

Updated November 2015

## **CURRICULUM VITAE**

NAME: Purves, Dale

### **EDUCATION:**

1960 - B.A. Summa cum Laude, Yale University, New Haven, CT

1964 - M.D. Harvard Medical School, Boston, MA

### **EXPERIENCE:**

2013-present George B. Geller Professor of Neurobiology, Emeritus; Research Professor, Duke Institute for Brain Sciences

1990-2013 George Barth Geller Professor, Department of Neurobiology, Duke University, Durham, North Carolina

2009-2013 Director, Neuroscience and Behavioral Disorders Program, Duke-NUS Graduate Medical School

2009-2012 Executive Director, A\*STAR Neuroscience Research Partnership in Singapore

2003-2009 Director, Center for Cognitive Neuroscience, Duke University, Durham, North Carolina

2003-present Professor, Department of Philosophy

1996-present Professor, Department of Psychological and Brain Sciences

1990-2002 Chairman, Department of Neurobiology, Duke University, Durham, North Carolina

1985-1990 Professor of Neurobiology, Department of Anatomy and Neurobiology, Washington University School of Medicine, St. Louis, Missouri

1985-1990 Co-Director, Javits Center for Neuroscience at Washington University

1985-1987 Director, Grass Fellows Program, Marine Biological Laboratory

1979-1985 Professor of Physiology and Biophysics, Department of Physiology and Biophysics, Washington University School of Medicine, St. Louis, Missouri

1976-1979 Associate Professor, Department of Physiology and Biophysics, Washington University School of Medicine

1978-1984 Instructor and Organizer, Cold Spring Harbor Summer Course on

## Developmental Neurobiology

1977; 1979 Instructor and Organizer, Cold Spring Harbor Summer Course on the Structure and Function of the Synapse

1973-1976 Assistant Professor, Department of Physiology and Biophysics, Washington University School of Medicine

1971-1973 Postdoctoral Fellow, Department of Biophysics, University College London, London, England

1970 Grass Fellow in Neurophysiology (Marine Biological Laboratory, Woods Hole)

1968-1971 Postdoctoral Fellow, Department of Neurobiology, Harvard Medical School

1968-69 Resident in Neurosurgery, Massachusetts General Hospital

1968 Physician for the Committee of Responsibility, Vietnam

1967-1968 Assistant Resident in Surgery, Massachusetts General Hospital

1965-1967 Peace Corps Physician, Venezuela (USPHS)

1964-1965 Intern in Surgery, Massachusetts General Hospital

## **PRIMARY ACADEMIC APPOINTMENTS:**

George Barth Geller Professor of Neurobiology, Duke Institute for Brain Sciences

## **SECONDARY ACADEMIC APPOINTMENTS:**

Professor, Department of Psychological and Brain Sciences, Duke University

Professor, Department of Philosophy, Duke University

Professor, Department of Physiology, National University of Singapore

Adjunct Professor, Neuroscience and Behavioral Disorders Program, Duke-NUS Graduate

Medical School, Singapore

## **HONORS AND AWARDS:**

Scholar of the House, Yale University, 1959-60

Dean's Prize, Yale University, 1960

Alpha Omega Alpha, Harvard Medical School, 1963

Graduation Day Speaker, Harvard Medical School, 1964

Moseley Traveling Fellowship, Harvard Medical School, 1971

Named Teacher of Year by first year medical students, Washington University School of Medicine, 1974

Named Teacher of the Year by graduating class, Washington University School of Medicine, 1978.

Mathilde Solowey Award in Neuroscience, 1979

Alexander Forbes Lectureship (Grass Foundation), 1983

Jacob K. Javits Neuroscience Investigator Award (NINCDS), 1984

Viktor Hamburger Lecturer (Washington University), 1984

Clinton Woolsey Annual Lecturer (University of Wisconsin), 1986

Annual Distinguished Lecturer in Neuroscience (SUNY, Stony Brook), 1987

Camillo Golgi Award Lecturer (FIDIA), 1988-89

Election to National Academy of Sciences, 1989

Annual Distinguished Lecturer in Neuroscience (University of Edinburgh), 1990

Grass Lecturer (Society for Neuroscience), 1990

Jacob K. Javits Neuroscience Investigator Award (NINDS - 2nd Award), 1990

John H. Krantz, Jr. Memorial Lectureship (University of Maryland), 1991

Decade of the Brain Plenary Lecturer (American Academy of Neurology), 1992

"Lezioni Lincee" Award Lectures (Accademia Nazionale dei Lincei, Italy), 1992

Plenary Special Lecturer, Japanese Society for Neuroscience, 1992

5th C.U. Ariens Kappers Lecturer, Brain Research Institute, Amsterdam, The Netherlands,

1993

10th Annual Dodge Lecturer (Washington University), 1995

Davison Society Excellence in Teaching Award (Duke University), 1995

Election to the Institute of Medicine, National Academy of Sciences, 1996

Second Annual Stephen S. Kuffler Lecturer (Stanford University), 1998

Election to the American Academy of Arts and Sciences, 1999

Edward W. Snowden Lecturer, Wesleyan University, 2007

Award for Excellence in Neuroscience Education (Association of Neuroscience Departments

and Programs), 2008

Election to Fellowship, American Association for the Advancement of Science, 2008

Plenary Speaker, 25th Anniversary, Institute of Neuroscience and Brain Research Center

(Taiwan), 2010

Plenary Speaker, Decade of the Mind VI (Singapore), 2010

TEDX speaker, Singapore 2010

Keynote Speaker, Annual Fly Meeting (HHMI), 2011

Presidential Lecturer, Spanish Society for Neuroscience, 2011

#### **EDITORIAL POSTS:**

Associate Editor, Journal of Neurocytology (1977-1983)

Associate Editor, Journal of Neuroscience (1980-1987)

Associate Editor, Journal of Physiology (Lond.) (1982-1989)

Editorial Advisor, Seminars in Neuroscience (1989-1992)

