William H. Warren

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Education

B.A. 1976 Hampshire College, Amherst, Mass: Psychology, Biology, and Philosophy
Ph.D. 1982 University of Connecticut, Storrs, CT: Experimental Psychology
"A biodynamic basis for perception and action in bipedal climbing"

Professional Appointments

1983	Post-doctoral fellow, Dept. of Psychology, University of Edinburgh, Scotland (David Lee, sponsor)
1982-88	Assistant Professor of Psychology, Brown University
1988-92	Associate Professor of Psychology and Cognitive and Linguistic Sciences, Brown University
1989	Fulbright Research Fellow, Dept. of Medical and Physiological Physics, Utrecht University, The Netherlands (Jan Koenderink, sponsor)
1992-	Professor of Cognitive and Linguistic Sciences, Brown University
1995-96	Visiting Professor, School of Optometry, University of California, Berkeley (Martin Banks, sponsor)
1998-	Director of the Virtual Environment Navigation Lab (VENLab)
2001-02	Visiting Professor, University of Paris, Orsay (Benoit Bardy, sponsor) and University of the Mediterranean, Marseille (Reinoud Bootsma, sponsor)
2002-10	Chairperson, Dept. of Cognitive and Linguistic Sciences, Brown University
2005-	Affiliated Faculty, Department of Philosophy, Brown University
2010-11	Visiting Professor, University of Paris, Orsay (Isabelle Siegler, sponsor)
2016	Sabbatical visitor, INRIA, University of Rennes (Julien Pettré, sponsor)

Honors and Awards

NSF Graduate Fellow, 1977-80
NIH National Research Service Award, 1983
Fulbright Research Scholar Award, 1989
Wriston Award for Curriculum Development, Brown University, 1992
W.L. Bryan Lecture in Cognitive Science, Indiana University, 1994
Faculty Colloquium, Brown University, 1995
Elizabeth Leduc Award for Teaching Excellence in the Life Sciences, Brown University, 1995
James J. Gibson Lecture, Cornell University, 1997
NIMH Research Career Development Award, 1997-2002
Professeur Invité, University of Paris, Orsay, 2001
Professeur Invité, University of Aix-Marseille, 2002
Fellow, Association for Psychological Science, 2005
Astor Visiting Lecturer, Oxford University, Jan. 2008 (two-week residency)
Pellechia Memorial Lecture, University of Connecticut, 2009
Distinguished Visitor, Hong Kong University, Jan. 2010 (two-week residency)
Chancellor's Professor, Brown University, 2010

Professeur Invité, University of Paris Orsay, 2011
Fellow, Society of Experimental Psychologists, 2012
President, International Society for Ecological Psychology, 2015-
Distinguished Scholar Lecturer, University of Alberta, Canada, 2017 (three lectures)
Foreign Expert, NYU-ECNU Joint Institute, Shanghai, China, 2018 (ten-day residency, two lectures)
VENLab team wins Hyundai Visionary Challenge, 2018
Distinguished Lecturer, Science of Intelligence Cluster of Excellence, Technical University of Berlin, 2019
Ken Nakayama Medal for Excellence in Vision Science, Vision Sciences Society, 2023 [link]
The Rank Prize Lecture, European Conference on Visual Perception, 2025

Affiliations

Vision Sciences Society
Psychonomic Society
Association for Psychological Science
International Society for Ecological Psychology

Research focus: Human perception and action

- Visual control of locomotion
- Collective behavior of human crowds
- Spatial navigation, path integration, and the geometry of spatial knowledge
- Dynamics of perceptual-motor behavior

Publications

(Symbols denote undergraduate student**, graduate student*, post-doctoral† trainee. The field convention is that the lead author is usually listed first and the senior author last.)

Books

1. **Warren, W.H.** & Shaw, R.E. (Eds.) (1985) *Persistence and change: Proceedings of the First International Conference on Event Perception.* Hillsdale, NJ: Erlbaum. Reviewed in *Contemporary Psychology* (1986), *31,* 100-101.
2. **Warren, W.H.** (Ed.) (1998) *Visually controlled locomotion and orientation.* Guest Editor, special double-issue of *Ecological Psychology, 10,* 157-346. Distributed separately by Erlbaum as a book.
3. Covarrubias, P., Jiménez, Á.A., & **Warren, W.H.** (Eds.) (2023) *Studies in perception and action XVI. Proceedings of the 21st International Conference on Perception and Action.* Creative Commons BY-NC-ND 4.0. http://commons.trincoll.edu/isep/history/past-icpa-isep-meetings-and-related-events/

Book Chapters

4. **Warren, W.H.**, Nicholas, D., & Trabasso, T. (1979) Event chains and inferences in understanding narratives. In R. Freedle (Ed.), *New directions in discourse processing.* Norwood, NJ: Ablex.
5. **Warren, W.H.** & Shaw, R.E. (1985) Events as units of analysis for ecological psychology. In Warren & Shaw (Eds.).
6. **Warren, W.H.** & Kelso, J.A.S. (1985) Report of the work group on perception and action. In Warren & Shaw (Eds.).
7. **Warren, W.H.** (1988a) Action modes and laws of control for the visual guidance of action. In O. Meijer & K. Roth (Eds.), *Movement behavior: The motor-action controversy.* Amsterdam: North Holland.
8. **Warren, W.H.** (1988b) Critical behavior in perception-action systems. In J.A.S. Kelso, A.J. Mandell, & M.E. Shlesinger, (Eds.) *Dynamic patterns in complex systems.* Singapore: World Scientific.

