

**BIOGRAPHICAL SKETCH**

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NAME Arthur P. Arnold	POSITION TITLE Distinguished Professor, Principal Investigator
eRA COMMONS USER NAME arnold2	

EDUCATION/TRAINING (Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)			
INSTITUTION AND LOCATION	DEGREE (if applicable)	YEAR(s)	FIELD OF STUDY
Grinnell College, Grinnell IA	A.B.	1967	psychology
Rockefeller University, New York NY	Ph.D.	1974	neurobiology & behavior
Rockefeller University, New York NY	postdoc	1974-76	neurophys./ neuroanat.

**A. Positions and Honors**

1968-69 Instructor of Psychology, Central State University, Wilberforce, Ohio  
 1970-74 Ph.D. thesis research, Rockefeller University, F. Nottebohm, mentor.  
 1974-76 NIH Postdoctoral Fellowship, research in laboratory of H. Asanuma, Rockefeller University.  
 1976-present UCLA. Department of Psychology: Assistant Professor 1976-80, Associate Professor 1980-83, Professor 1983-1994. Department of Physiological Science: Professor 1994-present. Member, Laboratory of Neuroendocrinology (LNE), Brain Research Institute 1980-present, Director of LNE 2005-present. Member, Mental Retardation Research Center 1992-present. Associate Director, Brain Research Institute, 1989-2001. Chair, Interdepartmental Undergraduate Program for Neuroscience, 1996-1998. Chair, Interdepartmental Ph.D. Program for Neuroscience, 1995-2001. Chair, Department of Physiological Science, 2001-present.  
 Distinguished Professor, 2000-present  
 1966 Phi Beta Kappa  
 1997-99 President, Society for Behavioral Neuroendocrinology  
 1998 Fellow, John Simon Guggenheim Memorial Foundation  
 1998 Fellow, AAAS  
 2003 Magoun Lecturer, UCLA

**B. Selected Publications (from total of 188)**

Schlinger BA, Arnold AP 1991 Brain is the major site of estrogen synthesis in a male songbird. ***PNAS*** 88:4191-4194.  
 Schlinger BA, Arnold AP. 1992 Circulating estrogens in a male songbird originate in the brain. ***PNAS*** 89:7650-7653.  
 Wade J, Schlinger BA, Hodges L, Arnold AP 1994 Fadrozole, a potent and specific inhibitor of aromatase in the zebra finch brain. ***General and Comparative Endocrinology*** 94:53-61.  
 Wade J, Arnold AP 1996 Functional testicular tissue does not masculinize development of the zebra finch song system. ***PNAS*** 93:5264-5268.  
 Wade J, Spinger ML, Wingfield JC, Arnold AP (1996) Neither testicular androgens nor embryonic aromatase activity alter morphology of the neural song system in zebra finches. ***Biology of Reproduction*** 55:1126-1132.  
 Arnold AP (1996) Genetically triggered sexual differentiation of brain and behavior. ***Hormones and Behavior*** 30:495-505.  
 Bottjer SW, Arnold AP (1997) Developmental plasticity in neural circuits for a learned behavior. ***Annual Review of Neuroscience*** 20:455-477.  
 Al-Shamma HA, Arnold AP(1997) BDNF regulates expression of androgen receptors in perineal motoneurons. ***PNAS*** 94:1521-1526.  
 Gong A, Freking FW, Wingfield J, Schlinger BA, Arnold AP (1999) Effects of embryonic treatment with fadrozole on phenotype of gonads, syrinx, and neural song system in zebra finches. ***General and Comparative Endocrinology*** 115: 346-353.  
 Arnold AP. 2002 Concepts of genetic and hormonal induction of vertebrate sexual differentiation in the twentieth century, with special reference to the brain. 2002 In Pfaff DW, Arnold AP, Etgen AM, Fahrbach SE, Rubin RT (eds.), ***Hormones, Brain and Behavior***, vol IV, chapter 63, Academic Press, NY, pp 105-135.

