

CURRICULUM VITAE

ELIZABETH GOULD
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Education:

1984 B.A., St. John's University, Psychology
1985 Marine Biological Laboratory, Woods Hole (Neural Systems and Behavior)
1986 M.A. UCLA, Behavioral Neuroscience
1988 Ph.D., UCLA, Behavioral Neuroscience
1989-1992 Postdoctoral Fellow, The Rockefeller University, Neuroendocrinology

Professional Experience:

1993-1996 Assistant Professor, The Rockefeller University
1997-2000 Assistant Professor, Princeton University
2000 Professor, Princeton University
2006-2011 co-director, Neuroscience certificate program Princeton University
2012 endowed chair – Dorman T. Warren Professor of Psychology
2012 IACUC chair – Princeton University
2014 –present Chair, Psychology Department, Princeton University

Awards and Honors:

1989-1991 NRSA Individual postdoctoral fellowship
1991-1992 WinstonTri-Institutional (Rockefeller, Cornell, Sloan-Kettering) fellowship
1992-1993 American Paralysis Association fellowship
1994-1996 NARSAD Young Investigator Award
1994-1999 NIMH FIRST award
2000 National Academy of Sciences Troland Award
2006 NARSAD Distinguished Investigator Award
2009 Royal Society of the Arts Benjamin Franklin Award
2013 Honorary Doctorate in Sciences, Chapman University
2014 Feinstein Institute for Medical Research AWSM Award

Advisory Committees:

1998 – 2000 NSF Learning and Intelligence Systems KDI-LIS Review Committee
2000-2001 NJ Governor's Council on Autism Grants Review Panel
2000-2004 ad hoc reviewer for NIH
2002-2006 LAM NIH study section
2002-present ad hoc reviewer for NIH grants
2008-present NIH pioneer award, new innovator award panel, K99 award panel
2011 Wesleyan University Neuroscience external program review

2009-2011 Baylor College of Medicine Neuroscience external program review
2009, 2012 NIMH tenure review panel
2012-present NARSAD scientific counsel
2013 University of Maryland Neuroscience external program review

Editorial boards:

Journal of Neuroscience
Neurobiology of Learning and Memory
Biological Psychiatry
Neuroscience Research
Cell Stem Cell
Annual Review Psychology

Research articles:

Gould E, Butcher LL (1987) Transient expression of choline acetyltransferase-like immunoreactivity in Purkinje cells of the developing rat cerebellum. *Develop Brain Res* 431:303-306.

Gould E, Butcher LL (1989) Developing cholinergic basal forebrain neurons are sensitive to thyroid hormone. *J Neurosci* 9:3347-3358.

Gould E, Farris TW, Butcher LL (1989) Basal forebrain neurons undergo somatal and dendritic remodeling during postnatal development: a single-section Golgi and choline acetyltransferase analysis. *Develop Brain Res* 46:297-302.

Gould E, Woolf NJ, Butcher LL (1989) Cholinergic projections to the substantia nigra from the pedunculopontine and laterodorsal tegmental nuclei. *Neuroscience* 28:611-623.

Woolf NJ, Gould E, Butcher LL (1989) Nerve growth factor receptor is associated with cholinergic neurons of the basal forebrain but not the pontomesencephalon. *Neuroscience* 30:143-152.

Woolley CS, Gould E, Frankfurt M, McEwen BS (1990) Naturally occurring fluctuation in dendritic spine density on adult hippocampal pyramidal neurons. *J Neurosci* 10:4035-4039.

Woolley CS, Gould E, McEwen BS (1990) Exposure to excess glucocorticoids alters dendritic morphology of adult hippocampal pyramidal neurons. *Brain Res* 531:225-231.

Frankfurt M, Gould E, Woolley CS, McEwen BS (1990) Gonadal steroids modify dendritic spine density in ventromedial hypothalamic neurons: a Golgi study in the adult rat. *Neuroendocrinology* 51:530-535.

Gould E, Woolley CS, Frankfurt M, McEwen BS (1990) Gonadal steroids regulate dendritic spine density in hippocampal pyramidal cells in adulthood. *J Neurosci* 10:1286-1291.