Editor-in-Chief, Journal of Neuroscience (1988-1993)

Editorial Board, Proceedings of the National Academy of Sciences (2004-present)

#### **MEMBERSHIPS:**

Society for Neuroscience

Corporation of the Marine Biological Laboratory

Cognitive Neuroscience Society

National Academy of Sciences

Institute of Medicine (now National Academy of Medicine)

American Academy of Arts and Sciences

#### **OTHER PROFESSIONAL ACTIVITIES:**

Course master for Neural Sciences Course, Washington University School of Medicine (1978-

1984)

Program Committee, Society for Neuroscience (1978-1981)

Neurological Sciences Study Section, NIH (1981-1985)

Chairman, Task Force on the Annual Meeting, Society for Neuroscience (1982)

Chairman, Publications Committee, Society for Neuroscience (1984-1987)

Vice-President, St. Louis Chapter, Physicians for Social Responsibility (1985-1986)

Nominating Committee for the Dana Foundation Awards (1992-1995)

Howard Hughes Medical Institute, Postdoctoral Research Fellowships for Physicians External

Review Panel (1992-1994)

Member at Large, Class Membership Committee, National Academy of Sciences (1992)

Board of Directors, Ruth K. Broad Biomedical Research Foundation (1992-2002)

International Scientific Advisory Board for the Basic Research Institute of the Max-Planck-

Institut für Psychiatrie in Martinsried (1994-2000)

Dana Alliance (1994-present)

Committee on the History of Neuroscience, Society for Neuroscience (1995-1998)

Morehouse School of Medicine Neuroscience Institute External Advisory Committee (1995-

present)

Liaison for Neuroscience Section, National Academy of Sciences (1997-1999)

Trustee, Grass Foundation (1998-2001)

Liaison to the National Research Council, National Academy of Science (1999-2002)

City of Medicine Awards Committee (1999-2005)

Perl Neuroscience Prize Selection Committee (2000-2004)

NASA, The Universities Space Research Association's Division of Space Life Sciences Committee (2003-2005)

Grass Foundation Lecture Selection Committee (2003-2006)

Committee on the History of Neuroscience, Society for Neuroscience (2005-2006)

Chair, Wellcome Trust Neurosciences and Mental Health Strategy Committee (2005-2007)

Cozarelli Prize Committee (2009, 2014)

### **STATEMENT OF RESEARCH INTERESTS:**

Current research in the Purves laboratory concerns visual and auditory perception and the neurobiological underpinnings of perceptual phenomena. Ongoing investigations in vision include understanding the perception of lightness, brightness, color, orientation, motion, and depth; the interest in audition concerns understanding music in biological terms, based on the similarity of musical tones and voiced speech. The unifying theme of these projects is the hypothesis that perceptions are generated according to a wholly empirical strategy that presents in consciousness (or in unconscious behavior) the empirical rank of stimuli rather than stimulus features, or the properties of objects in the world. This theory and its implications for brain structure and function is being explored by examining the responses of human subjects, the statistical relation of stimuli and their sources in natural image and sound databases, and the properties of artificial neural networks evolved in simulated environments.

### **PUBLICATIONS:**

#### **Original articles**

1. Nicholls JG, Purves D (1970) Monosynaptic chemical and electrical connections between sensory and motor cells in the central nervous system of the leech. *J Physiol* 209: 647-667.
2. Nicholls JG, Purves D (1972) A comparison of chemical and electrical synaptic transmission between single sensory cells and a motoneurone in the central nervous system of the leech. *J Physiol* 225: 637-656.
3. Purves D, McMahan UJ (1973) The distribution of synapses on a physiologically identified motor neuron in the central nervous system of the leech: an electron microscope study after injection of the fluorescent dye Procion yellow. *J Cell Biol* 55: 205-220.
4. Purves D, Sakmann B (1974) The effect of contractile activity on fibrillation and extrajunctional acetylcholine-sensitivity in rat muscle maintained in organ culture. *J Physiol* 237: 157-182.

5. Purves D, Sakmann B (1974) Membrane properties underlying spontaneous activity of denervated muscle fibres. *J Physiol* 239: 125-153.
6. Purves D (1975) Functional and structural changes in mammalian sympathetic neurones following interruption of their axons. *J Physiol* 252: 429-463.
7. Purves D (1975) Persistent innervation of mammalian sympathetic neurones by native and foreign fibres. *Nature* 256: 589-590.
8. McMahan UJ, Purves D (1976) Visual identification of two kinds of nerve cells and their synaptic contacts in a living autonomic ganglion of the mudpuppy (*Necturus*). *J Physiol* 254: 405-425.
9. Purves D (1976) Functional and structural changes in mammalian sympathetic neurones following colchicine application to postganglionic nerves. *J Physiol* 259: 159-175.
10. Purves D, Njå A (1976) Effect of nerve growth factor on synaptic depression after axotomy. *Nature* 260: 535-536.
11. Purves D (1976) Competitive and non-competitive re-innervation of mammalian sympathetic neurones by native and foreign fibres. *J Physiol* 261: 453-475.
12. Njå A, Purves D (1977) Specific innervation of guinea-pig superior cervical ganglion cells by preganglionic fibres arising from different levels of the spinal cord. *J Physiol* 264: 565-583.
13. Njå A, Purves D (1977) Re-innervation of guinea-pig superior cervical ganglion cells by preganglionic fibres arising from different levels of the spinal cord. *J Physiol* 272: 633-651.
14. Njå A, Purves D (1978) The effects of nerve growth factor and its antiserum on synapses in the superior cervical ganglion of the guinea-pig. *J Physiol* 277: 53-75.
15. Njå A, Purves D (1978) Specificity of initial synaptic contacts made on guinea-pig superior cervical ganglion cells during regeneration of the cervical sympathetic trunk. *J Physiol* 281: 45-62.
16. Lichtman JW, Purves D, Yip JW (1979) On the purpose of selective innervation of guinea-pig superior cervical ganglion cells. *J Physiol* 292: 69-84.
17. Purves D, Thompson W (1979) The effects of postganglionic axotomy on

selective synaptic connections in the superior cervical ganglion of the guinea pig. *J Physiol* 297: 95-110.

