

DONALD WELLS PFAFF

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The Rockefeller University  
1230 York Avenue  
New York, New York 10021  
Born December 9, 1939, in Rochester, New York.

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## **EDUCATION**

Monroe High School, Rochester, New York. Graduated 1957.  
Harvard College, 1957-61, A.B., 1961.  
Massachusetts Institute of Technology, 1961-1965, Ph.D., 1965.

## **PROFESSIONAL EXPERIENCE**

Research Associate, M.I.T., Dept. of Psychology, 1965-1966.  
Trainee, Marine Biological Laboratory (Woods Hole) Course in Nerve-Muscle Physiology  
(Dr. S. W. Kuffler, Director), 1966.  
Postdoctoral Fellow, Rockefeller University, 1966-1968.  
Staff Scientist, Biomed. Division of the Population Council at Rockefeller Univ, 1968-1969.  
Fellow, Intensive Study Program, Neurosciences Research Program, Summer, 1969.  
Assistant Professor, Rockefeller University, 1969-1971.  
Associate Professor, Rockefeller University, 1971-1973.  
Associate Professor with tenure, Rockefeller University, 1973-1978.  
Professor, Rockefeller University, 1978-

## **ACADEMIC HONORS AND FELLOWSHIPS**

Harvard College, A.B. *magna cum laude*  
Fellow, American Academy of Arts and Sciences (elected 4/92)  
Member, U.S.A. National Academy of Sciences (elected 4/94)  
National Merit Scholarship, 1957-1961.  
Harvard National Scholarship, 1957-1961.  
Woodrow Wilson Fellowship, 1961-1962.  
M.I.T. President's Award Fellowship, 1962-1963.  
National Institutes of Health, Predoctoral Fellowship, 1963-1965.  
National Science Foundation, Postdoctoral Fellowship, 1966-1968.  
ISI Highly Cited Researcher, 2000, 2001, 2003, 2007, 2008, 2009.  
Asso. Amer. Publishers Award, Best Medical Science book, 2005.  
MERIT NIH grant award, 2003-2013.  
Nominated, NIH Director's Pioneer Award 2004, 2005  
The Harvey Society (elected 2004).  
Fellow, New York Academy of Sciences (Elected 2006).  
Fellow, Collegium Internationale Neuro-Psychopharmacologicum. (Elected 2007).  
Honorary Doctorate, Pace University, 2008.  
IPSEN Foundation Prize in Neural Plasticity, Paris, 2010  
Lehrman Memorial Prize, Soc. Behav. Neuroendocrinology, 2011

Honorary Professor, Medical School, Wuhan University, Wuhan, China, 2013

### **EDITORIAL, ADVISORY, PLENARY**

Associate Editor, Hormones and Behavior, 1972-1986; Editorial Board, 1997-  
Editorial Board, Neuroendocrinology, 1983-1987, 1994-  
Editorial Board, Series on Perspectives in Neuroendocrine Research, 1971-1980.  
Fellow, Division 6, APA.

Editor, Series on Current Topics in Neuroendocrinology (Springer-Verlag).

Co-editor, Experimental Brain Research, 1980-1992.

Editorial Board, Handbook of Behavioral Neurobiology (1980- ).

Consulting Editor, Behavioral Neuroscience.

Editorial Board, Brain Research Bulletin, 1989-1995

Editorial Board, J. Neuroendocrinology, 1989-1999

Editorial Board, J. Neurophysiology, 1989-1992

Associate Editor, Molecular & Cellular Neurosciences, 1990-1995

Editorial Board, Synapse, 1994-2004

Editorial Board, Developmental Neuroscience, 1994-2009

Editorial Board, Neuroscience-Net, 1996-

Associate Editor, Encyclopedia of Reproduction, 1998

Editorial Board, Stress, 2000-2016.

Editorial Board, Endocrinology, 2000-2003.

Editorial Board, Endocrine Reviews, 2001-2004

Editorial Board, Regulatory Peptides, 2003-2016

Editorial Board, Endocrine, 2003-

Editorial Board, Frontiers in Neuroendocrinology, 2004-

NIH Biochemical Endocrinology Study Section, 1983-1987.