9. **Warren, W.H.** (1990) The perception-action coupling. In Bloch, H. & Bertenthal, B. (Eds.), *Sensory-motor organization and development in infancy and early childhood.* Dordrecht, The Netherlends: Kluwer Academic Publishers.
10. **Warren, W.H.** (1995) Self-motion: Visual perception and visual control. In W. Epstein & S. Rogers (Eds.), *Handbook of perception and cognition: Perception of space and motion.* Academic Press, p. 263-325.
11. **Warren, W.H.** (1995) Constructing an econiche. In J. Flach, P. Hancock, J. Caird, & K. Vicente (Eds.), *The ecology of human-machine systems.* Hilldsale, NJ: Erlbaum, p. 210-237.
12. Kay, B.A.† & **Warren, W.H.** (1998) A dynamical model of the coupling between posture and gait. In D.A. Rosenbaum & C. Collyer (Ed.), *Timing of behavior: Neural, computational, and psychological perspectives.* Cambridge, MA: MIT Press, p. 293-322.
13. Diedrich, F.J.* & **Warren, W.H.** (1998) Dynamics of human gait transitions. In D.A. Rosenbaum & C. Collyer (Ed.), *Timing of behavior: Neural, computational, and psychological perspectives.* Cambridge, MA: MIT Press, p. 323-343.
14. **Warren, W.H.** (1998a) The state of flow. In T. Wanatabe (Ed.), *High-level motion processing.* Cambridge, MA: MIT Press, p. 315-358.
15. **Warren, W.H.** (2004) Optic flow. In L. Chalupa & J. Werner (Eds.) *The Visual Neurosciences, v. II.* Cambridge, MA: MIT Press, 1247-1259.
16. **Warren, W.H.** (2005) Information, representation, and dynamics. In J.J. Reiser, J.J. Lockman, and C.A. Nelson (Eds.) *Action as an organizer of learning and development: The Minnesota Symposium on Child Psychology, v. 33.* Mahwah, NJ: Erlbaum, 123-136.
17. Israel, I. & **Warren, W.H.** (2005) Vestibular, proprioceptive, and visual influences on the perception of orientation and self-motion in humans. In S.I. Wiener & J.S. Taube (Eds.) *Head direction cells and the neural mechanisms of spatial orientation.* Cambridge, MA: MIT Press, 347-381.
18. **Warren, W.H.** (2007) Action-scaled information. In G.J. Pepping & M.L. Grealy (Eds.), *Closing the gap: The scientific writings of David N. Lee.* Mahwah, NJ: Erlbaum, 253-268.
19. **Warren, W.H.** & Fajen, B.R.† (2008) Behavioral dynamics of visually-guided locomotion. In A. Fuchs & V. Jirsa (Eds.), *Coordination: Neural, behavioral, and social dynamics.* Heidelberg: Springer, 45-75.
20. **Warren, W. H.** (2008) Optic flow. In A. I. Basbaum, A. Kaneko, G. M. Shepherd, & G. Westheimer (Eds.), *The senses - a comprehensive reference: Vision II* (Vol. 2, T.D. Albright & R. Masland, Eds.). Oxford, UK: Academic Press, 219-230.
21. **Warren, W.H.** (2010) Direct perception. In E.B. Goldstein (Ed.), *Encyclopedia of Perception* (Vol. 1). Los Angeles: Sage, 366-370.
22. Kiefer, A. W.†, Rhea, C. K.†, & **Warren, W. H.** (2013) VR-based assessment and rehabilitation of functional mobility. Invited chapter in F. Steinicke, Y. Visell, J. Campos, & A. Lécuyer (Eds.), *Human walking in virtual environments: Perception, technology and applications.* Heidelberg: Springer.
23. Bonneaud, S.† & **Warren, W.H.** (2014) An empirically-grounded emergent approach to modeling pedestrian behavior. In U. Weidmann, U. Kirsch, M. Schreckenberg (Eds.) *Pedestrian and Evacuation Dynamics 2012*, Springer International, p. 625-637.
24. Rio, K.* & **Warren, W.H.** (2014) A data-driven model of pedestrian following and emergent crowd behavior. In U. Weidmann, U. Kirsch, M. Schreckenberg (Eds.) *Pedestrian and Evacuation Dynamics 2012*, Springer International, p. 561-574.
25. Wright, G., Creem-Regehr, S.H., **Warren, W.H.**, Anson, E., Jeka, J., & Keshner, E.A. (2014) Sensorimotor recalibration in virtual environments. In T. Weiss, E.A. Keshner, & M. Levin (Eds.) *Virtual Reality Technologies for Health and Clinical Applications, Vol. X: Physical and Motor Rehabilitation* (P. Sharkey, Series Ed.). New York: Springer, p. 71-94.

26. Rio, K.* & **Warren, W.H.** (2016) Interpersonal coordination in biological systems: The emergence of collective locomotion. In P. Passos, J.Y. Chow, & K. Davids (Eds.) *Interpersonal coordination and performance in social systems.* Routledge, 3-16.
27. Kinateder, M.†, Wirth, T. D.*, & **Warren, W. H.** (2019). Crowd dynamics in virtual reality. In N. Bellomo & L. Gibelli (Eds.), *Crowd Dynamics, Volume 1: Theory, Models, and Safety Problems*. Chan, Switzerland: Springer Birkhauser, p. 15-36. https://link.springer.com/chapter/10.1007/978-3-030-05129-7_2
28. **Warren. W.H.** (2020) Perceiving surface layout: Ground theory, affordances, and the objects of perception. In J. Wagman & J. Blau (Eds.), *Perception as information detection: Reflections on Gibson's 'Ecological approach to visual perception'*. Routledge, 151-173. https://www.taylorfrancis.com/chapters/edit/10.4324/9780429316128-10/perceiving-surface-layout-william-warren
29. **Warren, W.H.** (2023) Epilogue: The Cartesian submariner learns to surf. In A. Szokolszky, C. Read, Z. Palatinus (Eds.) *Intellectual journeys in ecological psychology: Interviews and reflections from pioneers in the field.* Routledge, 410-430. https://www.taylorfrancis.com/chapters/edit/10.4324/9781003160724-15/epilogue-cartesian-submariner-learns-surf-william-warren
30. **Warren, W.H.** (2024) The perception-action coupling in collective dynamics. In Mindy F. Levin, Maurizio Petrarca, Daniele Piscitelli and Susanna Summa (Eds.) *Progress in Motor Control: From Neuroscience to Patient Outcomes.* UK: Academic Press, pp. 105-138. https://doi.org/10.1016/B978-0-443-23987-8.00005-5
31. **Warren, W.H.** (2025) Behavioral dynamics of pedestrians and crowds. To appear in V. Romero, M. Segundo-Ortin, J. Wagman, & T. Nonaka (Eds), *International handbook of ecological psychology.* Routledge, in press, 40 pp.