18. Lichtman JW, Purves D, Yip JW (1980) Innervation of sympathetic neurones in the guinea-pig thoracic chain. *J Physiol* 298: 285-299.

19. Lichtman JW, Purves D (1980) The elimination of redundant preganglionic innervation to hamster sympathetic ganglion cells in early post-natal life. *J Physiol* 301: 213-228.

20. Rubin E, Purves D (1980) Segmental organization of sympathetic preganglionic neurons in the mammalian spinal cord. *J Comp Neurol* 192: 163-174.

21. Purves D, Thompson W, Yip JW (1981) Re-innervation of ganglia transplanted to the neck from different levels of the guinea-pig sympathetic chain. *J Physiol* 313: 49-63.

22. Purves D, Hume RI (1981) The relation of postsynaptic geometry to the number of presynaptic axons that innervate autonomic ganglion cells. *J Neurosci* 1: 441-452.

23. Johnson DA, Purves D (1981) Post-natal reduction of neural unit size in the rabbit ciliary ganglion. *J Physiol* 318: 143-159.

24. Hume RI, Purves D (1981) Geometry of neonatal neurones and the regulation of synapse elimination. *Nature* 293: 469-471.

25. Purves D, Wigston DJ (1983) Neural units in the superior cervical ganglion of the guinea pig. *J Physiol* 334: 169-178.

26. Hume RI, Purves D (1983) Apportionment of the terminals from single preganglionic axons to target neurones in the rabbit ciliary ganglion. *J Physiol* 338: 259-275.

27. Johnson DA, Purves D (1983) Tonic and reflex synaptic activity recorded in ciliary ganglion cells of anaesthetized rabbits. *J Physiol* 339: 599-613.

28. Forehand CJ, Purves D (1984) Regional innervation of rabbit ciliary ganglion cells by the terminals of preganglionic axons. *J Neurosci* 4: 1-12.

29. Purves D, Hadley RD (1985) Changes in the dendritic branching of adult mammalian neurones revealed by repeated imaging in situ. *Nature* 315: 404-406.

30. Purves D, Lichtman JW (1985) Geometrical differences among homologous neurons in mammals. *Science* 228: 298-302.

31. Purves D, Rubin E, Snider WD, Lichtman JW (1986) Relation of animal size to convergence, divergence and neuronal number in peripheral sympathetic pathways. *J Neurosci* 6: 158-163.



32. Purves D, Hadley RD, Voyvodic J (1986) Dynamic changes in the dendritic geometry of individual neurons visualized over periods of up to three months in the superior cervical ganglion of living mice. *J Neurosci* 6: 1051-1060.
33. Purves D, Lichtman JW (1987) Synaptic sites on reinnervation nerve cells visualized at two different times in living mice. *J Neurosci* 7: 1492-1497.
34. Magrassi L, Purves D, Lichtman JW (1987) Fluorescent probes that stain living nerve terminals. *J Neurosci* 7: 1207-1214.
35. Lichtman JW, Magrassi L, Purves D (1987) Visualization of neuromuscular junctions over periods of several months in living mice. *J Neurosci* 7: 1215-1222.
36. Purves D, Voyvodic JT, Magrassi L, Yawo H (1987) Nerve terminal remodeling visualized in living mice by repeated examination of the same neuron. *Science* 238:1122-1126.
37. Pomeroy SL, Purves D (1988) Neuron/glia relationships observed over intervals of several months in living mice. *J Cell Biol* 107: 1167-1175.
38. Purves D, Snider WD, Voyvodic JT (1988) Trophic regulation of nerve cell morphology and innervation in the autonomic nervous system. *Nature* 336: 123-128.
39. Harris L, Purves D (1989) Rapid remodeling of sensory endings in the corneas of living mice. *J Neurosci* 6: 2210-2214.
40. Ivanov A, Purves D (1989) Ongoing electrical activity of superior cervical ganglion cells in mammals of different sizes. *J Comp Neurol* 284: 398-404.
41. LaMantia A-S, Purves D (1989) Development of glomerular pattern visualized in the olfactory bulbs of living mice. *Nature* 341: 646-649.
42. Pomeroy SL, LaMantia A-S, Purves D (1990) Postnatal construction of neural circuitry in the mouse olfactory bulb. *J Neurosci* 10: 1952-1966.
43. Purves D, LaMantia A-S (1990) Number of "blobs" in the primary visual cortex of neonatal and adult monkeys. *Proc Natl Acad Sci* 87: 5764-5767.
44. Zheng D, LaMantia A-S, Purves D (1991) Specialized vascularization of the primate visual cortex. *J Neurosci* 11: 2622-2629.
45. LaMantia A-S, Pomeroy S, Purves D (1992) Vital imaging of glomeruli in the mouse olfactory bulb. *J Neurosci* 12: 976-988.
46. Riddle D, Richards A, Zsuppan F, Purves D (1992) Growth of the rat somatic sensory cortex and its constituent parts during postnatal development. *J Neurosci* 12: 3509-3524.

