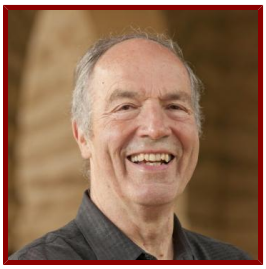
Stanford



Russell D. Fernald

Benjamin Scott Crocker Professor of Human Biology, Emeritus

Curriculum Vitae available Online Resume available Online

Bio

ACADEMIC APPOINTMENTS

- Emeritus Faculty, Acad Council, Biology
- Member, Bio-X
- Member, Stanford Cancer Institute
- Member, Wu Tsai Neurosciences Institute

HONORS AND AWARDS

- Bing Prize for Excellence & Innovation in Undergraduate Teaching, Stanford University (1996-99)
- Cox Medal for Excellence in Fostering Undergraduate Research, Stanford University (1998)
- Dinkelspiel Prize for Outstanding Contributions to Undergraduate Education, Stanford University (2000)
- Benjamin Scott Crocker Professor of Human Biology, Stanford University (1994-)
- NIH Fogarty Senior International Fellowship, NIH (1985-86)
- Javits Neuroscience Investigator Award, National Institute of Neurological Disorders and Stroke (1999-2006)
- Fellow-American Association for Advancement of Science, AAAS (2003)
- Rank Prize in Vision/Opto-electronics, Rank Foundation (February 2004)
- Elected Fellow, American Academy of Arts and Sciences (2011)

PROFESSIONAL EDUCATION

- PhD, University of Pennsylvania , Biophysics (1969)
- B.S., Swarthmore College , Electrical Engineering/Physics (1963)

LINKS

- Lab Website: https://web.stanford.edu/group/fernaldlab/

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

How does social experience influence the brain?

Our research is focused on understanding the mechanisms through which social change is transduced into cellular and molecular change. Sex is the most potent selective force acting on animal behavior, shaping many aspects of animals' behavior and physiology. How is vertebrate sexual maturation and behavior controlled? Ultimately, males regulate reproductive opportunity and success through their behavior and social interactions, selecting a mate

from among males on offer. Males use a variety of competitive strategies, evolved to impress females, intending to become the chosen one. Amongst males, there is typically a status hierarchy in which males compete for highest rank that brings with it a higher chance of being chosen because high status leads to reproductive opportunity and competence as well as access to females and food. Lower ranking animals often have limited access to food and reproduction and are reproductively incompetent. To understand the circuitry responsible for male reproduction, we study the neural mechanisms of social ascent, assessing the changes in males as they ascend from low to high status. We use a uniquely appropriate fish model system dominance is reflected in maintaining a territory so when a vacated territory becomes available, a low-ranking male must quickly detect his absence, seize the opportunity to acquire this valuable resource, and initiate a dramatic transformation that spans from whole-organism behavior and coloration changes, to hormonal, cellular, and transcriptional-level changes throughout the body. In fact, within a matter of minutes, his appearance and physiology has changed radically as he prepares for a new lifestyle as a dominant and reproductively active territory holder. But social ascent happens over two timescales. Following the rapid changes described above that occur in minutes, the reproductive system also needs to ramp up so the male has sperm for mating. Though both of these systems are triggered by the recognition of social opportunity, we can show that they comprise distinct circuits in which different neural peptides are activated to achieve the changes needed.

Teaching

GRADUATE AND FELLOWSHIP PROGRAM AFFILIATIONS

- Biology (School of Humanities and Sciences) (Phd Program)
- Neurosciences (Phd Program)