Refereed Journal Articles

32. **Warren, W.H.** (1977) Visual information for object identity in apparent movement. *Perception and Psychophysics, 21,* 264-268.
33. **Warren, W.H.** & Shaw, R.E. (1978) The visual specification of events: A reply to Ullman. *Perception and Psychophysics, 24,* 387-389.
34. Omanson, R., **Warren, W.H.**, & Trabasso, T. (1978) Goals, inferential comprehension, and recall of stories by children. *Discourse Processes, 1,* 337-354.
35. Todd, J.T. & **Warren, W.H.** (1982) Visual perception of relative mass in dynamic events. *Perception, 11,* 325-335.
36. **Warren, W.H.** (1984) Perceiving affordances: The visual guidance of stair climbing. *Journal of Experimental Psychology: Human Perception and Performance, 10,* 683-703.
37. **Warren, W.H.** & Verbrugge, R.R. (1984) Auditory perception of breaking and bouncing events: A case study in ecological acoustics. *Journal of Experimental Psychology: Human Perception and Performance, 10,* 704-712. (Reprinted in W. Richards (Ed.) (1988), *Selections in natural computation.* Cambridge: MIT Press.)
38. **Warren, W.H.**, Young, D.S., & Lee, D.N. (1986) Visual control of step length during running over irregular terrain. *Journal of Experimental Psychology: Human Perception and Performance, 12,* 259-266.
39. **Warren, W.H.** & Whang, S.* (1987) Visual guidance of walking through apertures: Body-scaled information for affordances. *Journal of Experimental Psychology: Human Perception and Performance, 13,* 371-383.
40. **Warren, W.H.**, Kim, E.S.**, & Husney, R.** (1987) The way the ball bounces: Visual perception of elasticity and control of the bounce pass. *Perception, 16,* 309-336.
41. **Warren, W.H.** & Hannon, D.* (1988) Direction of self-motion is perceived from optical flow. *Nature, 336,* 162-163.

42. **Warren, W.H.**, Morris, M.**, & Kalish, M.** (1988) Perception of translational heading from optical flow. *Journal of Experimental Psychology: Human Perception and Performance, 14,* 646-660.
43. Mestre, D.† & **Warren, W.H.** (1989) Le flux optique: Son role lors du controle du deplacement. *Psychologie Francaise, 34,* 5-11.
44. **Warren, W.H.**, Blackwell, A.W.**, & Morris, M.W.** (1989) Age differences in perceiving the direction of self-motion from optical flow. *Journal of Gerontology: Psychological Sciences, 44,* P147-P153.
45. **Warren, W.H.** & Yaffe, D.M.** (1989) Dynamics of step length adjustment during running. *Journal of Experimental Psychology: Human Perception and Performance, 15,* 618-623.
46. **Warren, W.H.** & Hannon, D.* (1990) Eye movements and optical flow. *Journal of the Optical Society of America A, 7,* 160-169.
47. **Warren, W.H.**, Mestre, D.R.†, Blackwell, A.W.**, & Morris, M.W.** (1991) Perception of circular heading from optical flow. *Journal of Experimental Psychology: Human Perception and Performance, 17,* 28-43.
48. Hatsopoulos, N.* & **Warren, W.H.** (1991) Visual navigation with a neural network. *Neural Networks, 4,* 303-317.
49. **Warren, W.H.**, Blackwell, A.W.**, Hatsopoulos, N.*, & Kalish, M.** (1991) On the sufficiency of the optical velocity field for perception of heading. *Biological Cybernetics, 65,* 311.
50. **Warren, W.H.** & Kurtz, K.J.** (1992) The role of central and peripheral vision in perceiving the direction of self-motion. *Perception & Psychophysics, 51,* 443-454.
51. Goldfield, G., Kay, B.†, & **Warren, W.H.** (1993) Infant bouncing: The assembly and tuning of action systems. *Child Development, 64,* 1128-1142.
52. Diedrich, F.*, & **Warren, W.H.** (1995) Why change gaits? Dynamics of the walk-run transition. *Journal of Experimental Psychology: Human Perception and Performance, 21,* 183-202.
53. **Warren, W.H.** & Saunders, J.A. (1995) Perceiving heading in the presence of moving objects. *Perception, 24,* 315-331.
54. Yilmaz, E.** & **Warren, W.H.** (1995) Visual control of braking: A test of the tau-dot hypothesis. *Journal of Experimental Psychology: Human Perception and Performance, 21,* 996-1014.
55. Hatsopoulos, N.G.* & **Warren, W.H.** (1996) Resonance tuning in rhythmic arm movements. *Journal of Motor Behavior, 28,* 3-14.
56. **Warren, W.H.**, Kay, B.A.†, & Yilmaz, E.** (1996) Visual control of posture during walking: Functional specificity. *Journal of Experimental Psychology: Human Perception and Performance, 22,* 818-838.
57. Bardy, B.G., **Warren, W.H.**, & Kay, B.A.† (1996) Motion parallax is used to control postural sway during walking. *Experimental Brain Research, 11,* 271-282.
58. Bardy, B.G. & **Warren, W.H.** (1997) Visual control of braking in goal-directed action and sport. Special issue of *Journal of Sport Sciences, 15,* 607-620.
59. Diedrich, F.J.* & **Warren, W.H.** (1998) The dynamics of gait transitions: Effects of grade and load. *Journal of Motor Behavior*, *30,* 60-78.
60. Duchon, A.*, **Warren, W.H.**, & Kaelbling, L.P. (1998) Ecological robotics. Special issue of *Adaptive Behavior, 6,* 473-507.
61. **Warren, W.H.** (1998) Visually controlled locomotion: 40 years later. Special issue of *Ecological Psychology, 10,* 177-219.
62. Bardy, B.G., **Warren, W.H.**, & Kay, B.A.† (1999) The role of central and peripheral vision in postural control during walking. *Perception & Psychophysics, 61,* 1356-1368.
63. Li, L.* & **Warren, W.H.** (2000) Perception of heading during rotation: Sufficiency of dense motion parallax and reference objects. *Vision Research, 40,* 3873-3894.
64. **Warren, W.H.**, Kay, B.A.†, Duchon, A.P.*, Zosh, W.*, & Sahuc, S. (2001) Optic flow is used to control human walking. *Nature Neuroscience, 4*, 213-216. [Selected for *F1000: Neuroscience*]