NSF, Cellular and Molecular Neurobiology Study Section, 1987-1990.

NIMH Neuroscience & Mental Health Advisory Panel, 1988 & 1993.

NIH/NCRR Study Section, 2000.

NICHHD Study Section (Underrepresented Schools, 2001).

Society for Neuroscience Public Information Committee (1985-1988)

NICHHD 5-year Planning Committee, 1985.

MIT Visiting Committee (Whitaker College) 1986-1989.

Burroughs-Wellcome Fund Career Awards Board (1994- 2001 ), Co-chair (1999- 2000).

Scientific Advisory Board, Oregon National Primate Research Center (1999- ).

AAAS, Science & Policy (Law/CNS) Program, 2003-

Wolf Foundation Prize in Medicine, International Committee, 2004

Advisory Board, NSF Cntr. for Behav. Neuroscience (Atlanta), 2007-

NSF Advisory, Brain Science/Physical Science Interface, 2007

Society for Behavioral Neuroendocrinology, Board, 2007-

Scientific Advisory Board, Hope for Depression Foundation, 2007-2011.

Plenary Lecture, Internat. Congress Physiol. Sciences Vancouver, 1986.

Plenary Lecture, Internat. Study Group on Steroid Hormones Vienna, Austria, 1993.

Pincus Lecturer, Laurentian Hormone Conference, 1993.

Plenary Lecture, Gottingen Neurobiology Conference, 1994.  
Plenary Lecture, European Pediatric Endocrine Society, Maastricht, 1994.  
Plenary Lecture, International Society for Neuroendocrinology, Budapest, 1994.  
Plenary Lecture, NIAAA Conference on Stress, Gender and Alcohol Addiction, 1994.  
Plenary Lecture, International Congress on Steroid Hormones, Dallas Texas, 1994.  
Greenblatt Memorial Lecturer, University of Georgia, 1994  
Lindner Memorial Lecturer, Weizmann Institute, 1994  
Plenary Lecture, Int. Cong. Comp. Endo./GnRH, Tokyo, 1997  
Cuozzo Memorial lecturer, University of Pennsylvania, 1997  
Organon Lecture, The Physiological Society (U.K.), 1998  
Miller Distinguished Lecture, Univ. of Illinois Coll. of Medicine, Chicago, 1999  
Hopkins/U. Maryland Lectureship in Reproductive Biology, 1999  
Plenary Lecture, Berlin (Germany) Neuroscience Forum, 1999  
Plenary Lecture, Internat. Narcotics Research Congress, 1999  
Nobel Symposium on Hormone Action, Speaker, Stockholm, 1999  
Plenary Lecture, The Physiological Society (U.K.), London, 2000  
Plenary Lecture, Internat. Soc. Study Women's Health, Berlin, 2001  
Plenary Lecture, Soc. for Biological Psychiatry, 2002  
Gordon Research Conf. on Environmental Endocrine Disruptors, 2002  
Plenary, European Comm. Expert Conf. on Hormone.Gene Relns, Ulm 2002  
Plenary, NIH Workshop, Emerging Technologies in Neuroendo., 2002  
Plenary, Dutch Obstetrics/Gynecology Conference, Arnhem, 2002  
Rudolf Magnus Lecturer, Utrecht, Netherlands, 2003  
Plenary, European J. of Pharmacology, Spring Meeting, 2003  
Plenary, World Cong. On Post.Pituitary Hormones, Kyoto, 2003  
Nobel Symposium on Gender Medicine, Stockholm, Speaker, 2003  
Gordon Research Conf. on Genes and Behavior, Speaker, 2004  
Plenary, Women's Health Research Conf., North Carolina, 2004  
Plenary, University of Cologne, Germany, Fall Meeting, 2004  
Nobel Symposium on CNS Sexual Differentiation, Stockholm, Speaker, 2005  
Gordon Research Conf. on Chronobiology, Speaker, 2005  
Plenary, Soc. Study of Ingestive Behavior, Pittsburgh, 2005  
Plenary, International Society of Neuroendocrinology, 2006  
Plenary, International Congress for Neuropsychiatry, 2006  
Speaker, Cold Spring Harbor Banbury Conf. on Biology of Social Cognition, 2006  
Speaker, Cold Spring Harbor Labs Conf. on Engineering Principles in Biology, 2006  
Co-organizer, Banbury Conf. on Molecular Mechanisms of CNS Arousal, 2007  
Plenary, Physiological Society of Japan, Tokyo, 2008  
Nobel Symposium on Hormone Action, Stockholm, Speaker, 2008  
J.W. Jones Distinguished Science Lecture, Rochester Institute Of Technology, 2009.  
Keynote lecture, United Nations, Meeting on "Neuroscience, Law, and Morality" 2009.  
Roger Guillemin Nobel Lecture, Salk Institute, 2009.  
Plenary lecture, International Society for Research on Aggression, 2010.  
Keynote lecture, EMBO meeting, "Science and Society" (Sex Differences) Heidelberg, 2010.  
Distinguished lecturer in Neuroscience, University of Toronto, 2012.  
Pioneer Lecture, Genomic Biology, University of Illinois, 2012.  
State Key Lecture, University of Hong Kong, 2013.