- Xu J, Burgoyne PS, Arnold AP 2002 Sex differences in sex chromosome gene expression in mouse brain. **Human Molecular Genetics** 11:1409-1419
- De Vries GJ, Rissman EF, Simerly RB, Yang L-Y, Scordalakes EM, Auger C, Swain A, Lovell-Badge R, Burgoyne PS, Arnold AP. 2002 Sex chromosome effects on the induction of sexually dimorphic neural and behavioral development. **Journal of Neuroscience** 22:9005-9014.
- Agate RJ, Perlman W, Arnold AP. 2002 Cloning and expression of zebra finch SF1 (Steroidogenic factor 1): Overlap with hypothalamic but not telencephalic aromatase. **Biology of Reproduction** 66:1127-1133.
- Carruth LC, Reisert I, Arnold AP. 2002 Direct effect of sex chromosome genes on brain sexual differentiation. **Nature Neuroscience** 5:933-934.
- Perlman WR, Ramachandran B, Arnold AP 2003 Expression of androgen receptor mRNA in the late embryonic and early posthatch zebra finch brain. **Journal of Comparative Neurology** 455:513-530.
- Perlman WR, Arnold AP 2003 Expression of estrogen receptor and aromatase mRNA in embryonic and post-hatch zebra finch brain. **Journal of Neurobiology** 55:204-219.
- Agate RJ, Grisham W, Wade J, Mann S, Wingfield J, Schanen C, Palotie A, Arnold AP. Neural not gonadal origin of brain sex differences in a gynandromorphic finch. **PNAS** 100:4873-4878.
- Kim J-H, Perlman WR, Arnold AP 2004 Expression of androgen receptor mRNA in the zebra finch song system: developmental regulation by estrogen. **Journal of Comparative Neurology** 469:535-547.
- Arnold AP 2003 The gender of the voice within: Neural origin of sex differences in the brain. **Current Opinion in Neurobiology** 13:759-764.
- Arnold AP, Rissman EF, De Vries GJ 2003 Two perspectives on the origin of sex differences in the brain. **Annals of the NY Academy of Sciences** 1007: 176-188.
- Agate RJ, Choe MC, Arnold AP. 2004 Sex differences in structure and expression of the sex chromosome genes *CHD1Z* and *CHD1W* in zebra finches. **Molecular Biology and Evolution** 21:384-396.
- Arnold AP, Burgoyne PS 2004 Are XX and XY brain cells intrinsically different? **Trends in Endocrinology and Metabolism** 15:6-11.
- Wagner CK, Xu J, Pfau JL, Quadros PS, De Vries GJ, Arnold AP. 2004 Neonatal mice possessing an *Sry* transgene show a masculinized pattern of progesterone receptor expression in the brain independent of sex chromosome status. **Endocrinology** 145:1046-1049.
- Arnold AP, Xu J, Grisham W, Chen X, Kim Y-H, Itoh Y 2004 Sex chromosomes and brain sexual differentiation. **Endocrinology** 145:1057-1062.
- Arnold AP, Agate RJ, Carruth LC 2004 Hormonal and non-hormonal mechanisms of sexual differentiation of the brain. In **Principles of Gender-Specific Medicine**, edited by Legato M. Vol 1, pp 84-95. San Diego, Elsevier Academic Press,
- Wade J, Arnold AP. 2004 Sexual differentiation of the zebra finch song system. In P. Ziegler and P. Marler, eds., Behavioral Neurobiology of Birdsong, **Annals of the NY Academy of Sciences** 1016:540-559.
- Arnold AP. 2004 Sex chromosomes and brain gender. **Nature Reviews Neuroscience** 5:701-708.
- Itoh Y, Arnold AP. 2005 Chromosomal polymorphism and comparative painting analysis in the zebra finch. **Chromosome Research** 13:47-56.
- Becker J, Arnold A, Berkley KJ, Blaustein, JD, Eckel LA, Hampson E, Herman JP, Marts S, Sadee W, Steiner M, Taylor J, Young E. 2004 Strategies and methods for research on sex differences in brain and behavior. **Endocrinology**, 146:1650-1673.
- Xu J, Taya S, Kaibuchi K, Arnold AP. 2005 Spatially and temporally specific expression in mouse hippocampus of *Usp9x*, a ubiquitin-specific protease involved in synaptic development. **Journal of Neuroscience Research** 80:47-55.
- Palaszynski KM, Smith DL, Burgoyne PS, Arnold AP, Voskuhl RR 2005 A yin-yang effect between sex chromosomes and sex hormones on the immune response. **Endocrinology** 146:3280-3285..
- Chen X, Agate RJ, Itoh Y, Arnold AP 2005 Sexually dimorphic expression of *trkB*, a Z-linked gene, in early posthatch zebra finch brain. **PNAS** 102:7730-5
- Xu J, Taya S, Kaibuchi K, Arnold AP. 2005 Sexually dimorphic expression of *Usp9x* is related to sex chromosome complement in adult mouse brain **European Journal of Neuroscience** 21:3017-22
- Kim Y-H, Arnold AP. 2005 Distribution and onset of aldehyde dehydrogenase (*zRaldH*) expression in zebra finch brain: lack of sex difference in HVC and RA at early posthatch ages. **Journal of Neurobiology** 65:260-8

Luo M., Yu Y, Kim H, Kudrna D, Itoh Y, Agate RJ, Melamed E, Goicoechea JL, Talag J, Mueller C, Wang W, Currie J, Sisneros NB, Wing RA, Arnold AP. 2006 Utilization of a zebra finch BAC library to determine the structure of an avian androgen receptor genomic region. **Genomics** 87:181-90.

Xu J, Watkins R, Arnold AP. 2005 Sexually dimorphic expression of the X-linked gene Eif2s3x mRNA but not protein in mouse brain. **Gene Expression Patterns** 6:146-155.