65. Kay, B.A.† & **Warren, W.H.** (2001) Coupling of posture and gait: Mode locking and parametric excitation. *Biological Cybernetics, 85,* 89-106.
66. Kearns, M.*, **Warren, W.H,** Duchon, A.*, & Tarr, M. (2002) Path integration from optic flow and body senses in a homing task. *Perception, 31,* 349-374.
67. Duchon, A.P.* & **Warren, W.H.** (2002) A visual equalization strategy for locomotor control: Of honeybees, humans, and robots. *Psychological Science, 13,* 272-278.
68. Li, L.* & **Warren, W.H.** (2002) Retinal flow is sufficient for steering during observer rotation. *Psychological Science, 13,* 485-491.
69. Bennett, D.* & **Warren, W.H.** (2002) Size scaling: Retinal or environmental frame of reference? *Perception & Psychophysics, 64,* 462-477.
70. Finney, S.A.* & **Warren, W.H.** (2002) Delayed auditory feedback and rhythmic tapping: Evidence for a critical interval shift. *Perception & Psychophysics, 64,* 896-908.
71. Li,L.*, Peli, E., & **Warren, W.H.** (2002) Heading perception in patients with advanced *retinitis pigmentosa*. *Optometry and Vision Science, 79,* 581-589.
72. Tarr, M.T. & **Warren, W.H.** (2002) Virtual reality in behavioral neuroscience and beyond. *Nature Neuroscience (Suppl.), 5,* 1089-1092.
73. Fajen, B.R.† & **Warren, W.H.** (2003) Behavioral dynamics of steering, obstacle avoidance, and route selection. *Journal of Experimental Psychology: Human Perception and Performance, 29,* 343-362. DOI: 10.1037/0096-1523.29.2.343
74. Fajen, B.R.†, **Warren, W.H.**, Temizer, S., & Kaelbling, L.P. (2003) A dynamical model of visually-guided steering, obstacle avoidance, and route selection. *International Journal of Computer Vision*, *54,* 13-34.
75. Li, L.* & **Warren, W.H.** (2004) Path perception during rotation: Influence of instructions, depth range, and dot density. *Vision Research*, *44,* 1879-1889.
76. **Warren, W.H.** & Fajen, B.R.† (2004) From optic flow to laws of control. In L.M. Vaina, S.A. Beardsley, and S. Rushton (Eds.), *Optic Flow and Beyond*. Kluwer, 307-337.
77. Fajen, B.R.† & **Warren, W.H.** (2004) Visual guidance of intercepting a moving target on foot. *Perception, 33,* 689-715.
78. **Warren, W.H.** & Fajen, B.R.† (2004) Behavioral dynamics of human locomotion. *Ecological Psychology, 16,* 61-66.
79. Laidlaw, D.H., Kirby, R.M., Jackson, C.D., Davidson, J.S., Miller, T.S., da Silva, M., **Warren, W.H.**, & Tarr, M. (2005) Comparing 2D vector field visualization methods: A user study. *IEEE Transactions on Visualization and Computer Graphics, 11,* 1-12.
80. Foo, P.†, **Warren, W.H.**, Duchon, A.* & Tarr, M.J. (2005) Do humans integrate routes into a cognitive map? Map- vs. landmark-based navigation of novel shortcuts. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 31,* 195-215.
81. Huang, W.H., Fajen, B.R.†, Fink, J.R., & **Warren, W.H.** (2006) Visual navigation and obstacle avoidance using a steering potential function. *Robotics and Autonomous Systems, 54,* 288-299.
82. **Warren, W.H.** (2006) The dynamics of perception and action. *Psychological Review, 113,* 358-389. doi: 10.1037/0033-295X.113.2.358
83. Fernandez, L., **Warren, W.H.**, & Bootsma, R. (2006) Kinematic adaptation to sudden changes in visual task constraints during reciprocal aiming. *Human Movement Science, 25,* 695-717.
84. Fink, P.W.†, Foo, P.† & **Warren, W.H.** (2007) Obstacle avoidance during walking in real and virtual environments. Invited article for special issue on "Locomotion in real and virtual environments," *ACM Transactions on Applied Perception, 4,* 1-18.
85. Fajen, B.R.† & **Warren, W.H.** (2007) Behavioral dynamics of intercepting a moving target. *Experimental Brain Research, 180,* 303-319. DOI 10.1007/s00221-007-0859-6

86. Foo, P.†, Duchon, A.*, **Warren, W.H.**, & Tarr, M.J. (2007) Humans do not switch between path knowledge and landmarks when learning a new environment. Invited article for special issue on "Spatial cognition: Behavioral, neurocognitive, and computational approaches," *Psychological Research, 71,* 240-251.
87. **Warren, W.H.** (2005/2007 appeared) Direct perception: The view from here. Invited article for special issue on "Perception," *Philosophical Topics, 33,* 335-361.
88. Mohler, B.J., Thompson, W.B., Creem-Regehr, S.H., Pick, H.L., & **Warren, W.H.** (2007) Visual flow influences gait transition speed and preferred walking speed. *Experimental Brain Research, 181,* 221-228.
89. Morice, A.H.P., Siegler, I.A., Bardy, B.G., & **Warren, W.H.** (2007) Learning new perception-action solutions in virtual ball bouncing. *Experimental Brain Research, 181,* 249-265.
90. Bruggeman, H.†, Zosh, W.*, & **Warren, W.H.** (2007) Optic flow drives human visuo-locomotor adaptation. *Current Biology, 17,* 2035-2040. DOI 10.1016/j.cub.2007.10.059. PMCID: PMC2228332
91. **Warren, W.H.** (2009) How do animals get about by vision? Visually controlled locomotion and orientation after 50 years. *British Journal of Psychology, 100,* 277-281. PMCID: PMC3780564
92. Fink, P.W.†, Foo, P.S.†, & **Warren, W.H.** (2009) Catching fly balls in virtual reality: A critical test of the outfielder problem. *Journal of Vision, 9*(13), 14:1-8. PMCID: PMC3816735
93. Siegle, J.H.** & **Warren, W.H.** (2010) Distal attribution and distance perception in sensory substitution. *Perception, 39,* 208-23. PMCID: PMC3780418
94. Bruggeman, H.† & **Warren, W.H.** (2010) The direction of walking – but not throwing or kicking – is adapted by optic flow. *Psychological Science, 21,* 1006-13. DOI: 10.1177/0956797610372635. PMCID: PMC3142708
95. Gérin-Lajoie, M.†, Ciombor, D.M., **Warren, W.H.**, & Aaron, R.K. (2010) Using ambulatory virtual environments for the assessment of functional gait impairment: A proof-of-concept study. *Gait and Posture*, *31,* 533-6. PMCID: PMC2854238
96. Siegler, I.A., Bardy, B., & **Warren, W.H.** (2010) Passive vs. active control of rhythmic ball bouncing: The role of visual information. *Journal of Experimental Psychology: Human Perception and Performance, 36,* 729-50.
97. Chrastil, E.R.* & **Warren, W.H.** (2012). Active and passive contributions to spatial learning. *Psychonomic Bulletin and Review, 19,* 1-23.
98. Cinelli, M.† & **Warren, W.H.** (2012) Do walkers follow their heads? Investigating the role of head rotation in locomotor control. *Experimental Brain Research, 219,* 175-290. DOI 10.1007/s00221-012-3077-9. PMCID: PMC3592975
99. Bonneaud, S.†, Rio, K.*, Chevaillier, P., **Warren, W.H.** (2012) Accounting for patterns of collective behavior in crowd locomotor dynamics for realistic simulations. In Z. Pan, A.D. Cheok, W. Muller, M. Chang, & M. Zhang (Eds.) *Lecture Notes in Computer Science, v. 7145: Transactions on Edutainment VII*. Heidelberg: Springer, 1-11.
100. **Warren, W.H.** (2012) Does this computational theory solve the right problem? Marr, Gibson, and the goal of vision. *Perception, 41,* 1053-1060, special issue on the 30th anniversary of David Marr's book *Vision*. PMCID: PMC3816718
101. Siegler, I.A., Bazile, C., & **Warren, W.H.** (2013) 'Mixed' control for perception and action: Timing and error correction in rhythmic ball bouncing. *Experimental Brain Research, 226,* 603-615.
102. Chrastil, E.R.* & **Warren, W.H.** (2013) Active and passive spatial learning in human navigation: Acquisition of survey knowledge. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 39,* 1520-1537.
103. Chrastil, E.R.* & **Warren, W.H.** (2014) Does the human odometer use an extrinsic or intrinsic metric? *Attention, Perception and Psychophysics*, 76, 230-246. doi: 10.3758/s13414-013-0549-3.