Cheah Distinguished Lecture, Monash University (Malaysia), 2013.  
Plenary Lecture, Turkish Neuroscience Society, 2013.  
McGovern Lecturer, Peking University, Beijing, China, 2014.  
Sir John Monash Lecture, Monash Univ., Kuala Lumpur, Malaysia, 2015  
Distinguished Lecture, MIND Institute, U. California Davis, 2016.  
'Pioneer in Endocrinology' lecture, Rutgers University, 2016  
Plenary, Jinan University, Guangzhou, China, 2016.

Internat. Union Physiol. Sciences, Commission on Endocrinology, Chairman, 1990-1996  
Internat. Union Physiol. Sciences, Commission on Molecular Biology  
International Congress of Physiol. Sciences, St. Petersburg, Russia, 1997, Program Committee.  
International Soc. of Neuroendocrinology, Council, 1988-2000  
Steering Committee for Recent Progress in Hormone Research, 1994-1998  
MacArthur Foundation Network on Psychopathology and Development, 1994-1995  
Endocrine Society Program Committee, 1996-1997  
Nat. Acad. Sci. Neurosciences Award Selection Committee, 1998, Chair, 2001  
Amer. Acad. Arts & Sciences, Neuroscience Selection Panel, 2001-2002  
Advisory Workgroup, NIMH Council, Future Priorities, 2004  
Advisory Workgroup, NIH, Blueprint for the Neurosciences, 2004  
Advisor, Board of Scientific Counselors, NIMH, 2005  
Member, Dana Alliance for Brain Initiatives, 2006-  
Board, Fordham Univ. Law School Center for Neuroscience and Law, 2015-.

### **SOCIETIES:**

American Physiological Society; Endocrine Society; International Brain Research Organization;  
Society For Neuroscience; International Society for Neuroendocrinology; New York Academy  
of Sciences; American Association for the Advancement of Science; Behavior Genetics  
Association; American Society for Pharmacology and Experimental Therapeutics.

### **SOME THEMES IN PUBLICATIONS TO DATE, WITH SELECTED REFERENCES (1/2017)**

#### **Lab's Major Accomplishments:**

- 1.** First localization of hormone target neurons in the brain: discovery of estrogen-binding neurons in a limbic/hypothalamic system (CV #3, 6, 38, Books 1, 3). The discovery initially was made in rat brain, but our work on fish CNS *through* monkey CNS showed it to be a general vertebrate system (95, 264). We followed up the histochemical findings to demonstrate consequences of hormone binding for electrophysiological activity (61) and neuronal growth (132,179,185, 205, 242, 327).
- 2.** We worked out the first neural circuit for a vertebrate behavior, the estrogen-dependent lordosis behavior (Books 2, 3). The lordosis behavior circuit proved that it is possible to explain how mechanisms for a mammalian behavior work.
- 3.** First demonstration of hormone-dependent genes in the brain (279, 328, 452). Their induction has temporal, spatial and gender specificities appropriate to reproductive behavior (326, 396, Book 8).
- 4.** Some of these hormone-dependent genes are required for, or foster, hormone-dependent behavior (588, Books 8, 9).