Gould E, Westlind-Danielsson A, Frankfurt M, McEwen BS (1990) Sex differences and thyroid hormone sensitivity of hippocampal pyramidal cells. *J Neurosci* 10:996-1003.

Gould E, Frankfurt M, Westlind-Danielsson A, McEwen BS (1990) Developing forebrain astrocytes are sensitive to thyroid hormone. *Glia* 3:283-292.

Gould E, Woolley CS, McEwen BS (1990) Short-term glucocorticoid manipulations affect neuronal morphology and survival in the adult dentate gyrus. *Neuroscience* 37:367-375.

Gould, E., C.S. Woolley and B.S. McEwen (1991) Adrenal steroids regulate postnatal development of the rat dentate gyrus I. Effects of glucocorticoids on cell death. *J. Comp. Neurol.* 313:479-485.

Gould, E., C.S. Woolley, H.A. Cameron, D.C. Daniels and B.S. McEwen (1991) Adrenal steroids regulate postnatal development of the rat dentate gyrus: II. Effects of glucocorticoids and mineralocorticoids on cell birth. *J. Comp. Neurol.* 313:486-493.

Woolley CS, Gould E, Sakai RR, Spencer RL, McEwen BS (1991) Effects of aldosterone or RU28362 treatment on adrenalectomy-induced cell death in the dentate gyrus of the adult rat. *Brain Res* 554:312-315

Gould E, Woolley CS, McEwen BS (1991) Naturally occurring cell death in the developing dentate gyrus of the rat. *J Comp Neurol* 304:408-418.

Westlind-Danielsson A, Gould E, McEwen BS (1991) Thyroid hormone causes sexually distinct neurochemical and morphological alterations in rat septal-diagonal band neurons. *J Neurochem* 56:119-128.

Watanabe Y, Gould E, Cameron HA, Daniels DC, McEwen BS (1992) Phenytoin prevents stress- and corticosterone-induced atrophy of CA3 pyramidal neurons. *Hippocampus* 2:431-435.

Gould E, Cameron HA, Daniels DC, Woolley CS, McEwen BS (1992) Adrenal hormones suppress cell division in the adult rat dentate gyrus. *J Neurosci* 12:3642-3650.

Watanabe Y, Gould E, McEwen BS (1992) Stress induces atrophy of apical dendrites of hippocampal CA3 pyramidal neurons. *Brain Res* 588:341-345.

Gould, E., D.C. Daniels, H.A. Cameron and B.S. McEwen (1992) Expression of adrenal steroid receptors by newly born cells and pyknotic cells in the dentate gyrus of the postnatal rat. *Molec. Cell. Neurosci.* 3:44-48.

Cameron HA, Woolley CS, McEwen BS, Gould E (1993) Differentiation of newly born neurons and glia in the dentate gyrus of the adult rat. *Neuroscience* 56:337-344.

Cameron HA, Woolley CS, Gould E (1993) Adrenal steroid receptor immunoreactivity in cells born in the adult rat dentate gyrus. *Brain Res* 611:342-346.

Cameron HA, Gould E (1994) Adult neurogenesis is regulated by adrenal steroids in the dentate gyrus. *Neuroscience* 61:203-209.

Gould E, Cameron HA, McEwen BS (1994) Blockade of NMDA receptors increases cell death and birth in the developing rat dentate gyrus. *J Comp Neurol* 340:551-565.

Cameron HA, McEwen BS, Gould E (1995) Regulation of adult neurogenesis by excitatory input and NMDA receptor activation in the dentate gyrus. *J Neurosci* 15:4687-4692.

Cameron HA, Gould E (1996) Distinct populations of cells in the adult dentate gyrus undergo mitosis or apoptosis in response to adrenalectomy. *J Comp Neurol* 369:56-63.

Gould E, Cameron HA (1997) Early NMDA receptor blockade impairs defensive behavior and increases cell proliferation in the dentate gyrus of developing rats. *Behav Neurosci* 111:49-56.

Gould E, Tanapat P, Cameron HA (1997) Adrenal steroids suppress granule cell death in the developing dentate gyrus through an NMDA receptor-dependent mechanism. *Develop Brain Res* 103:91-93.