104. Rio, K.*, Rhea, C.†, & **Warren, W.H.** (2014) Follow the leader: Visual control of speed in pedestrian following. *Journal of Vision, 14*(2), 4:1-16. doi: 10.1167/14.2.4
105. Rhea, C.K.†, Kiefer, A.W.†, D'Andrea, S.E., **Warren, W.H.**, & Aaron, R.K. (2014) Entrainment to a real time fractal visual stimulus modulates fractal gait dynamics. *Human Movement Science, 36,* 20-34. doi: 10.1016/j.humov.2014.04.006
106. Rhea, C.K.*, Kiefer, A.W.†, Haran, P.F., Glass, S.M., & **Warren, W.H.** (2014) A new measure of the CoP trajectory in postural sway: Dynamics of heading change. *Medical Engineering and Physics, 36,* 1473-1479.
107. Chrastil, E.R & **Warren, W.H.** (2014) From cognitive maps to cognitive graphs. *PLoS ONE 9*(11): e112544, p. 1-8. doi:10.1371/journal.pone.0112544
108. Dachner, G.* & **Warren, W.H.** (2014) Behavioral dynamics of heading alignment in pedestrian following. *Transportation Research Procedia, 2,* 69-76. DOI: 10.1016/j.trpro.2014.09.010
109. Rio, K.W.* & **Warren, W.H.** (2014) The visual coupling between neighbors in real and virtual crowds. *Transportation Research Procedia, 2,* 132-140. DOI: 10.1016/j.trpro.2014.09.017
110. Chrastil, E.R.* & **Warren, W.H.** (2015) Active and passive spatial learning in human navigation: Acquisition of graph knowledge. *Journal of Experimental Psychology: Learning, Memory, & Cognition, 41,* 1162-1178. https://doi.org/10.1037/xlm0000082
111. Zhao, H.* & **Warren, W.H.** (2015) On-line and model-based approaches to the visual control of action. *Vision Research, 110,* 190-202.
112. Zhao, M.† & **Warren, W.H.** (2015) How you get there from here: Interaction of visual landmarks and path integration in human navigation. *Psychological Science, 26,* 915-924. doi:10.1177/0956797615574952
113. Zhao, M.† & **Warren, W.H.** (2015) Environmental stability modulates the role of path integration in human navigation. *Cognition, 142,* 96-109.
114. Kinateder, M.† & **Warren, W.H.** (2016) Social influence on evacuation behavior in real and virtual environments. *Frontiers in Robotics and AI: Virtual Environments, 3,* 43. doi: 10.3389/frobt.2016.00043
115. Chrastil, E.R.* & **Warren, W.H.** (2017) Rotational error in path integration: Encoding and execution errors in angle reproduction. *Experimental Brain Research, 235,* 1885-1897. doi: 10.1007/s00221-017-4910-y
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117. **Warren, W.H.**, Rothman, D.B.**, Schnapp, B.H.** & Ericson, J.D.* (2017) Wormholes in virtual space: From cognitive maps to cognitive graphs. *Cognition, 166,* 152-163. doi: 10.1016/j.cognition.2017.05.020. [Selected for *F1000 Prime: Neuroscience*]
118. Kiefer, A.W.†, Rio, K.*, Bonneaud, S.†, Walton, A. & **Warren, W.H.** (2017) Quantifying and modeling coordination and coherence in pedestrian groups. *Frontiers in Psychology: Cognitive Science, 8*:949, 1-13. doi: 10.3389/fpsyg.2017.00949
119. Kinateder, M.†, Communale, B.**, & **Warren, W.H.** (2018) Exit choice in an emergency evacuation scenario is influenced by exit familiarity and neighbor behavior. *Safety Science, 106,* 170-175. doi: 10.1016/j.ssci.2018.03.015
120. Rio, K.W.*, Dachner, G.C.* & **Warren, W.H.** (2018) Local interactions underlying collective motion in human crowds. *Proceedings of the Royal Society B, 285,* 20180611. doi: 10.1098/rspb.2018.0611
121. **Warren, W.H.** (2018) Collective motion in human crowds. *Current Directions in Psychological Science, 27,* 232-240. https://doi.org/10.1177/0963721417746743
122. Kinateder, M.†, **Warren, W.H.**, & Schloss, K.B. (2019) What color are emergency exit signs? Egress behavior differs from verbal report. *Applied Ergonomics, 75,* 155-160. https://doi.org/10.1016/j.apergo.2018.08.010

