Commission Sea Lamprey Integration Committee/Alternative Technology Task Force (1991-1993)
 Organizer and Chair of Sex Differentiation/Determination Workshop in Chicago, March, 1992
 Member of 1991-1994 Research Committee for the New Hampshire Affiliate American Heart Association
 Member of the American Institute of Biological Sciences (AIBS) Peer Review Panel of the NOAA National Sea Grant College Program Marine Biotechnology Proposals, April 21-April 24, 1994
 Member of NSF-Academic Research Infrastructure Program Panel, June 26-29, 1994; June 9-12, 1996
 Co-chair and co-organizer, 22th New England Endocrine Conference, Durham, New Hampshire, October 15, 1994.
 Member of the International Committee on Fish Endocrinology (1992-1997)
 Invited Member of a committee to Review a Program Designed to Develop Information to Support the Approval of Chemicals and Drugs for Public Aquaculture, to be held in La Crosse, Wisconsin, May 15-16, 1995.
 Member of NSF-Neuroendocrinology Panel, (1995)
 Nominated and selected for Program Officer, Division of Comparative Endocrinology, American Society of Zoology, (1995-1997)
 Nominated and selected as a member of the US National Committee for the International Union of Biological Sciences (National Academy of Sciences) (1995-2001)
 Member of Program Committee for The Third International Symposium of Fish Endocrinology, May 27-31, 1996
 Served as panel member for NSF sponsored workshop entitled "Integration of Research and Education: What are our Responsibilities" at the Society for Integrative and Comparative Biology annual meetings, Dec. 26-30, 1996, Albuquerque, NM
 Member of NSF-Academic Research Infrastructure Program Panel, June 9-12, 1996
 Member of NSF-Integrative Graduate Education and Research Training Panel (1997)
 Served as a panelist for NSF's Division of Undergraduate Education on NSF Collaboratives for Excellence in Teacher Preparation, April 23, 1997
 Served as one of NSF IBN's representatives on BIO Issues Working Group, 1997.
 Served as NSF IBN's representative on BIO Postdoctoral Working Group, 1996-1997.
 Served as one of three representatives of NSF on the Committee on Environment and Natural

Resources (CENR) working group on Endocrine Disruptor Research, 1996-1997.
 Chair of NSF BIO POWRE (Professional Opportunities for Women in Research and Education) program and BIO's representative on NSF POWRE committee, 1997.
 Member of Organizing Committee for Satellite Symposium, "Molecular Ancestry of Vertebrate Polypeptide Hormones and Neuropeptides, Nov. 22-24, 1997.
 Co-Organizer of Symposium at the Annual Meetings of Society of Integrative and Comparative Biology, Jan., 1999
 Member of Program Committee for Fourth International Symposium of Fish Endocrinology, 2000.
 Co-Organizer of Symposium at the Fourth International Symposium of Fish Endocrinology, 2000.
 Co-Chair and Co-Organizer of Symposium entitled, "Agnathan and Chondrichthyes Reproduction and Adaptation, held at the ISFE meeting, Seattle, 2000, Wa
 Co-Chair and Co-Organizer of the 28th New England Endocrine Conference held Oct 28, 2000 at UNH.
 Co-Chair of 14th International Congress of Comparative Endocrinology, Boston, May, 2005, Program Officer-Elect-2001, and Member of Executive Committee, Society of Comparative and Integrative Biology,
 Program Officer and Member of Executive Committee, Jan 2002-2005, Society of Comparative and Integrative Biology
 Co-Organizer of International Congress of Comparative Endocrinology, Boston, May 22-27, 2005
 Chair of Satellite Conference to ICCE entitled: Reproductive Endocrine System in Agnathans and Protochordates: In Honor of Hiroshi Kawauchi, May 28 to 30, 2005
 Member of Program Committee of International Congress of Comparative Endocrinology, Boston, 2005
 Member of USDA NRICGP's Animal Reproduction Program review Panel 2004, 2005, 2006
 Member of NSF Integrative Organismal Biology Review Panel, 2006, 2007
 Member of NSF MRI Review Panel, 2008, 2009
 Chair-Elect, Division of General and Comparative Endocrinology, Society of Integrative and Comparative Biology (2006-2008)
 Chair, Division of General and Comparative Endocrinology, Society of Integrative and Comparative Biology (2008-2010)
 Member of Scientific Committee for the 6th International Symposium on Fish Endocrinology, June 22-28, 2008, Calgary Canada
 Co-Organizer of Symposium at 6th International Symposium on Fish Endocrinology, June 22-28, 2008, Calgary, Canada
 Member of the Board of International Federation of Comparative Endocrinology, 2005-present
 Co-Organizer of Symposium at Annual Meeting of Society of Comparative Endocrinology, Jan 2-7, 2010 Seattle, Washington
 Member of the North American Society for Comparative Endocrinology Council, March 2010-present
 Member of the North American Society for Comparative Endocrinology 2011 Program Committee
 SICB Division of Comparative Endocrinology Poster Naming Committee 2010-2011.