Gould E, Tanapat P (1997) Lesion-induced proliferation of neuronal progenitors in the dentate gyrus of the adult rat. *Neuroscience* 80:427-436.

Gould E, Tanapat P, McEwen BS (1997) Activation of the type 2 adrenal steroid receptor can rescue granule cells from death during development. *Develop Brain Res* 101:265-268.

Gould E, McEwen BS, Tanapat P, Galea LA, Fuchs E (1997) Neurogenesis in the dentate gyrus of the adult tree shrew is regulated by psychosocial stress and NMDA receptor activation. *J Neurosci* 17:2492-2498.

Tanapat P, Galea LA, Gould E (1998) Stress inhibits the proliferation of granule cell precursors in the developing dentate gyrus. *Int J Dev Neurosci* 16:235-239.

Gould E, Tanapat P, McEwen BS, Flugge G, Fuchs E (1998) Proliferation of granule cell precursors in the dentate gyrus of adult monkeys is diminished by stress. *Proc Natl Acad Sci U S A* 95:3168-3171.

Cameron HA, Tanapat P, Gould E (1998) Adrenal steroids and N-methyl-D-aspartate receptor activation regulate neurogenesis in the dentate gyrus of adult rats through a common pathway. *Neuroscience* 82:349-354.

Hastings NB, Gould E (1999) Rapid extension of axons into the CA3 region by adult-generated granule cells. *J Comp Neurol* 413:146-154.

Tanapat P, Hastings NB, Reeves AJ, Gould E (1999) Estrogen stimulates a transient increase in the number of new neurons in the dentate gyrus of the adult female rat. *J Neurosci* 19:5792-5801.

Gould E, Reeves AJ, Fallah M, Tanapat P, Gross CG, Fuchs E (1999) Hippocampal neurogenesis in adult Old World primates. *Proc Natl Acad Sci U S A* 96:5263-5267.

Gould E, Beylin A, Tanapat P, Reeves A, Shors TJ (1999) Learning enhances adult neurogenesis in the hippocampal formation. *Nature Neurosci* 2:260-265.

Gould E, Reeve AJ, Graziano MSA and Gross CG (1999) Neurogenesis in the neocortex of adult primates. *Science* 286: 548-552.

Shors TJ, Miesegaes G, Beylin A, Zhao M, Rydel T, Gould E. (2001) Neurogenesis in the adult is involved in the formation of trace memories. *Nature*. 410:372-376.

Tanapat P, Hastings NB, Rydel TA, Galea LA, Gould E. (2001) Exposure to fox odor inhibits cell proliferation in the hippocampus of adult rats via an adrenal hormone-dependent mechanism. *J Comp Neurol*. 437:496-504.

Gould E, Vail N, Wagers M, Gross CG (2001) Adult-generated hippocampal and neocortical neurons in macaques have a transient existence. *Proc Natl Acad Sci U S A*.98:10910-7.

Hastings NB, Seth MI, Tanapat P, Rydel TA, Gould E (2002) Granule neurons Generated During Development Extend Divergent Axon Collaterals to Hippocampal Area CA3. *J Comp Neurol*. 452:324-333.

Shors TJ, Townsend DA, Zhao M, Kozorovitskiy Y, Gould E (2002) Neurogenesis may relate to some but not all types of hippocampal-dependent learning *Hippocampus* 12: 578-584

Coe CL, Kramer M, Czeh B, Gould E, Reeves AJ, Kirschbaum C, Fuchs E. (2003) Prenatal stress diminishes neurogenesis in the dentate gyrus of juvenile rhesus monkeys. *Biol Psychiatry*. 54:1025-1034.

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Kozorovitskiy Y, Gould E. (2004) Dominance hierarchy influences adult neurogenesis in the dentate gyrus. *J Neurosci*. 24:6755-6759.

Mirescu C, Peters JD, Gould E. (2004) Early life experience alters response of adult neurogenesis to stress. *Nat Neurosci*. 7:841-846.

Tanapat P, Hastings NB, Gould E (2005) Ovarian steroids influence cell proliferation in the dentate gyrus of the adult female rat in a dose- and time-dependent manner. *J Comp Neurol*. 481:252-265.