123. **Warren, W.H.** (2019) Non-Euclidean navigation. *Journal of Experimental Biology*, *222*, jeb187971, 1-10. https://doi.org/10.1242/jeb.187971
124. Ericson, J.D.* & **Warren, W.H.** (2020) Probing the invariant structure of spatial knowledge: Support for the cognitive graph hypothesis. *Cognition*, 2000, 104276, 1-20. https://doi.org/10.1016/j.cognition.2020.104276.
125. Hackney, A.L., Cinelli, M.E.†, **Warren, W.H.**, & Frank, J.S. (2020) Are avatars treated like human obstacles during aperture crossing in virtual environments? *Gait & Posture*, 80, 74-76. https://doi.org/10.1016/j.gaitpost.2020.05.028
126. Baxter, B.A.* & **Warren, W.H.** (2020) Route selection in barrier avoidance. *Gait & Posture*, 80, 192-198. https://doi.org/10.1016/j.gaitpost.2020.04.009
127. Lombardi, M., **Warren, W.H.**, & DiBernardo, M. (2020) Nonverbal leadership emergence in walking groups. *Scientific Reports,* 10, 18948, 1-10. https://doi.org/10.1038/s41598-020-75551-2
128. Ravi, S., Siesenop, T., Bertrand, O., Li, L., Dousott, C., **Warren, W.**, Combes, S., & Egelhaaf, M. (2020) Bumblebees perceive the spatial layout of their environment in relation to their body size and form to minimize inflight collisions. *Proceedings of the National Academy of Sciences*, 117 (49), 31494-31499. https://doi.org/10.1073/pnas.2016872117
129. Chrastil, E.R.* & **Warren, W.H.** (2021) Executing the homebound path is a major source of error in homing by path integration. *Journal of Experimental Psychology: Human Perception and Performance, 47* (1), 13-35. https://doi.org/10.1037/xhp0000875
130. Ericson, J.D.*, Chrastil, E.R.*, & **Warren, W.H.** (2021). Space syntax visibility graph analysis is not robust to changes in spatial and temporal resolution. *Environment and Planning B: Urban Analytics and City Science,* 48(6):1478-1494. https://doi.org/10.1177/2399808319897624.
131. Kinateder, M.† & **Warren, W.H.** (2021) Exit choice during evacuation is influenced by both the size and proportion of the egressing crowd. *Physica A, 569,* 125746, 1-14. https://doi.org/10.1016/j.physa.2021.125746
132. **Warren, W.H.** (2021) Information is where you find it: Perception as an ecologically well-posed problem. *iPerception*, *12*(2), 1-24. https://doi.org/10.1177/20416695211000366
133. Wirth, T.D*. & **Warren, W.H.** (2021) Robust weighted averaging accounts for recruitment into collective motion in human crowds. *Frontiers in Applied Mathematics and Statistics: Dynamical Systems, 7:* 761445. https://doi.org/10.3389/fams.2021.761445
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135. Dachner, G.C.,* Wirth, T.D.*, Richmond, E.** & **Warren, W.H.** (2022) The visual coupling between neighbors explains local interactions underlying human 'flocking'. *Proceedings of the Royal Society B*, *289,* 202120892. https://royalsocietypublishing.org/doi/10.1098/rspb.2021.2089
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137. Mullick, P., Fontaine, S., Appert-Rolland, C., Olivier, A-H., **Warren, W.H**., & Pettré, J. (2022) Analysis of emergent patterns in crossing flows of pedestrians reveals an invariant of stripe formation in human data. *PLoS Computational Biology*, *18,* e1010210. https://doi.org/10.1371/journal.pcbi.1010210
138. Wirth, T.D.*, Dachner, G.C.*, Rio, K.W.,* & **Warren, W.H.** (2023) Is the neighborhood of interaction in human crowds metric, topological, or visual? *PNAS Nexus, 2*, 1-13. https://doi.org/10.1093/pnasnexus/pgad118
139. Bai, J.* & **Warren, W.H.** (2023) Relative rate of expansion controls speed in 1D pedestrian following. *Journal of Vision*, *23* (10):3, 1-15. https://doi.org/10.1167/jov.23.10.3

140. Falandays, J.B.†, Yoshimi, J., **Warren, W.H.**, & Spivey, M. (2024) A potential mechanism for Gibsonian resonance: Behavioral entrainment emerges from local homeostasis in an unsupervised reservoir network. *Cognitive Neurodynamics,* 18, 1811-1834. https://doi.org/10.1007/s11571-023-09988-2

141. **Warren, W.H.**, Falandays, J.B.†, Yoshida, K.*, Wirth, T.D.*, Free, B.A.† (2024) Human crowds as social networks: Collective dynamics of consensus and polarization. *Perspectives on Psychological Science*, *19,* 1-16. https://doi.org/10.1177/17456916231186406

142. Zhang, Y., Kinateder, M.†, Huang, X., **Warren, W.H.** (2025). Modeling competing guidance on evacuation choices under time pressure using virtual reality and machine learning. *Expert Systems with Applications, 262,* 125582, p 1-17. https://doi.org/10.1016/j.eswa.2024.125582

143. Mullick, P., Appert-Rolland, C., **Warren, W.H**., & Pettré, J. (2025) Eliminating bias in pedestrian density estimation: A Voronoi cell perspective. *Physica A, 657,* 130251, p. 1-12. https://doi.org/10.1016/j.physa.2024.130251

144. Zhang, Y., Kinateder, M.†, Templeton, A. & **Warren, W.H.** (2025). A virtual reality experiment on visual and auditory guidance for egress in road tunnel fires. *Fire Technology,* p. 1-25. https://doi.org/10.1007/s10694-024-01668-9.

In Review/Revision

Yoshida, K.*, di Bernardo, M., & **Warren, W.H.** (2025) Visual influence networks in walking crowds. bioRxiv 2025.01.29.635594. https://doi.org/10.1101/2025.01.29.635594

In Progress

Todd, J.T. & **Warren, W.H.** *Perception and information: An introduction to ecological optics.* Book project.

Book Reviews

Warren, W.H. (1987) "Behavior" vs. "action." Review of M. Frese & J. Sabini (Eds.), "Goal directed behavior: The concept of action in psychology." *Contemporary Psychology, 32,* 120-121.

Refereed Proceedings

Warren, W.H. (1990) Visual regulation of gait. *Proceedings of the Sixth Biennial Conference of the Canadian Society for Biomechanics, Human Locomotion VI,* 195-198.

Duchon, A.P.* & **Warren, W.H.** (1994) Robot navigation from a Gibsonian viewpoint. *Proceedings of the IEEE International Conference on Systems, Man, and Cybernetics*, San Antonio, TX, pp. 2272-2277, vol.3, doi: 10.1109/ICSMC.1994.400203.