47. Purves D, LaMantia A (1993) Development of blobs in the visual cortex of macaques. *JComp Neurol* 334: 169-175.
48. Riddle DR, Gutierrez G, Zheng D, White LE, Richards A, Purves D (1993) Differential metabolic and electrical activity in the somatic sensory cortex of juvenile and adult rats. *J Neurosci* 13: 4193-4213.
49. White L, Lucas G, Richards A, Purves D (1994) Cerebral asymmetry and handedness. *Nature* 368: 197-198.
50. Purves D, White LE, Andrews T (1994) Manual asymmetry and handedness. *Proc Natl Acad Sci* 91: 5030-5032.
51. Purves D, White LE (1994) Monocular preferences in binocular viewing. *Proc Natl Acad Sci* 91: 8339-8342.
52. Zheng D, Purves D (1995) Effects of increased neural activity on brain growth. *Proc Natl Acad Sci* 92: 1802-1806.
53. Riddle DR, Purves D (1995) Individual variation and lateral asymmetry of the rat primary somatosensory cortex. *J Neurosci* 15: 4184-4195.
54. Andrews TJ, White LE, Binder D, Purves D (1996) Temporal events in cyclopean vision. *Proc Natl Acad Sci* 93: 3689-3692.
55. Purves D, Paydarfar JA, Andrews TJ (1996) The wagon wheel illusion in movies and reality. *Proc Natl Acad Sci* 93: 3693-3697.
56. Coppola D, Purves D (1996) The extraordinarily rapid disappearance of entoptic images. *Proc Natl Acad Sci* 93: 8001-8004.
57. Purves D, White LE, Riddle DR (1996) Is neural development Darwinian? *TINS* 19 (11): 460-464.
58. White LE, Andrews TJ, Hulette C, Richards A, Groelle M, Paydarfar J, Purves D (1997) Structure of the human sensorimotor system I. Morphology and cytoarchitecture of the central sulcus. *Cereb Cortex* 7: 18-30.
59. White LE, Andrews TJ, Hulette C, Richards A, Groelle M, Paydarfar J, Purves D (1997) Structure of the Human Sensorimotor System II. Lateral symmetry. *Cereb Cortex* 7:31-47.
60. Andrews TJ, Halpern SD, Purves D (1997) Correlated size variations in human visual cortex, lateral geniculate nucleus and optic tract. *J Neurosci* 17: 2859-2868.
61. Purves D, Andrews TJ (1997) The perception of transparent 3-dimensional objects. *Proc Natl Acad Sci* 94: 6517-6522.
62. Andrews TJ, Purves, D (1997) Similarities in normal and binocularly rivalrous viewing. *Proc Natl Acad Sci* 94: 9905-9908.

63. Coppola DM, White LE, Fitzpatrick D, Purves D (1998) Unequal representation of cardinal and oblique contours in ferret visual cortex. *Proc Natl Acad Sci* 95(5): 2621-2623.
64. Coppola DM, Purves HR, McCoy AN, Purves D (1998) The distribution of oriented contours in the real world. *Proc Natl Acad Sci* 95(7): 4002-4006.
65. Williams, SM, McCoy AN, Purves D (1998) The influence of depicted illumination on perceived brightness. *Proc Natl Acad Sci* 95(22): 13296-13300.
66. Williams, SM, McCoy AN, Purves D (1998) An empirical explanation of brightness. *Proc Natl Acad Sci* 95(22): 13301-13306.
67. Lotto RB, Williams SM, Purves D (1999) An empirical basis for Mach bands. *Proc Natl Acad Sci* 96(9): 5239-5244.
68. Lotto RB, Williams SM, Purves D (1999) Mach bands as empirically derived associations. *Proc Natl Acad Sci* 96(9): 5245-5250.
69. Purves D, Shimpi A, Lotto RB (1999) An empirical explanation of the Cornsweet effect. *J Neurosci* 19(19): 8542-8551.
70. Lotto, RB, Purves D (1999) The effects of color on brightness. *Nature Neurosci* 2: 1010-1014.
71. Halpern, SD, Andrews TJ, Purves D (1999) Interindividual variation in human visual performance. *J Cog Neurosci* 11(5): 521-534.
72. Purves D, Lotto B, Polger T (2000) Color vision and the four-color-map problem. *J Cog Neurosci* 12(2): 233-237.
73. Nundy S, Lotto B, Coppola D, Shimpi A, Purves D. (2000) Why are angles misperceived? *Proc Natl Acad Sci*. 97(10): 5592-5597.
74. Lotto, RB, Purves D (2000). An empirical explanation of color contrast. *Proc Natl Acad Sci* 97(23): 12834-12839.
75. Lotto RB, Purves D (2001) An empirical explanation of the Chubb illusion. *J Cog Neurosci* 13(5): 547-555.
76. Yang Z, Shimpi A, Purves D (2001) A wholly empirical explanation of perceived motion. *Proc Natl Acad Sci* 98(9): 5252-5257.
77. Howe CQ, Purves D (2002) Range image statistics can explain the anomalous perception of length. *Proc Natl Acad Sci* 99(20): 13184-13188.
78. Lotto RB, Purves D (2002) The empirical basis of color perception. *Consciousness and Cognition* 11(4): 609-629.

79. Nundy S, Purves D (2002) A probabilistic explanation of brightness scaling. *Proc Natl Acad Sci* 99(22): 14482-14487.
80. Yang Z, Shimpi A, Purves D (2002) Perception of objects that are translating and rotating. *Perception* 31(8): 925-942.
81. Yang Z, Purves D (2003) A statistical explanation of visual space. *Nature Neurosci* 6:632 - 640.
82. Schwartz D, Howe CQ, Purves D (2003) The statistical structure of human speech sounds predicts musical universals. *J Neurosci* 23(18): 7160-7168.
83. Long F, Purves D (2003) Natural scene statistics as the universal basis for color context effects. *Proc Natl Acad Sci* 100 (25): 15190-15193.10
84. Yang Z, Purves D (2003) Image/source statistics of surfaces in natural scenes. *Network: Computation in Neural Systems* 14: 371-390.
85. Howe CQ, Purves D (2004) Size contrast and assimilation explained by the statistics of natural scene geometry. *J Cog Neurosci* 16(1): 90-102.
86. Yang Z, Purves D (2004) The statistical structure of natural light patterns determines perceived light intensity. *Proc Natl Acad Sci* 101(23): 8745-8750.
87. Schwartz D, Purves D (2004) Pitch is determined by naturally occurring periodic sounds. *Hearing Research* 194: 31-46.
88. Howe CQ, Purves D (2005) Natural scene geometry predicts the perception of angles and line orientation. *Proc Natl Acad Sci* 102(4): 1228-1233.
89. Howe CQ, Purves D (2005) The Müller-Lyer illusion explained by the statistics of imagesource relationships. *Proc Natl Acad Sci* 102(4): 1234-1239.
90. Howe CQ, Yang Z, Purves D (2005) The Poggendorff illusion explained by natural scene geometry. *Proc Natl Acad Sci* 102(21): 7707-7712.
91. Long F, Yang Z, Purves D (2006) Spectral statistics in natural scene predict hue, saturation, and brightness. *Proc Natl Acad Sci* 103(15): 6013-6018.
92. Howe CQ, Lotto RB, Purves D (2006) Comparison of Bayesian and empirical ranking approaches to visual perception. *J Theor Biol* 241: 866-875.
93. Boots B, Nundy S, Purves D (2007) Evolution of visually-guided behavior in artificial agents. *Network: Computation in Neural Systems* 18 (1): 11-34.
94. Ross D, Choi J, Purves D (2007) Musical intervals in speech. *Proc Natl Acad Sci* 104(23): 9852-9857.
95. Wojtach WT, Sung K, Truong S, Purves D (2008) An empirical explanation of