Committee member for UNH departmental, college and university-wide committees:

Chair, Department of Zoology Graduate Admissions Committee (1989-1991);
 Chair of the Academic Senate Budget and Planning Committee (1990-1991);
 Chair of Committee for UNH Planning Session, March 7, (1992)
 Co-Chair of Biochemistry Department, (1993)
 Chair of COLSA's Undergraduate Research Conference Committee (1993-1994)
 Chair of COLSA's Undergraduate Research Conference Committee (1997-1999)
 Chair of Ad-hoc Endocrine Disruptor Committee (1997-1998)
 Chair of Ad-hoc Computer Proposal Committee (1997-1998)
 Chair of subcommittee of IACUC to revise the Animal Care Documents. This was completed during the spring of 2001 and accepted and implemented July, 2001.
 Chair of Departmental P&T Full Professor Committee (Fall, 2001).
 Chair of Departmental P&T and Evaluation Committee (Spring, 2002)

Chair of College-Wide Planning Committee (2003-2004)
 Graduate Coordinator, Biochemistry and Molecular Biology, (1999-2006)
 Chair of the Organic Dairy Steering Committee (2006)
 Chair of the Bioinformatics iNquiry System (2006-2008)
 Chair of the COLSA Research Advisory Committee (2005-2007)
 Chair of the COLSA AES Advisory Committee (2005-2007)
 Chair of Search Committee to hire Confocal Scientist III (2006-2007)
 Chair of Organic Dairy Planning Committee (April-Aug, 2007)
 Chair of the COLSA-UIC Confocal Microscope Steering Committee (2006-2009)

Member of the following:

Administrative Budget Committee (1990-1991); Trustees Financial Affairs Committee (1990- 1991); Executive Committee on Parking (May-Sept. 1990); Commission on Research and Graduate Education (1989-1991); Health Benefits Committee (May-Oct. 23, 1990); President's Cabinet (1990-1991), Academic Affairs Council (1990-1991), Master Planning Committee (Fall Semester, 1990), Program Review Committee (1990-1991); Task Group for Allocation of Resources (1990-1992); COLSA representative to Academic Senate and Caucus (1990-1991; 1992-1993); Academic Senate Budget and Planning Committee (1987-1988; 1989-1991); Biology 1 and 2 Committee (1986-1987); College of Liberal Arts Representative to Academic Senate (1985-1987); College of Liberal Arts Policies Committee (1985-1986); Women in Science Committee (1983-1985); 2 Faculty Search Committees, Department of Zoology (1985-1986); Zoology Academic Committee (1983-1984); Zoology Executive Committee (1984-1985; 1986-1987; 1991-1992); Biological Science Task Force (1991); Zoology Graduate Examinations Committee (1985-1987); COLSA Strategic Planning Committee (1987-1988); IMSOE Communicator Search Committee (1987-1988); COLSA Equitable Education Committee (1987-1988); COLSA Biological Science Task Force (Spring and Fall, 1991); Advisory Committee on Allocation of State Appropriation (1991-1992). Sigma Xi Biochemistry Department Representative (1989-present); Biochemistry Facilities and Operations Committee (1992); Biochemistry Executive Committee (Spring, 1993); COLSA--Undergraduate Research Conference Committee (1992-96); -- Allocation Space Committee (Spring 1993); Department of Biochemistry and Molecular Biology P& T Committees (1993-1994; 1994-1995); University-- ACRHM Radiation Safety Committee (1992-1996); Department of Biochemistry and Molecular Biology Search Committee (1994-1995); COLSA Student Development Task Force (1994-1995); Biology Program Executive Committee (1994-present); Faculty Marshall at 1995 Commencement; Special Commission of Previous Academic Senate Budget and Planning Chairs to Review Budget Status of UNH (Fall , 1995); University Travel Focus Committee (1996-1997); Chief Faculty Marshall at 1998 UNH Honors Convocation; Member of UNH's Technology, Society and Values Program (1997-1998); University System of NH Information Systems Steering Committee (1997-1998); Hubbard Endowed Chair Search (1998-1999; 2000-2001); Member of CoLSA Dean Search (1999-2000), Member of UNH's Technology, Society and Values Program (1997-2003); Departmental Contact for the Center for International Education Scholarship/Fellowship program; Ad-hoc committee to obtain benefits for Postdoc research associates (1999-2001); Member of Hubbard Proposal Review Committee (2001, 2002); Faculty group member for three different search committees: Director of Intellectual Property Management; Director of CINEMAR and Director of Marine Program; Member of Search Committee for the Student & Academic Infrastructure Support Manager position, 2000-2001; Member of Research Information System Steering Committee (1999-2001); Member of COLSA Reorganization Committee (2001); Member of IROP committee (2002-2006); Member of UNH's Institutional Animal Care and Use Committee (IACUC), 2000-2010; Ad-hoc planning committee for two-2003 CoLSA faculty retreats; Member of Search Committee for UNH A/V Director-04; Member of BsL3 Committee (2005-2006); Member of SURF/UROP Committee (2005-present); Member of the Beckman Scholar Committee (2006); Member of the Radiation Safety Officer Search committee, 2008; Faculty Marshall for 2001-2003, 2005-2010 Commencement; Pre-Dental and Premedical Committee (1984-1988; 1991-1996; 2011-)

Other:

Center for Marine Biology:

Director of the Anadromous Fish and Aquatic Invertebrate Research Laboratory (AFAIR laboratory--fish hatchery) 1983-present.
Member, 1983-present

Protein Engineering Facility:

Director for the Protein Sequencing and Synthesis Facility (1985-1992).
Co-Advisor for the Protein Sequencing and Synthesis Facility (1992-1995)

Invited Research Seminars:

Bigelow Marine Laboratory, Maine; Department of Fisheries and Wildlife, Minnesota; University of Cape Town Medical School, South Africa; Department of Zoology, University of Rhode Island; Department of Anatomy and Cellular Biology, Tufts Medical School; Department of Physiology, Medical School, University of Alberta; Hatfield Marine Science Center, Oregon State University; Endocrine Forum, Oregon State University; Department of Biology, Portland State University; Department of Biology, North Dakota State University; Mt Holyoke College, Mass.; Brooklyn College, New York; Center College, Kentucky; MacQuarie University, Australia; Rutgers University; University of Toronto, Toronto, Canada; Harvard Reproductive Science Seminar Series, Mass General Hospital; Kitasato University, Japan; University of Virginia, University of Cincinnati, Ohio; Northern Arizona University; Uppsala University, Sweden; University of Washington; Washington State University; Dartmouth Medical School; Mahaidol University, Thailand; Univ. California, Fresno;

Other:

Guest Co-editor of a special issue on Salmonid Reproduction in the journal, Aquaculture, Vol. 43, 1984, and a Washington Sea Grant Publication (1985).
Guest Co-editor of a special issue of Gen Comp Endocrinology, Vol 148, 2006.

Consultant:

OreAqua Foods, Inc. (private salmon sea ranching operation, subsidiary of Weyerhaeuser Corporation, Oregon) (1980-1982);
Domsea Farms (private salmon aquaculture corporation, Washington) (1981-1983);
Sea Run, Inc. (private salmon aquaculture, Maine) (1985-1988).