Kozorovitskiy Y, Gross CG, Kopil C, Battaglia L, McBreen M, Stranahan AM, Gould E. (2005) Experience induces structural and biochemical changes in the adult primate brain. *Proc Natl Acad Sci USA*. 102:17478-82.

Kozorovitskiy Y, Hughes M, Lee K, Gould E. (2006) Fatherhood affects dendritic spines and vasopressin V1a receptors in the primate prefrontal cortex. *Nat Neurosci*. 9:1094-5.

Stranahan AM, Khalil D, Gould E. (2006) Social isolation delays the positive effects of running on adult neurogenesis. *Nat Neurosci*. 9:526-533.

Mirescu C, Peters JD, Noiman L, Gould E. (2006) Sleep deprivation inhibits adult neurogenesis in the hippocampus by elevating glucocorticoids. *Proc Natl Acad Sci U S A*. 103:19170-75.

Leuner B, Waddell J, Gould E, Shors TJ (2006) Temporal discontinuity is neither necessary nor sufficient for learning-induced effects on adult neurogenesis. *Journal of Neuroscience* 26:13437-42.

Leuner B, Mirescu C, Noiman L, Gould E. (2007) Maternal experience inhibits the production of immature neurons in the hippocampus during the postpartum period through elevations in adrenal steroids. *Hippocampus*. 17:434-442.

Leuner B, Kozorovitskiy Y, Gross CG, Gould E. (2007) Diminished adult neurogenesis in the marmoset brain precedes old age. *Proc Natl Acad Sci U S A*. 104:17169-173.

Stranahan AM, Khalil D, Gould E. (2007) Running induces widespread structural alterations in the hippocampus and entorhinal cortex. *Hippocampus*. 17:1017-1022.

Leuner B, Glasper ER, Gould E.(2009) Thymidine analog methods for studies of adult neurogenesis are not equally sensitive. *J Comp Neurol*. 517:123-33.

Glasper ER, Llorens-Martin MV, Leuner B, Gould E, Trejo JL. (2010) Blockade of insulin-like growth factor-I has complex effects on structural plasticity in the hippocampus. *Hippocampus*. 20:706-12.

Leuner B, Glasper ER, Gould E.(2010) Sexual experience promotes adult neurogenesis in the hippocampus despite an initial elevation in stress hormones. *PLoS One*. 5:e11597.

Leuner B, Gould E. (2010) Dendritic growth in medial prefrontal cortex and cognitive flexibility are enhanced during the postpartum period. *J Neurosci*. 30:13499-503.

Glasper ER, Kozorovitskiy Y, Pavlic A, Gould E. (2011) Paternal experience suppresses adult neurogenesis without altering hippocampal function in *Peromyscus californicus*. *J Comp Neurol*. 519:2271-81.

Leuner B, Caponiti JM, Gould E (2012) Oxytocin stimulates adult neurogenesis even under conditions of stress and elevated glucocorticoids. *Hippocampus*. 22:861-8.

Schoenfeld TJ, Rada P, Pieruzzini PR, Hsueh B, Gould E (2013) Physical exercise prevents stress-induced activation of granule neurons and enhances local inhibitory mechanisms in the dentate gyrus. *J Neurosci*.33:7770-7.

Glasper ER, Gould E (2013) Sexual experience restores age-related decline in adult neurogenesis and hippocampal function. *Hippocampus*. 23:303-12.

Schoenfeld TJ, Kloth AD, Hsueh B, Runkle MB, Kane GA, Wang SS, Gould E (2014) Gap junctions in the ventral hippocampal-medial prefrontal pathway are involved in anxiety regulation. *J Neurosci* 34:15679-88.

Glasper ER, LaMarca EA, Bocarsly ME, Fasolino M, Opendak M, Gould E (2015) Sexual experience enhances cognitive flexibility and dendritic spine density in the medial prefrontal cortex. *Neurobiol Learn Mem.* 125:73-79.