*Taken together, Points 1., 2., 3., and 4. showed exactly how specific neurochemical reactions in specific parts of the brain determine a specific mammalian behavior.*

5. Demonstration of a neuropeptide (LHRH, GnRH) driving a behavior in a manner consonant with its peripheral physiological effects (40).
6. Discovery that the neurons that control reproduction (GnRH neurons) are born not in the brain, but in the olfactory pit, and migrate into the basal forebrain (336, 391, 423, 427, 524). Explains loss of libido in X-linked Kallmann's syndrome (363).
7. First use of a viral vector to express a foreign gene in a mammalian brain (405, 406, 443, 461, 517).
8. Generalized CNS Arousal ("GA"): The lab has accomplished the concept, an operational definition, a precise assay, and several units of data about GA, thought of as the most primitive, powerful and essential function in the vertebrate CNS. We have results indicating that giant nerve cells in the medullary reticular formation play an essential role in producing GA.

### **Some current interests:**

1. Genetic and hormonal influences on brain arousal -- both sexual and generalized arousal (GA) in mice. For example, we follow mouse responsivity during the light-to-dark ( low-to-high arousal) transition, measuring behavioral arousal with 20 millisecond resolution. Is this a physically defined phase transition? What mathematical function are these animals following? Why is there a sex difference?
2. The "master cells" for generalized CNS arousal are certain large medullary reticular neurons (nucleus gigantocellularis , NGC). We have determined the transcriptome of the specific set of NGC neurons with axons projecting to the thalamus (for activating the cortex). We believe these neurons are responsible for 'waking up' the brain from zero states: e.g. coma, deep sleep, deep anesthesia.
3. Molecular, biophysical and behavioral studies of GA-related transmitter actions on nerve cells. Our studies include opioid peptides, hypocretin/orexin, histamine and norepinephrine. Regarding specific channels, in NGC neurons we are testing the hypothesis that fully functioning delayed rectifier potassium channels are crucial for high levels of NGC excitability and therefore, perhaps, required for entry into consciousness.
4. The genes for the glucocorticoid receptor (GR) and mineralocorticoid receptor (MR) are expressed in these NGC neurons. Since GR and MR are ligand-activated transcription factors, effects of stresses on these neurons can be studied at the transcriptional and epigenetic levels.
5. Exactly when and where are NGC neurons born and how do they migrate to their final functional positions? These experiments will determine the transcription factor (hox gene) spatiotemporal patterning that produces the NGC neurons we need to understand.
6. We have preliminary data indicating that at least some NGC neurons are outside the blood-brain-barrier. If we can replicate that evidence then NGC neurons would be unusually susceptible to blood-borne influences.

7. Use of viral vectors to alter gene expression in NGC neurons and measure behavioral consequences: for GA and for specific motivated behaviors.
8. Follow up microarray studies of steroid hormone effects on gene expression in specific regions of the adult brain; and of sex differences in the developing brain. Follow-up at RNA and protein levels. Predictions for epigenetic studies.