- the flashlag effect. *Proc Natl Acad Sci*, 105(42): 16338-16343.
96. Sung K, Wojtach WT, Purves D (2009) An empirical explanation of aperture effects *Proc Natl Acad Sci*, 106 (1): 298-303.
  97. Wojtach WT, Sung K, Purves D (2009) An Empirical Explanation of the Speed-Distance Effect. *PLoS ONE* 4(8): e6771 doi:10.1371/journal.pone.0006771
  98. Gill, KZ and Purves D (2009) A biological rationale for musical scales. *PLoS ONE* 4: e8144. doi:10.1371/journal.pone.0008144.
  99. Bowling, D L, Gill K, et al. (2010) Major and minor music compared to excited and subdued speech. *J Acoust Soc Am* 127 (1): 491-503.11
  100. Purves D, Wojtach WT, Lotto RB (2011) Understanding vision in wholly empirical terms. *Proc Natl Acad Sci*, 108 (3): 15588-15595.
  101. Shui' er Han, Janani Sundararajan, Daniel Liu Bowling, Jessica Lake, Dale Purves (2011) Co-Variation of Tonality in the Music and Speech of Different Cultures. *PLoS ONE* 6(5) e20160 doi:10.1371/journal.pone.0020160
  102. Bowling DL, Sundararajan J, Han S, Purves, D (2012) Expression of emotion in Eastern and Western music mirrors vocalization. *PLoS ONE* 7(3):e31942. doi:10.1371/journal.pone.0031942
  103. Monson BB, Han S, Purves D (2013) Are Auditory Percepts Determined by Experience? *PLoS ONE* 8(5): e63728. doi:10.1371/journal.pone.0063728
  104. Ng C, Sundararajan J, Hogan M, Purves D (2013) Network Connections That Evolve to Circumvent the Inverse Optics Problem. *PLoS ONE* 8(3): e60490. 1. doi:10.1371/journal.pone.0060490
  105. Purves D, Monson BB, Sundararajan J, Wojtach WT (2014). How biological vision succeeds in the physical world. *Proceedings of the National Academy of Sciences* 111: 4750-4755
  106. Morgenstern Y, Rostami M, and Purves D (2014) Properties of artificial networks evolved to contend with natural spectra. *PNAS* 2014 111 (Supplement 3) 10868-10872.
  107. Morgenstern Y, Rukmini DV, Purves D (2014) Properties of artificial neurons that report lightness based on accumulated experience with luminance. *Front Comput Neurosci* 8:134. doi: 10.3389/fncom.2014.00134
  108. Purves D, Morgenstern Y and Wojtach WT (2015) Will understanding vision require a wholly empirical paradigm? *Front. Psychol.* 6:1072. doi: 10.3389/fpsyg.2015.01072
  109. Bowling DL, Purves D (2015) A biological rationale for musical consonance.

### **Supervised Papers by Students in the Lab**

1. Lichtman JW (1977) The reorganization of synaptic connexions in the rat submandibular ganglion during post-natal development. *J Physiol* 273: 155-177.
2. Lichtman JW (1980) On the predominantly single innervation of submandibular ganglion cells in the rat. *J Physiol* 302: 121-130.
3. Wigston DJ (1981) Innervation of individual guinea-pig superior cervical ganglion cells by axons with similar conduction velocities. *J Physiol* 334: 178-187.
4. Wigston DJ, Sanes JR (1982) Selective reinnervation of adult mammalian muscle by axons from different segmental levels. *Nature* 299: 464-467.12
5. Wigston DJ (1983) Maintenance of cholinergic neurones and synapses in the ciliary ganglion of aged rats. *J Physiol* 344: 223-231.
6. Jackson PC (1983) Reduced activity during development delays the normal rearrangement of synapses in the rabbit ciliary ganglion. *J Physiol* 345: 319-327.
7. Rubin E (1985) Development of the rat superior cervical ganglion: ganglion cell maturation. *J Neurosci* 5: 673-684.
8. Rubin E (1985) Development of the rat superior cervical ganglion: ingrowth of preganglionic axons. *J Neurosci* 5: 685-696.
9. Rubin E (1985) Development of the rat superior cervical ganglion: initial stages of synapse formation. *J Neurosci* 5: 697-704.
10. Snider WD (1986) Rostro-caudal differences in the development of rat sympathetic chain ganglia. *J Comp Neurol* 244: 245-253.
11. Forehand CJ (1985) Density of somatic innervation on mammalian autonomic ganglion cells is inversely related to dendritic complexity and preganglionic convergence. *J Neurosci* 5: 3403-3408.
12. Jackson PC (1986) Innervation of the iris by individual parasympathetic axons in the adult mouse. *J Physiol* 378: 485-495.
13. Snider WD (1986) Rostrocaudal differences in dendritic growth and synaptogenesis in rat sympathetic chain ganglia. *J Comp Neurol* 244: 245-253.
14. Snider WD (1987) The dendritic complexity and innervation of submandibular neurons in five species of mammals. *J Neurosci* 7: 1760-1768.
15. Voyvodic J (1987) Development and regulation of dendrites in the rat

superior cervical ganglion. J Neurosci 7: 904-912.