Gatewood JD, Wills A, Shetty S, Xu J, Arnold AP, Burgoyne PS, Rissman EF. 2006 Sex chromosome complement and gonadal sex influence aggressive and parental behaviors in mice. **J Neurosci** 26:2335-42.

Itoh Y, Kampf K, Arnold AP. 2006 Assignment1 of human X chromosome-syntenic genes to a zebra finch microchromosome by in situ hybridization of BAC clones. **Cytogenetic and Genome Research** 112:343-344.

Yang X, Schadt EE, Wang S, Ingram-Drake L, Arnold AP, Drake TA, Lusis AJ. 2006 Tissue-specific expression and regulation of sexually dimorphic genes in mice. **Genome Research**, in press.

Itoh Y, Melamed E, Yang X, Kampf K, Wang S, Yehya N, Van Nas A, Drake TA, Replogle K, Band MR, Clayton DF, Schadt EE, Lusis AJ, Arnold AP. Dosage compensation in birds versus mammals. Submitted.

Itoh Y, Kampf K, Arnold AP 2006 Comparison of the chicken and zebra finch Z chromosomes shows evolutionary rearrangements. **Chromosome Research**, submitted.

### Research Support (last 3 years)

#### Ongoing Research Support

“Sex differences in dopamine systems”

PI: Arnold Agency: NINDS  
NS045966 Period: 30 September 2003 through 30 June 2007

Major goals: Determine whether sex differences in dopamine neurons are caused by X or Y genes. Determine whether the dopamine neurons themselves are influenced by the sex chromosome effect, or whether it is indirect. Examine sex chromosome effects on the phenotype of dopamine and related neurons in vivo.

“Neural and hormonal bases of vocalization”

PI: Arthur P. Arnold Agency: NIDCD  
R01 DC00217, years 20-24. Period: 1 April 2004 through 31 March 2009

Major goals: Determine the role of sex chromosomes and steroid hormones in sexual differentiation of the zebra finch brain. Establish the developmental onset and topography of estrogen and androgen receptor mRNA expression in brain and peripheral tissues. Measure effects of estrogen on important regulatory genes related to dimorphic development of the neural song system. Identify sex chromosome genes expressed in brain.

“Sex chromosome effects on neural development”

PI: Arthur P. Arnold Agency: NINDS  
1 R01 NS043196 Period: 15 Dec 2002 through 30 Nov 2006

Major goals: Identify genes encoded on the Y chromosome that influence aggressive behavior and correlate with measurements of Y gene expression in the brain.

“The Role of Sex Chromosomes in Gender Differences in immune responses”

PI: Rhonda Voskuhl Agency: NIAID  
RO1 AI/AR50839 h Period: 12/01/01-6/30/10

Goal: Determine if the Y chromosome or an XX dosage effect can modulate immune responses during the induction phase of experimental autoimmune encephalomyelitis.

Developmental Regulation of Brain and Behavior

PI: J.S. Wade Agency: NIMH  
1 R01 MH55488 (J.S. Wade) Period: 6/1/2005 – 5/31/2010  
NIH/NIMH

Arnold role in this project is to test the chromosomal location of several zebra finch genes.

**Completed Research Support**

“Sex chromosome effects on brain and behavior”

PI: Jill Becker (Arnold, co-investigator) Agency: Society for Women’s Health Research

No number Period: 1 September 2003- 30 August 2005

Pilot grant to investigate sex chromosome effects on neurotoxicity, tolerance to amphetamine, self-stimulation, and animals models of depression.

“UCLA Center for Advanced Parkinson Disease Research”

PI: Marie-Francoise Chesselet Agency: American Parkinson Disease Association

Period: Sept 1998 through 30 Aug 2003

Arnold Pilot Grant: 1 Aug 2002 through 30 July 2003 Sex chromosome effects of nigrostriatal neuron number

Major goal: Measure sex chromosome effects on neuron number and gene expression in the adult nigrostriatal system in mice.

“Genetic Determinants of Brain Sexual Differentiation”

PI: Arthur P. Arnold Agency: NIMH

R01 MH59268 Period: 1 January 1999 through 31 December 2002

Major goals: Test the hypothesis that gene encoded on sex chromosomes are expressed in brain and lead directly to sex differences in neural development via non-hormonal mechanisms. Measure various regions of the brain and behavior in mice that possess different numbers of X and Y chromosomes to determine if there are differences in brain and behavior attributable to the actions of genes on these chromosomes.

"The role of sex chromosomes in gender differences in EAE"

PI: Rhonda Voskuhl (Arnold, Collaborator) Agency: NIAID

1R01AI/AR50839 Period 1 Dec 2001 through 30 Nov 2004

Investigates the role of sex chromosome genes in sex differences in Experimental Autoimmune Encephalomyelitis, a mouse model of Multiple Sclerosis.