## **PUBLICATIONS - D. W. PFAFF**

### **BOOKS**

1. Pfaff, D. W. (Editor) Hormonal Factors in Brain Function. Cambridge, Mass.: The MIT Press, 1975.
2. Adler, N., Pfaff, D. W. and Goy, R. (Editors) Neurobiology of Reproduction (Handbook of Behavioral Neurobiology). New York: Plenum, 1985.
3. Pfaff, D. W. Estrogens and Brain Function: Neural Analysis of a Hormone-Controlled Mammalian Reproductive Behavior. New York: Springer-Verlag, 1980.
4. Pfaff, D. W. (Editor) The Physiological Mechanisms of Motivation. Heidelberg; New York: Springer-Verlag, 1982.
5. Pfaff, D. W. (Editor) Ethical Questions in Brain and Behavior: Problems and Opportunities. New York: Springer-Verlag, 1983.
6. Pfaff, D. W. (Editor) Taste, Olfaction and the Central Nervous System. New York: Rockefeller University Press, 1985.
7. Strauss, G. and Pfaff, D. (Editors) Molecular Neurobiology: Endocrine Approaches. New York: Academic Press, 1987.
8. Pfaff, D.W. Drive: Neurobiological and Molecular Mechanisms of Sexual Motivation. Cambridge: The M.I.T. Press, 1999.
9. Pfaff, D.W., Berrettini, W., Joh, T. and Maxson, S. (Editors) Genetic Influences on Neural and Behavioral Functions. Boca Raton: CRC Press, 1999.
10. Bodnar, R., Commons, K. and Pfaff, D.W. Central Neural States Relating Sex and Pain. Baltimore: The Johns Hopkins University Press, 2002.
11. Pfaff, D.W., (Editor in Chief). Hormones, Brain and Behavior. (a 5 volume reference treatise). San Diego: Academic Press, 2002 .

12. Pfaff, D.W., Phillips, M.I. and R.T. Rubin. Principles of Hormone/Behavior Relations. San Diego: Elsevier/Academic Press, (2004).
13. Pfaff, D.W. Associate Editor, Knobil & Neill's The Physiology of Reproduction. (2 volumes). 3<sup>rd</sup> Edition. San Diego: Elsevier/Academic Press, (2005). 2<sup>nd</sup> edition, 1994; 1<sup>st</sup> edition, 1988.
14. Devine, J., Gilligan, J., Miczek, K., Shaikh, R. and Pfaff, D. (Editors). Scientific Approaches to the Prevention of Youth Violence. Annals, New York Academy of Sciences, v.1036, (2004).
15. Pfaff, D.W. Brain Arousal and Information Theory: Neural and Genetic Mechanisms. Cambridge, Mass.: Harvard University Press, (2006).
16. Pfaff, D.W., Nelson, R. and Keverne, E.B. (G. Bock & J. Goode, Editors). Molecular Mechanisms Influencing Aggressive Behaviours. (a Novartis Foundation Symposium). London: Wylie, (2005).
17. Pfaff, D.W. The Neuroscience of Fair Play. Washington: Dana Press (2007).
18. Pfaff, D.W. and Kieffer, B.L. (Eds.) Molecular and biophysical mechanisms of arousal, alertness and attention. Annals, New York Academy of Sciences, Vol. 1129 (2008).
19. Pfaff, D., Kordon, C., Chanson, P. and Christen, Y. (Eds.) Hormones and Social Behavior. Heidelberg: Springer-Verlag (2008).
20. Pfaff, D.W., (Editor in Chief). Hormones, Brain and Behavior (Second edition). San Diego: Academic Press/Elsevier, (2009).
21. Pfaff, D.W. Man and Woman: An Inside Story. New York: Oxford University Press, (2010).
22. Martini, L. et al. (Pfaff, Associate Editor). Neuroendocrinology. Progress in Brain Research Amsterdam: Elsevier. (2011).
23. Fotopoulou, A. Pfaff, D. & Conway, M. (Eds) From the Couch to the Lab: Trends in Psychodynamic Neuroscience. Oxford, UK: Oxford University Press. (2012).
24. Schenck-Gustafsson, K.; DeCola, P.R.; Pfaff, D.W.; Pisetsky, D.S. (Eds) Handbook of Clinical Gender Medicine. Basel: Karger AG. (2012).
25. Fink, G., Pfaff, D and Levine, J., Handbook of Neuroendocrinology. San Diego: Academic Press/Elsevier, (2012).
26. Choleris, E., Pfaff, D. and Kavaliers, M. Oxytocin, Vasopressin and Related Peptides in the Regulation of Behavior. Cambridge: Cambridge University Press, (2013).