16. Forehand C (1987) Ultrastructural analysis of the distribution of synaptic boutons from labeled preganglionic axons on rabbit ciliary neurons. J Neurosci 7: 3274-3281.

17. Yawo H (1987) Changes in the dendritic geometry of mouse superior cervical ganglion cells following postganglionic axotomy. J Neurosci 7: 3703-3711.

18. Johnson DA (1988) Regulation of intraganglionic synapses among rabbit parasympathetic neurones. J Physiol 397: 51-62.

19. Snider WD (1988) Nerve growth factor promotes dendritic arborization of sympathetic ganglion cells in developing mammals. J Neurosci 8: 2628-2634.

20. Voyvodic JT (1989) Target size regulates calibre and myelination of sympathetic axons. Nature 342: 430-433.

21. Voyvodic JT (1989) Peripheral target regulation of dendritic geometry in the rat superior cervical ganglion. J Neurosci 9: 1997-2010.

22. Hadley RD (1990) Innervation and geometry of rabbit ciliary ganglion cells after preganglionic nerve regeneration. J Comp Neurol 295: 268-276.

23. LaMantia A-S (1991) The regulation of neuronal morphology and innervation in developing and adult animals: Anatomical, physiological and in vivo observations. NATO Advanced Study Institute Proceedings, Systems Approaches to Developmental Neurobiology, (Raymond P, Easter S, eds), pp. 99-111. New York: Plenum Press.

24. Andrews TJ, McCoy AN (1997) Illusory motion prevents tracking real motion. Perception 26: 269-275.

25. Andrews TJ, Coppola DM (1999) Idiosyncratic characteristics of saccadic eye movements when viewing different visual environments. Vision Research 39: 2947-2953.

## **Reviews**

1. Roper S, Purves D, McMahan UJ (1976) Synaptic organization and acetylcholine sensitivity of multiply innervated autonomic ganglion cells. Cold Spring Harbor Symposium on Quantitative Biology, 40: 283-295.

2. Purves D, Lichtman JW (1978) Formation and maintenance of synaptic connections in autonomic ganglia. Physiol Rev 58: 821-862.

3. Purves D, Lichtman JW (1980) Elimination of synapses in the developing nervous system. Science 210: 153-157.

4. Purves D, Lichtman JW (1983) Specific connections between nerve cells. Ann Rev Physiol 45: 553-565.

5. Purves D (1983) Modulation of neuronal competition by postsynaptic geometry in autonomic ganglia. *Trends in Neurosci* 6: 10-16.
6. Easter SS, Purves D, Rakic P, Spitzer NC (1985) The changing view of neural specificity. *Science* 230: 507-511.
7. Purves D (1986) The trophic theory of neural connections. *Trends in Neurosci* 9: 486- 489.
8. Purves D, Voyvodic JT (1987) Imaging mammalian nerve cells and their connections over time in living animals. *Trends in Neurosci* 10: 398-404.
9. Purves D (1990) Assessing some dynamic properties of the living nervous system. "School of Bernard Katz" Symposium. *Quart J Exp Physiol* 74: 1089-1105.14
10. Purves D (1990) Neural architecture visualized over time in living animals. FIDIA Research Foundation, Neuroscience Award Lectures, Vol. 4, pp. 203-225. Raven Press, Ltd., New York.
11. Purves D, LaMantia A-S (1990) Construction of modular circuits in the mammalian brain. *Cold Spring Harbor Symposia on Quantitative Biology* LV: 445-452.
12. Purves D, Riddle D, LaMantia A (1992) Iterated patterns of brain circuitry (or how the cortex gets its spots). *Trends in Neurosci* 15: 362-368.
13. Purves D, Riddle D, White L, Gutierrez G (1994) Neural activity and the development of the somatic sensory system. *Curr Opin Neurobiol* 4: 120-123.
14. Purves D, White LE, Riddle DR (1996) Is neural development Darwinian? *Trends Neurosci* 19:460-464.
15. Purves D, Lotto RB, Williams SM, Nundy S, Yang, Z (2001) Why we see things the way we do: Evidence for a wholly empirical strategy of vision. *Philos Trans R Soc Lond B*, 356:285-297.
16. Lotto RB, Purves D (2002) A rationale for the structure of color space. *Trends Neurosci* 25(2): 84-89.
17. Purves D, Lotto RB, Nundy S (2002) Why we see what we do. *American Scientist* 90(3): 236-243.
18. Purves D, Lotto RB (2003) Why we see what we do: An empirical theory of vision. *Optician* 225: 22-26.
19. Purves D, Williams MS, Nundy S, Lotto RB (2004) Perceiving the intensity of light. *Psychological Rev.* 111(1): 142-158.
20. Lotto RB, Purves D (2004) Perceiving colour. *Rev Prog Coloration* 34: 12-25.