Brockett AT, LaMarca EA, Gould E (2015) Physical exercise enhances cognitive flexibility as well as astrocytic and synaptic markers in the medial prefrontal cortex. *PLOS One* 10:e0124859

Review Articles, Book Chapters, News & Views:

McEwen, B.S. and E. Gould (1990) Adrenal steroid influences on the survival of hippocampal neurons. *Biochem. Pharm.* 40:2393-2402.

McEwen BS, Coirini H, Danielsson A, Frankfurt M, Gould E, Mendelson S, Schumacher M, Segarra A, Woolley C (1991) Steroid and thyroid hormones modulate a changing brain. *J Steroid Biochem Mol Biol* 40:1-14.

Gould, E., C.S. Woolley and B.S. McEwen (1991) The hippocampal formation: morphological changes induced by thyroid, gonadal and adrenal hormones. *Psychoneuroendo.* 16:67-84.

McEwen BS, Coirini H, Westlind-Danielsson A, Frankfurt M, Gould E, Schumacher M, Woolley C (1991) Steroid hormones as mediators of neural plasticity. *J Steroid Biochem Mol Biol* 39:223-232.

McEwen BS, Gould EA, Sakai RR (1992) The vulnerability of the hippocampus to protective and destructive effects of glucocorticoids in relation to stress. *Br J Psychiatry Suppl* 15:18-23

McEwen BS, Angulo J, Cameron H, Chao HM, Daniels D, Gannon MN, Gould E, Mendelson S, Sakai R, Spencer R (1992) Paradoxical effects of adrenal steroids on the brain: protection versus degeneration. *Biol Psychiatry* 31:177-199.

McEwen BS, Cameron H, Chao HM, Gould E, Magarinos AM, Watanabe Y, Woolley CS (1993) Adrenal steroids and plasticity of hippocampal neurons: toward an understanding of underlying cellular and molecular mechanisms. *Cell Mol Neurobiol* 13:457-482.

Gould, E. and B.S. McEwen (1993) Neuronal birth and death. *Current Opinion Neurobiology* 3:676-682.

Gould, E. (1994) The effects of adrenal steroids and excitatory input on neuronal birth and survival. *Ann. NY Acad. Sci.* 743:73-93.

Woolley, C.S. and E. Gould (1994) Steroid action on neuronal structure. In: *Neurobiology of Steroids, Methods in Neurosciences* vol. 22. Eds: E.R. de Kloet and W. Sutanto, Academic Press, pp.383-402.

McEwen BS, Cameron H, Chao HM, Gould E, Luine V, Magarinos AM, Pavlides C, Spencer RL, Woolley C (1994) Resolving a mystery: progress in understanding the function of adrenal steroid receptors in hippocampus. *Prog Brain Res* 100:149-155.

McEwen BS, Gould E, Orchinik M, Weiland NG, Woolley CS (1995) Oestrogens and the structural and functional plasticity of neurons: implications for memory, ageing and neurodegenerative processes. *Ciba Found Symp* 191:52-66.