27. Pfaff, D.W. (Editor-in-Chief). Neuroscience in the 21<sup>st</sup> Century: From Basic to Clinical. Heidelberg: Springer Verlag (2012). (*5-volume text free electronically in developing countries*).
28. Pfaff, D.W., Christen, Y. (Eds.). Multiple origins of sex differences in brain. Neuroendocrine functions and their pathologies. Springer, Heidelberg (Fondation Ipsen), 2013.
29. Pfaff, D.W. with Sherman, S. The Altruistic Brain: How we are naturally good. New York: Oxford University Press (2014).
30. Pfaff, D.W. with Sherman, S. A Neuroscientist Looks at Robots. Singapore: World Scientific Press (2015).
31. Pfaff, D.W. and Volkow, N.D., (Editors-in-Chief). Neuroscience in the 21<sup>st</sup> Century: From Basic to Clinical. (2<sup>nd</sup> edition). Heidelberg: Springer Verlag (2016). (*5-volume text free electronically in developing countries*).
32. Pfaff, D.W. and Joels, M., (Editors-in-Chief). Hormones, Brain and Behavior. (a 5 volume reference treatise).(3<sup>rd</sup> edition). Cambridge: Elsevier ( 2017) .
33. Pfaff, D.W., Schneider, J., Head, G. and R.T. Rubin. Principles of Hormone/Behavior Relations. (2<sup>nd</sup> edition) San Diego: Elsevier/Academic Press, (2017, in press).
32. Pfaff, D.W., Christen, Y. (Eds.). Stem cells in neuroendocrinology. Springer, Heidelberg (Foundation Ipsen), 2016.
33. Pfaff, D.W. How the vertebrate brain regulates behavior: Direct from the lab. Cambridge, Mass: Harvard University Press, (2017, in press).

## **RESEARCH REPORTS AND REVIEW CHAPTERS**

1. Freedman, S. J. and Pfaff, D. W. The effect of dichotic noise on auditory localization. J. Auditory Research, 2: 305-310, 1962.
2. Freedman, S. J. and Pfaff, D. W. Trading relations between dichotic time and intensity differences in auditory localization. J. Auditory Research. 2: 311-318, 1962.
3. Pfaff, D. W. Cerebral implantation and autoradiography studies of sex hormones. In Sex Research: New Developments, J. Money (Ed.) New York: Holt, Rinehart & Winston, 1965, pp. 219-234.
4. Pfaff, D. W. Morphological changes in the brains of adult male rats after neonatal castration. J. Endocrinology, 36: 415-416, 1966.



5. Pfaff, D. W. Effects of body temperature and time of day on time judgments. J. Exp. Psychol., 76: 419-422, 1968.
6. Pfaff, D. W. Uptake of estradiol-17B-H3 in the female rat brain. An autoradiography study. Endocrinology. 82: 1149-1155, 1968.
7. Pfaff, D. W. Autoradiography localization of heterologous sex hormones in the rat brain. Experientia. 24: 958-959, 1968.
8. Pfaff, D. W. Autoradiographic localization of radioactivity in rat brain after injection of tritiated sex hormones. Science, 161: 1355-1356, 1968.
9. Pfaff, D. W. Parsimonious biological models of memory and reinforcement. Psychological Review, 76: 70-81, 1969.
10. Pfaff, D. W. and Pfaffmann, C. Olfactory and hormonal influences on the basal forebrain of the male rat. Brain Research. 15: 137-156, 1969.  
  
Pfaff, D. W., Scott, J. and Pfaffmann, C. Olfactory input to the medial forebrain bundle of the rat. Psychonomic Bull., 1: 22 (abstract), 1967.
11. Pfaff, D. W. Sex differences in food intake changes following pituitary growth hormone or prolactin injections. Proc. Amer. Psychol. Assn., 4: 211-212, 1969.
12. Pfaff, D. W. Histological differences between ventromedial hypothalamic neurons of well-fed and underfed rats. Nature. 223: 77-78, 1969.
13. Pfaff, D. W. and Pfaffmann, C. Behavioral and electrophysiological responses of male rats to female rat urine odors. In Olfaction and Taste, C. Pfaffmann (Ed.). Rockefeller University Press, New York, 1969, pp. 258-267.
14. Scott, J. and Pfaff, D. W. Behavioral and electrophysiological responses of female mice to male mouse urine odors. Physiology and Behavior. 5: 407-411, 1970.
15. Pfaff, D. W. Mating behavior of hypophysectomized rats. J. Comp. Physiol. Psychol., 72: 45-50, 1970.
16. Pfaff, D. W. Nature of sex hormone effects on rat sex behavior: Specificity of effects and individual patterns of response. J. Comp. Physiol. Psychol., 73: 349-358, 1970.  
  