21. Andrew TJ, Purves D (2005) The wagon wheel illusion in continuous light. *Trends Cog Neurosci* 9(6): 261-263.
22. Purves D, Lotto RB (2004) The Cornsweet effect. In: *Encyclopedia of Neuroscience*, 3<sup>rd</sup> edition. G. Adelman and B.H. Smith, eds. New York:Elsevier.
23. Purves D (2008) Vision and natural images. In: *Encyclopedia of Neuroscience*. (M.D.Binder, N.Hirokawa, U.Windhorst, M.C. Hirsch, eds) New York: Springer-Verlag
24. Purves D (2009) Perception of surfaces and forms. *Encyclopedia of Neuroscience* (L.R.Squire, Editor). Oxford: Academic Press, pp.513-521.
25. Purves D (2010) Visual Perception. In: *Handbook of Neuroscience for the Behavioral Sciences*. (Gary G. Berntson, John R. Cacioppo, eds). v.1, unit III, Chapter II. New York: John Wiley and Sons, pp. 224-250.15

### **Chapters in Books**

1. Purves D, McMahan UJ (1973) Procion yellow as a marker for electron microscopic examination of functionally identified nerve cells. In: *Intracellular Staining in Neurobiology*, (Kater SB, Nicholson C, eds), pp. 71-82. New York: Springer-Verlag.
2. Purves D (1976) Long-term regulation in the vertebrate peripheral nervous system. In: *International Review of Physiology, Neurophysiology II*. Vol. 10 (Porter R, ed), pp. 125-177. Baltimore: University Park Press.
3. Purves D (1977) The formation and maintenance of synaptic connections. In: *The Function and Formation of Neural Systems*, (Stent GS, ed), pp. 21-49. Berlin: Dahlem Konferenzen.
4. Purves D, Njå A (1978) Trophic maintenance of synaptic connections in autonomic ganglia. In: *Neuronal Plasticity*, (Cotman C, ed), pp. 27-47. New York: Raven Press.
5. Purves D, Njå A, Lichtman JW, Yip, JW Thompson W (1980) Selective innervation of mammalian sympathetic ganglion cells. In: *Scripta Varia*, (Levi-Montalcini R, ed), pp. 517-532. Vatican Academy of Sciences.
6. Purves D, Lichtman JW (1980) The elimination of some synaptic connections in autonomic ganglia during early postnatal life. In: *Ontogenesis and Functional Mechanisms of Peripheral Synapses*, (Taxi J, ed), pp. 15-26. Amsterdam: Elsevier.
7. Lichtman JW, Purves D (1981) Regulation of the number of axons that innervate target cells. In: *Development of the Nervous System*, British Society for Developmental Biology, Symposium 5, (Garrod DR, Feldman JD, eds), pp. 233-243. Cambridge, UK: Cambridge University Press.

8. Purves D, Johnson DA, Hume RI (1981) Regulation of synaptic connections in the rabbit ciliary ganglion. In: Development of the Autonomic Nervous System, pp. 232-251. CIBA Foundation Symposium No. 83.
9. Purves D (1981) Selective formation of synapses in the peripheral nervous system and chemoaffinity hypothesis of neural specificity. In: Studies in Developmental Neurobiology, (Cowan WM, ed), pp. 231-242. New York: Oxford University Press.
10. Purves D (1982) Guidance of axons during development and after nerve injury. In: Repair and Regeneration in the Nervous System, Dahlem Konferenzen (Nicholls JG, ed), pp. 107-125. New York: Springer-Verlag.
11. Purves D, Forehand CJ (1984) Competitive apportionment of innervation to individual rabbit ciliary neurons and its significance for the innervation of other classes of target cells. In: 6th Taniguchi Symposium, pp. 119-133. Tokyo, Japan: Japan Scientific Societies Press. 16
12. Purves D, Voyvodic JT, Harris L, Pomeroy SL (1990) Dynamic aspects of innervation in the peripheral nervous system of adult mammals. In: Signal and Sense: Local and Global Order in Perceptual Maps, (Edelman M, Gall WE, Cowan WM, eds), pp. 589-605. New York: John Wiley and Sons, Inc.
13. Purves D, Riddle D, White L, Gutierrez-Ospina G, LaMantia A-S (1994) Categories of cortical structure. In: Progress in Brain Research: The Self-Organizing Brain: From Growth Cones to Functional Networks, Volume 102, (Van Pelt J, Corner MA, Uylings HBM, Lopes Da Silva FH, eds). Amsterdam: Elsevier, Chapter 23, pp. 343-355.
14. Purves D, White LE, Zheng D, Andrews T, Riddle D (1996) Brain size, behavior and the allocation of neural space. In: The Lifespan Development of Individuals: Behavioral, Neurobiological, and Psychosocial Perspectives, (Magnusson D, ed). Cambridge, UK: Cambridge University Press. Chapter 8, pp. 162-178.
15. Purves D, Williams SM, Lotto RB (2000) The relevance of visual perception to cortical evolution and development. In: Evolutionary Developmental Biology of the Cerebral Cortex. Novartis Foundation Symposium. Chichester, UK and New York, USA: John Wiley & Sons, 228: 240-258.
16. Bowling D, Purves D (2012) A biological basis for musical tonality. In: Sensory Perception: Mind and Matter (Friedrich G. Bart, Patrizia Giampieri-Deutsch, Hans-Dieter Klein, eds), Springer Wien New York. Chapter 12, pp. 205 – 214.
17. Purves D, Wojtach, William T., Lotto, R Beau (2013) Why the Conventional Concept of “Visual Illusions” is Incorrect. In: Oxford Compendium of Visual Illusions. Oxford University Press. (In press)