Duchon, A.P.* & **Warren, W.H.** (1995) Ecological robotics: Controlling behavior with optical flow. *Proceedings of the Cognitive Science Society*.

Laidlaw, D.H, Kirby, R.M., Davidson, J.S., Miller, T.S., da Silva, M., **Warren, W.H.**, & Tarr, M. (2002) Quantitative comparative evaluation of vector field visualization methods. *Proceedings of the IEEE Conference on Visualization 2001*, Piscataway, NJ: IEEE.

B.J. Mohler, W.B. Thompson, S. Creem-Regehr, H.L. Pick, Jr., **W. Warren, Jr.**, J.J. Rieser, and P. Willemsen (2004) Visual motion influences locomotion in a treadmill virtual environment. *Proceedings of the ACM SIGGRAPH Symposium on Applied Perception in Graphics and Visualization*, 19-22.

Kiefer, A.W.,† Bonneaud, S.,† Rio, K.,* & **Warren, W.H.** (2013). Quantifying the coherence of pedestrian groups. *Proceedings of the Cognitive Science Society,* Berlin, Germany, p. 2710-2715.

Appert-Rolland, C., Pettré, J., Olivier, A-H., **Warren,W.H.**, Duigou-Majumdar, A., Pinsard, E. & Nicolas, A. (2018) Experimental study of collective pedestrian dynamics. *Proceedings of the 9th*

International Conference on Pedestrian and Evacuation Dynamics (PED2018), Lund, Sweden, August 21-23, paper 80, 1-8. https://collective-dynamics.eu/index.php/cod/article/view/A109/130

Kinateder, M.†, **Warren, W.H.**, Schloss, K.B. (2019) The influence of signage colour on exit choice: Observed behaviour differs from verbal report. *3nd International Fire Safety Symposium Ottawa, Ontario, Canada (IFireSS)*, 8 pp.

Mullick, P., Appert-Roland, C., **Warren, W.H.** & Pettré, J. (2024) Methods of density estimation for pedestrians moving in small groups without a spatial boundary. In Rao, K.R. (Eds.) *Traffic and Granular Flow '22. Lecture notes in civil engineering, v. 443.* Singapore: Springer Nature, p. 43-50. https://link.springer.com/chapter/10.1007/978-981-99-7976-9_6

Commentary; non-refereed publications

Warren, W.H. & Verbrugge, R.R. (1981) Auditory information for breaking and bouncing events. *Haskins Laboratories Status Report on Speech Research, SR-67/68,* 223-240.

Warren, W.H. & Shaw, R.E. (1981) Psychophysics and ecometrics. *Behavioral and Brain Sciences, 4,* 209-210.

Warren, W.H. (1987) An ecological conception of action: Commentary on Zanone & Hauert. *Cahiers de psychologie cognitive, 7,* 199-203.

Warren, W.H. (1989) Navigation from optical flow. *Perception-Action Workshop Review, 4,* 1-5.

Hatsopoulos, N.G. & **Warren, W.H.** (1995) Do control variables exist? *Behavioral and Brain Sciences, 18,* 762.

Warren, W.H. (1996) Today locomotion, tomorrow chess? The dynamical hypothesis meets cognitive science. *Bulletin of the Santa Fe Institute, 11,* 2, 16-17.

Warren, W.H. (1998) Perception of heading is a brain in the neck. Invited "News and Views" piece, *Nature Neuroscience, 1,* 647-649.

Fajen, B.R.† & **Warren, W.H.** (2000) Go with the flow. *Trends in Cognitive Sciences, 4,* 369-370.

Zhou, M. & **Warren, W.H.** (2018) Non-optimal perceptual decision in human navigation. *Behavioral and Brain Sciences, 41,* e233, 44-45.

Warren, W.H. (forever in press) Visual procession at the Koch Center. In M. Feehan (Ed.), *The Koch Science Center at Deerfield.*

Grants

Current

"Self-organization and collective decision-making in human crowds." PI, NSF BCS 1849446, 2019-25, $342,345 (DC), $161,176 (IC), $30,769 (REU supplement).

"A vision-based model of locomotion in crowded environments." PI, NIH R01 EY029745, 2019-26, $1,627,446 (DC), $900,799 IC).

"Interdisciplinary training grant in cognitive and computational neuroscience." NIH T32, trainer (David Badre, Michael Frank, Chris Moore, co-PIs)

Completed

"Visual perception of dynamic events." Brown University BRSG, 1982-84, $12,800.

"Age-related changes in the visual control of locomotion." PI, NIH R01 EY10923, 1985-88, $240,000 (direct costs).

"Visual control of locomotion." PI, NIH R01 EY10923, 12/1/89-11/31/94, $500,000 (direct costs).

"Perception, Illusion, and the Visual Arts." Mellon Fresh Combinations Grant, NSF/NEA/ FIPSE Parallax Grant, Wriston Grant, and Curricular Development Grant, Brown University, 1992-3.

"Visual control of locomotion." PI, NIH R01 EY10923, 12/1/94-11/31/98, $675,000 (direct costs).

"Visual control of adaptive behavior." PI, NIMH K02 MH01353 Research Career Award, 2/01/97 – 1/31/02, $500,000

"Learning minimal representations for visual navigation and recognition." PI, NSF IRI-9720327, 09/01/97 – 08/31/02, $825,000 (direct costs).

"Dealing with uncertainty: Cognitive, computational, and statistical approaches." Participating faculty, NSF/IGERT Training Grant, 1998-05.

"Visual control of locomotion." PI, NIH R01 EY10923, 12/1/98-11/31/03, $830,222 (direct costs).

"Visualization of multi-valued scientific data." Co-PI with David Laidlaw, et al, NSF, 2000-03, $2,296,599.

"Learning minimal representations for visual navigation and recognition II." Co-PI with Michael Tarr, NSF BCS-0214383, 09/01/03 – 08/31/08, $426,799 (direct costs).

"Visual control of locomotion." PI, NIH R01 EY10923, 12/1/03-11/31/08, $1,241,290 (direct costs).

"Understanding unsteady bioflows through simulation, modeling, visualization, art, and psychology." Co-PI with David Laidlaw, et al, NSF/ITR, 2005-09, $650,000.

"Dynamics of action and perception in a rhythmic task." Co-PI with Dagmar Sternad, NSF BCS-0450218, 09/01/05-08/31/10, $283,725 (direct costs).