Pfaff, D. W. Behavioral responses of rats to sex hormones: Specificity of hormone effects and individual patterns of response. Amer. Zoologist, 9: 1066 (Abstract), 1969.
17. McEwen, B. and Pfaff, D. W. Factors influencing sex hormone uptake by rat brain regions: I. Effects of neonatal treatment, hypophysectomy, and competing steroid on estradiol uptake. Brain Research, 21: 1-16, 1970.

18. McEwen, B., Pfaff, D. W. and Zigmond, R. E. Factors influencing sex hormone uptake by rat brain regions: II. Effects of neonatal treatment and hypophysectomy on testosterone uptake. Brain Research, 21: 17-28, 1970.
19. McEwen, B. S., Pfaff, D. W. and Zigmond, R. E. Factors influencing sex hormone uptake by rat brain regions: III. Effects of competing steroids on testosterone uptake. Brain Research, 21: 29-38, 1970.
20. Pfaff, D. W. Synergistic and antagonistic effects of sex hormones on female rat sex behavior. Amer. Zoologist, 10: no. 23 (Abstract), 1970.
21. Pfaff, D. W. and Gregory, E. Olfactory coding in olfactory bulb and medial forebrain bundle of normal and castrated male rats. J. Neurophysiol., 34: 208-216, 1971.
22. Pfaff, D.W. and Zigmond, R.E. Neonatal androgen effects on sexual and nonsexual behavior of adult rats tested under various hormone regimes. Neuroendocrinol., 7: 129-145, 1971.
23. Gregory, E. and Pfaff, D. W. Development of olfactory-guided behavior in infant rats. Physiology and Behavior, 6: 573-576, 1971.
24. Pfaff, D. W. Statistical effects of sensitivity differences among neurophysiological preparations. J. Theoretical Biol., 31: 159-160, 1971.
25. Pfaff, D. W. Steroid sex hormones in the rat brain: Specificity of uptake and physiological effects. In Steroid Hormones and Brain Function. C. H. Sawyer and R. A. Gorski (Eds.). Los Angeles: University of California Press, 1971, pp. 103-112.
26. Pfaff, D. W., Gregory, E. and Silva, M. T. A. Testosterone and corticosterone effects on single unit activity in the rat brain. In The Influence of Hormones on the Nervous System, D. H. Ford (Ed.). Basel: Karger, 1971, pp. 269-281.
27. Pfaff, D. W. and Gregory, E. Correlation between preoptic area unit activity and the cortical EEG: Difference between normal and castrated male rats. Electroenceph. Clin. Neurophysiol., 31: 223- 230, 1971.
28. Pfaff, D. W., Silva, M. T. A. and Weiss, J. M. Telemetered recording of hormone effects on hippocampal neurons. Science, 172: 394-395, 1971.
29. Pfaff, D. W. Mating behavior of adrenalectomized rats. Amer. Zoologist, 11: #2, 1971 (Abstract).
30. Pfaff, D. W. and Keiner, M. Estradiol-concentrating cells in the rat amygdala as part of a limbic-hypothalamic hormone-sensitive system. In The Neurobiology of the Amygdala, B. Eleftheriou (Ed.). New York: Plenum, 1972, pp. 775-785.