## **Books**

1. Patterson PH, Purves D (editors) (1982) Readings in Developmental Neurobiology. Cold Spring Harbor: Cold Spring Harbor Laboratory Press.
2. Purves D, Lichtman JW (1985) Principles of Neural Development. Sunderland, MA: Sinauer Associates.
3. Purves D (1988) Body and Brain: A Trophic Theory of Neural Connections. Cambridge, MA: Harvard University Press.
4. Purves D (1994) Neural Activity and the Growth of the Brain. Cambridge, UK: Cambridge University Press.
5. Purves D, Augustine GA, Fitzpatrick D, Katz LC, LaMantia A-S, McNamara JO (1997) Neuroscience. Sunderland, MA: Sinauer Associates.
6. Purves D, Augustine GA, Fitzpatrick D, Katz LC, LaMantia A-S, McNamara JO (2001) Neuroscience, 2nd edition. Sunderland, MA: Sinauer Associates.17
7. Purves D, Lotto RB (2003) Why We See What We Do: An Empirical Theory of Vision. Sunderland, MA: Sinauer Associates.
8. Purves D, Augustine GA, Fitzpatrick D, Hall W, LaMantia A-S, McNamara JO, Williams SM (2004) Neuroscience, 3rd edition. Sunderland, MA: Sinauer Associates.
9. Purves D, Howe CQ (2005) Perceiving Geometry: Geometrical Illusions Explained by Natural Scene Statistics. New York, NY: Springer.
10. Purves D, Augustine GA, Fitzpatrick D, Hall W, LaMantia A-S, McNamara JO, Williams SM (2008) Neuroscience, 4rd edition. Sunderland, MA: Sinauer Associates.
11. Purves D, Brannon EM, Cabeza R, Huettel, SA, LaBar KS, Platt ML, Woldorff M (2008) Principles of Cognitive Neuroscience. Sunderland, MA: Sinauer Associates.
12. Purves D. (2010) Brains: How They Seem to Work. New York: Pearson / Financial Times Press.
13. Purves D, Lotto RB (2011) Why We See What We Do Redux. Sunderland, MA: Sinauer Associates.
14. Purves D, Augustine GA, Fitzpatrick D, Hall W, LaMantia A-S, McNamara JO, Williams SM (2011) Neuroscience, 5th edition. Sunderland, MA: Sinauer Associates.
15. Purves D, Cabeza R, Huettel SA, LaBar KS, Platt ML, and Woldorff M (2012) Principles of Cognitive Neuroscience 2nd edition. Sunderland, MA: Sinauer Associates.

## **Book Reviews**

1. Purves D (1988) A new theory of brain function (Review of G. Edelman's book, Neural Darwinism). Quart. Rev. Biol. 63: 202-204.
2. Purves D (1988) Struggles and discovery. (Review of R. Levi-Montalcini's autobiography) Science 241: 1366.
3. Purves D (1991) Molecules and the mind. (Review of I. Black's book, Information in the Brain) Science 253: 572.
4. Purves D (1992) Consciousness Redux. (Review of D. Dennett's book, Consciousness Explained) Science 257: 1291-1292.
5. Purves D (1993) Brain or Mind? A Review of Allen Newell's Unified Theories of Cognition. Artificial Intell 59: 371-373.
6. Purves D, White LE (1997) Lateral thinking. (Review of journal Laterality). Nature 389: 142-143.18
7. Purves D (1998) A vision of history. (Review of C.G. Gross' book, Brain, Vision and Memory: Tales of the History of Neuroscience). Nature Neuroscience 1(3) July 1998:181.
8. Purves D (1999) Something sensible on brain and mind (Review of Brain and Mind: Evolutionary Perspectives) Trends Neurosci 22: 370.
9. Purves D (2000) Review of S. Edelman's Representation and Recognition in Vision. Trends Neurosci 23: 42-43.
10. Purves D (2009) Review of J. S. Luck and A. Hollingworth's Visual Memory, The Quarterly Review of Biology 84 (2): 198.
11. Purves D (2015) Review of The Measure of Madness: Philosophy of Mind, Cognitive Neuroscience, and Delusional Thought, The Quarterly Review of Biology 90 (4): 441.

## **Commentaries/Letters**

1. Purves D (1980) Neuronal competition. Nature 287: 585-586.
2. Lichtman JW, Purves D (1983) Activity-mediated neural change. Nature 301: 563-564.
3. Purves D (1987) Seeing neuronal connections over time in living animals. IBRO News, Summer, Vol. 15, No. 1.
4. Purves D, Sanes JR (1987) The 1986 Nobel Prize in Physiology or Medicine. Trends in Neurosci 10: 231-235.
5. Purves D (1990) In: Steve: Remembrances of Stephen W. Kuffler (compiled

and introduced by UJ McMahan) Sunderland, MA: Sinauer Associates, Inc., pp. 86.

6. Purves D (1995) Race plus IQ does not equal science. *Nature* 374: 10.

7. Purves D (1997) Two and a Half Cheers for Quartz and Sejnowski! *Behavioral and Brain Sciences* 20(4): 573.

8. Purves D (1999) Perception as probability. *Brain Res. Bull.* 50: 321.

### **Responses to Commentaries/Letters**

1. Purves D, Riddle D, LaMantia A (1993) Reply to Letters to the Editor from Francisco Aboitiz, Robert Hevner, and R.-B. Illing ("Iterated patterns of brain circuitry (or how the cortex gets its spots)" *TINS* 16: 180-181.

2. Purves D, White LE, Riddle D (1997) Response to a Letter to the Editor from Dr. Olaf Sporns ("Is neural development Darwinian?"). *TINS* 20: 293.

3. Purves D, White LE, Riddle D (1997) Response to a Letter to the Editor from Jean- Pierre Changeux. *TINS* 20: 293.19

4. Purves D, Lotto, B, Polger T (2000) Response to Letter to the Editor from Eric Schwartz and Michael Cohen ("Color vision and the four-color-map problem") *J. Cog. Neurosci.* 12:233-237.

5. Andrews TA, Purves D, et al (2005) The Wheels Keep Turning: Reply to Letter to Editor from Holcombe et al. *Trends in Cog Neurosci* 9(12).

### **Obituaries**

1. Purves, D. (2001) Obituary for Viktor Hamburger. *Nat Neurosci* 4(8): 777-778.

### **Miscellaneous**

1. Purves D (2003) Preface. *Modeling Neural Development*. Van Ooyen, Arjen, Ed. MIT Press. Cambridge, MA.

### **Online Articles**

1. Purves D, Wojtach W, Howe C (2008) Visual Illusions: An Empirical Explanation. *Scholarpedia* 3(6):3706

2. Purves D (2009) Neuroscience. *Scholarpedia* 4(8):7204.