- McEwen BS, Albeck D, Cameron H, Chao HM, Gould E, Hastings N, Kuroda Y, Luine V, Magarinos AM, McKittrick CR (1995) Stress and the brain: a paradoxical role for adrenal steroids. *Vitam Horm* 51:371-402.
- Cameron, H.A. and E. Gould (1996) The control of neuronal birth and death. In: *Receptor Dynamics and Neural Development*. Ed: C. A. Shaw, CRC Press. pp.141-158.
- Gould, E. and H.A. Cameron (1996) The regulation of neuronal birth, migration and death in the rat dentate gyrus. *Develop. Neurosci.* 18: 22-35.
- Gould, E., P. Tanapat, N.B. Hastings, and T.J. Shors (1999) Neurogenesis in adulthood: a possible role in learning. *Trends in Cognitive Sciences* 3:186-191.
- Gould, E. and P. Tanapat (1999) Stress and hippocampal neurogenesis *Biological Psychiatry* 46:1472-1479.
- Gould E, Tanapat P, Rydel T, Hastings N. (2000) Regulation of hippocampal neurogenesis in adulthood. *Biol Psychiatry.* 48:715-720.
- Fuchs E, Gould E. (2000) Mini-review: in vivo neurogenesis in the adult brain: regulation and functional implications. *Eur J Neurosci.* 12:2211-4.
- Tanapat, P., N.B. Hastings and E. Gould (2001) Adult neurogenesis in the hippocampal formation In: *Handbook in Developmental Cognitive Sciences* Ed: C.Nelson and M.Luciano, MIT Press
- Gould E, Gross CG (2002) Adult neurogenesis: some progress and problems. *JNeurosci* 22:619-623.
- Tanapat P, N.B. Hastings and E. Gould (2002) Adult neurogenesis in the mammalian brain. In: *Hormones, Brain and Behavior* Ed: P.W. Pfaff, A.P. Arnold, A.M.Etgen, S.E. Fahrback and R.T. Rubin., Academic Press
- Nestler EJ, Gould E, Manji H, Buncan M, Duman RS, Greshenfeld HK, Hen R, Koester S, Lederhendler I, Meaney M, Robbins T, Winsky L, Zalcman S. (2002) Preclinical models: status of basic research in depression. *Biol Psychiatry.* 52:503-528.
- Hastings NB, Gould E. (2003) Neurons inhibit neurogenesis. *Nat Med* 9:264-266.
- Kozorovitskiy Y, Gould E.(2003) Stem cell fusion in the brain. *Nat Cell Biol.* 5:952-954.
- Gould E (2004) Stress, deprivation and adult neurogenesis. In: *The Cognitive Neurosciences*, Ed: M. Gazzaniga, MIT Press.
- Mirescu C, Gould E. (2004) From neurotoxin to neurotrophin. *Nat Neurosci.* 7:899-900.
- Leuner B, Gould E, Shors TJ. (2006) Is there a link between adult neurogenesis and learning? *Hippocampus.* 16:216-24.
- Mirescu C, Gould E. (2006) Stress and adult neurogenesis. *Hippocampus.* 16:233-8.

Gould E (2007) Structural Plasticity. In: *The Hippocampus Book* Ed: Andersen P, Morris, J, O'Keefe J. Oxford Univ Press 321-342.

Gould E. (2007) How widespread is adult neurogenesis in mammals? *Nat Rev Neurosci.* 8:481-488.

Glasper ER, Leuner B, Gould E. (2008) Adult neurogenesis finds its niche *Nat Neurosci* 11, 731 - 731

Leuner B, Gould E. (2010) Structural plasticity and hippocampal function. *Annu Rev Psychol.* 61:111-40.

Leuner B, Gould E. (2010) Parenting and plasticity. *Trends in Neurosciences.* 33:465-73.

Glasper, Morton and Gould (2010) Environmental Influences on Adult Neurogenesis. In: Encyclopedia of Behavioral Neuroscience. Eds. Koob, LeMoal and Thompson. Elsevier

Schoenfeld T and Gould E (2011) Stress and neurogenesis. Handbook of Stress: Neuropsychological Effects on the Brain Ed: Conrad C. Wiley-Blackwell

Opendak M, Gould E. (2011) New neurons maintain efficient stress recovery. *Cell Stem Cell.* 9:287-8.

Glasper ER, Schoenfeld TJ, Gould E (2012) Adult neurogenesis: optimizing hippocampal function to suit the environment. *Behav Brain Res.* 227:380-3.

Schoenfeld TJ, Gould E (2012) New neurons retire early. *Nat Neurosci.* 15:1611-2.

Schoenfeld TJ, Gould E (2012) Stress, stress hormones, and adult neurogenesis. *Exp Neurol.* 233:12-21.

Cope EC, Gould E (2013) Cytokines make an indelible impression on neural stem cells. *Cell Stem Cell.* 13:507-8.

Schoenfeld TJ, Gould E. (2013) Differential effects of stress and glucocorticoids on adult neurogenesis. In: Neurogenesis and Neural Plasticity Current Topics in Behavioral Neurosciences Eds: C Belzung, Volume 15, 2013, pp 139-164

Opendak M, Gould E (2015) Adult neurogenesis: a substrate for experience-dependent change. *Trends in Cognitive Sciences* 19:151-161.

Books

Comer R, Gould E. (2012) Psychology Around Us. 2nd edition Wiley Press