Publications

PUBLICATIONS

- **Rhythmic expressed clock regulates the transcription of proliferating cellular nuclear antigen in teleost retina.** *Experimental eye research*
  Song, H., Wang, D., De Jesus Perez, F., Xie, R., Liu, Z., Chen, C., Yu, M., Yuan, L., Fernald, R. D., Zhao, S.
  2017; 160: 21-30
- **Differential activation of vasotocin neurons in contexts that elicit aggression and courtship** *BEHAVIOURAL BRAIN RESEARCH*
  Loveland, J. L., Fernald, R. D.
  2017; 317: 188-203
- **Cognitive skills and the evolution of social systems** *JOURNAL OF EXPERIMENTAL BIOLOGY*
  Fernald, R. D.
  2017; 220 (1): 103-113
- **Polygenic sex determination in the cichlid fish Astatotilapia burtoni.** *BMC genomics*
  Roberts, N. B., Juntti, S. A., Coyle, K. P., Dumont, B. L., Stanley, M. K., Ryan, A. Q., Fernald, R. D., Roberts, R. B.
  2016; 17 (1): 835-?
- **Dopaminergic inhibition of gonadotropin-releasing hormone neurons in the cichlid fish, Astatotilapia burtoni.** *journal of experimental biology*
  Bryant, A. S., Greenwood, A. K., Juntti, S. A., Byrne, A. E., Fernald, R. D.
  2016
- **Differential activation of vasotocin neurons in contexts that elicit aggression and courtship.** *Behavioural brain research*
  Loveland, J. L., Fernald, R. D.
  2016; 317: 188-203
- **Timing reproduction in teleost fish: cues and mechanisms** *CURRENT OPINION IN NEUROBIOLOGY*
  Juntti, S. A., Fernald, R. D.
  2016; 38: 57-62
- **A Neural Basis for Control of Cichlid Female Reproductive Behavior by Prostaglandin F-2 alpha** *CURRENT BIOLOGY*
  Juntti, S. A., Hilliard, A. T., Kent, K. R., Kumar, A., Andrew Nguyen, A., Jimenez, M. A., Loveland, J. L., Mourrain, P., Fernald, R. D.

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- **Two types of dominant male cichlid fish: behavioral and hormonal characteristics.** *Biology open*
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- **Identification of prohormones and pituitary neuropeptides in the African cichlid, Astatotilapia burtoni.** *BMC genomics*
  Hu, C. K., Southey, B. R., Romanova, E. V., Maruska, K. P., Sweedler, J. V., Fernald, R. D.
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- **Epigenetic DNA Methylation Linked to Social Dominance** *PLOS ONE*
  Lenkov, K., Lee, M. H., Lenkov, O. D., Swafford, A., Fernald, R. D.
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- **Social Crowding during Development Causes Changes in GnRH1 DNA Methylation** *PLOS ONE*
  Alvarado, S. G., Lenkov, K., Williams, B., Fernald, R. D.
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- **The effect of observers on behavior and the brain during aggressive encounters.** *Behavioural brain research*
  Desjardins, J. K., Becker, L., Fernald, R. D.
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- **Social behaviour: can it change the brain?** *ANIMAL BEHAVIOUR*
  Fernald, R. D.
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- **Electrical synapses connect a network of gonadotropin releasing hormone neurons in a cichlid fish** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
  Ma, Y., Juntti, S. A., Hu, C. K., Huguenard, J. R., Fernald, R. D.
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- **Communication about social status** *CURRENT OPINION IN NEUROBIOLOGY*
  Fernald, R. D.
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  Fernald, R. D.
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- **Social Context Influences Aggressive and Courtship Behavior in a Cichlid Fish** *PLOS ONE*
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- **Visual Information Alone Changes Behavior and Physiology during Social Interactions in a Cichlid Fish (Astatotilapia burtoni)** *PLOS ONE*
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  Wood, L. S., Desjardins, J. K., Fernald, R. D.
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- **Plasticity of the Reproductive Axis Caused by Social Status Change in an African Cichlid Fish: II. Testicular Gene Expression and Spermatogenesis** *ENDOCRINOLOGY*
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  Grone, B. P., Maruska, K. P., Korzan, W. J., Fernald, R. D.
  2010; 169 (1): 98-107
- **Behavioral and physiological plasticity: Rapid changes during social ascent in an African cichlid fish** *HORMONES AND BEHAVIOR*
  Maruska, K. P., Fernald, R. D.
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  Grone, B. P., Lee, M., Fernald, R. D.
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  Desjardins, J. K., Fernald, R. D.
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  Greenwood, A. K., Wark, A. R., Fernald, R. D., Hofmann, H. A.
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- **Chronic valproic acid treatment triggers increased neuropeptide Y expression and signaling in rat nucleus reticularis thalami** *JOURNAL OF NEUROSCIENCE*
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