- Pfaff, D. Keiner, M. and Waren, E. Estradiol-H3 concentration by cells in a limbic-hypothalamic system in the female rat brain. An autoradiography study. Proc Soc for Neurosci, 1971 (Abstract)
31. Pfaff, D. W., Lewis, C., Diakow, C. and Keiner, M. Neurophysiological analysis of mating behavior responses as hormone-sensitive reflexes. In Progress in Physiological Psychology, E. Stellar and J. M. Sprague (Eds.), vol. 5, 1972, pp. 253-297.  
Pfaff, D. W., Diakow, C., Malsbury, C. and Kelley, D. Physiological analysis of lordosis in the female rat as a hormone-sensitive reflex. Hormones, 3: 280, 1972 (Abstract).
32. Malsbury, C., Kelley, D. R. and Pfaff, D. W. Responses of single units in the dorsal midbrain to somatosensory stimulation in female rats. In Progress in Endocrinology. Proc. IV International Congress Endocrinology, C. Gaul (Ed.). Excerpta Medica Internat. Congress Series #273, 1972, pp. 205-209.
33. Pfaff, D. W. Interactions of steroid sex hormones with brain tissue: Studies of uptake and physiological effects. In The Regulation of Mammalian Reproduction, S. Segal et al. (Eds.). Springfield, Ill.: Thomas, 1973, pp. 5-22.
34. Pfaff, D. W. Mechanisms of sexual motivation. Discussion in Neural Control of Motivated Behavior. Edited by E. Stellar and J. D. Corbit. Neurosciences Research Program Bulletin, Vol. 11, 1973, pp. 368-375.
35. Zigmond, R. E., Nottebohm, F. and Pfaff, D. W. Androgen-concentrating cells in the midbrain of a songbird. Science, 179: 1005-1007, 1973.  
  
Zigmond, R. E., Nottebohm, F. and Pfaff, D. W. Distribution of androgen- concentrating cell in the brain of the chaffinch. Proc. IV International Congress Endocrinology, Washington, D.C., 1972, Excerpta Medica Internat. Congress Series No. 256 (Abstract #340).
36. McEwen, B. S. and Pfaff, D. W. Chemical and physiological approaches to neuroendocrine mechanisms: Attempts at integration. In Frontiers in Neuroendocrinology, W. F. Ganong and L. Martini (Eds.). New York: Oxford University Press, 1973, pp. 267-335.
37. Pfaff, D. W., Diakow, C., Zigmond, R. E. and Kow, L.-M. Neural and hormonal determinants of female mating behavior in rats. In The Neurosciences, Vol. III, F. O. Schmitt and F. G. Worden (Eds.). Cambridge: M.I.T. Press, 1973, pp. 621-646.
38. Pfaff, D. W. and Keiner, M. Atlas of estradiol-concentrating cells in the central nervous system of the female rat. J. Comp. Neurol., 151: 121-158, 1973
39. Diakow, C., Pfaff, D. W. and Komisaruk, B. Sensory and hormonal interactions in eliciting lordosis. Fed. Proc., 32: 241 (Abstract), 1973.
40. Pfaff, D. W. Luteinizing hormone releasing factor (LRF) potentiates lordosis behavior in hypophysectomized ovariectomized female rats. Science, 182: 1148-1149, 1973.

41. Kow, L.-M. and Pfaff, D. W. Effects of estrogen treatment on the size of receptive field and response threshold of pudendal nerve in the female rat. Neuroendocrinology, 13: 299-313, 1973.

Kow, L.-M. and Pfaff, D. W. Estrogen effect on pudendal nerve receptive field size in the female rat. Anat. Rec., 175: 362-363, 1973 (Abstract).

42. Malsbury, C. and Pfaff, D. W. Neural and hormonal determinants of mating behavior in adult male rats. A review. In Limbic and Autonomic Nervous Systems Research, L. DiCara (Ed.). New York: Plenum, 1974, pp. 85-136.

43. Floody, O. and Pfaff, D. W. Steroid hormones and aggressive behavior: Approaches to the study of hormone-sensitive brain mechanisms for behavior. Research Publications, Assn. for Research in Nervous and Mental Disease, 52: 149-185, 1974.

Floody, O. and Pfaff, D. W. Hormonal modulation Or aggressive behavior in female hamsters. Proceedings, Society for Neuroscience, 1973 (Abstract), p. 121.

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## **PATENTS**

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