"Applications of virtual reality to rehabilitation of mobility," subcontract from Roy Aaron, Veterans Administration, 2007-08, $50,000.

"Virtual reality and motion analysis to characterize functional mobility in lower limb injury," subcontract from Roy Aaron, Veterans Administration, 2008-09, $97,443.

"The geometry of spatial knowledge for navigation." PI, NSF BCS-0843940, 07/01/09 - 06/30/13, $456,663 (direct costs).

"Virtual reality and motion analysis to characterize functional mobility in lower limb injury," co-PI, led by Roy Aaron, DOD, 2009-13, $1,000,000.

"Visual control of locomotion." PI, NIH R01 EY10923, 12/1/08-11/30/14, $1,323,260 (direct costs).

"Virtual Reality rehabilitation for individuals with lower limb amputation," consultant, Susan D'Andrea PI, VA SPIRE, 2014-17.

"Collective behavior of human crowds." PI, NSF BCS-1431406, 2014-18, $256,260 (DC), $112,096 (IC), $48,379 (supplement, research experience for undergraduates).

"Applications of a pedestrian behavioral model." PI, Hyundai Motor Corporation, 2019, $30,769 (DC), $19,231 (IC).

"Interdisciplinary vision training program." NIH T32 EY018080, trainer (Michael Paradiso, PI), 6/1/12 - 5/31/22.

Patent Application

"Virtual Reality Methods and Systems," US Patent Application No. 61/896329 filed October 28, 2013; International Patent Application No. PCT/US14/62668 filed October 28, 2014.

Invited Lectures (keynotes, symposia, workshops)

Warren, W.H. (1985) *Environmental design as the design of affordances.* Invited symposium paper, 3rd International Conference on Event Perception, University of Uppsala, Sweden.

Warren, W.H. (1985) *Perception of affordances and the visual control of action.* Invited paper, Workshop on Complex Motor Behavior, Center for Interdisciplinary Research, Bielefeld, W. Germany.

Warren, W.H. (1986) *Exploiting ecological constraints: Visual control of animal locomotion and its implications for robotics.* Invited paper, NSF International Workshop for Sensing and Control in Mobile Robots, Honolulu, HA.

Warren, W.H. (1987) *Perception of heading from optical flow, revisited.* Invited symposium paper, 4th International Conference on Event Perception and Action, University of Trieste, Italy.

Warren, W.H. (1987) *Critical behavior in perception-action systems.* Invited paper, Conference on Dynamic Patterns in Complex Systems, Ft. Lauderdale, FL.

Warren, W.H. (1989) *The perception-action coupling.* Invited paper, Advanced Workshop on Sensory-motor Organization and Development in Infancy, Rouen, France.

Warren, W.H. (1989) *Perception of self-motion from optical flow.* Invited symposium paper, Annual Meeting of the Optical Society of America, Orlando, FL.

Warren, W.H. (1989) *What is optical flow?* Invited paper, Meeting of the Ecological Psychology Society, Dartmouth College, Hanover, NH.

Warren, W.H. (1989) *In pursuit of a lawful basis for perceiving and acting.* Invited paper, Conference on Domains of Mental Functioning: Attempts at a Synthesis, Center for Interdisciplinary Research, Bielefeld, West Germany.

Warren, W.H. (1990) *Navigation from optical flow.* Invited paper, Symposium on Orientation in Space, Center for Visual Science, University of Rochester, NY.

Warren, W.H. (1990) *Visual regulation of gait.* Invited symposium paper, Biennial Conference of the Canadian Society for Biomechanics, Quebec City.

Warren, W.H. (1991) *Optical modulation of balance during walking.* Invited paper, Meeting of the International Society for Ecological Psychology, Hartford, CT.

Warren, W.H. (1993) *Perception and action in the control of locomotion.* Invited paper, 17th Annual Interdisciplinary Conference, Jackson Hole, WY.

Warren, W.H. (1993) *The state of flow.* Invited paper, Conference on Optical Flow and Stereopsis, York University, Toronto.

Warren, W.H. (1993) *Gibson's mirror: Reflections on perception and action.* Invited symposium paper, 5th Annual Convention of the American Psychological Society, Chicago, IL.

Warren, W.H. (1993) *Optical flow and control.* Invited symposium paper, 7th International Conference on Event Perception and Action, Vancouver, BC, Canada.

Warren, W.H. (1994) *Visual control of locomotion.* W.L. Bryan Lecture in Cognitive Science, Indiana University.

Warren, W.H. (1994) *Adaptive nonrepresentational control.* Invited paper, Nissan Workshop, Cambridge Basic Research Center, MA.

Warren, W.H. (1995) *Visual control of adaptive behavior.* NECI Vision Workshop, Princeton, NJ.

Warren, W.H. (1995) *Virtually controlled locomotion.* Invited symposium paper, 8th International Conference on Perception and Action, Marseille, France.

Kay, B.A. & Warren, W.H. (1995) *Frequency response of postural sway to visual oscillations and the coupling between posture and locomotion.* Invited symposium paper, 3rd International Symposium on the Head/Neck System, Vail, CO.

Warren, W.H. (1997) *Visually controlled locomotion – 40 years later.* James J. Gibson Lecture, Cornell University.

Warren, W.H. (1997) *Visual control of steering during locomotion.* Invited paper, Meeting of the International Society for Ecological Psychology, University of Massachusetts, Amherst, MA.

Warren, W.H. (1997) *Visual control of balance and steering during human locomotion.* Invited paper, Satellite meeting on Sensory and Biomechanical Contributions to Posture and Gait, Neural Control of Movement Conference, Cozumel, Mexico.

Warren, W.H. (1997) *The dynamics of perception and action.* Invited paper, Workshop on Active Vision in Animals and Machines, Institute for Advanced Study, Berlin.

Warren, W.H. (1997) *The dynamics of perception and action.* Invited paper, International Conference on Perception and Action, York University, Toronto.

Warren, W.H. (1997) *The dynamics of action.* Invited paper, Symposium on Motor Behavior, 19th Annual Conference of the Cognitive Science Society, Stanford University, Palo Alto, CA.

Warren, W.H. (1999) *Optic flow and the visual control of locomotion.* Guest lecturer, Summer School on Sensori-motor Integration, Hanse-Wissenschaftskolleg, Delmenhorst, Germany.

Warren, W.H. (2000) *Workshop on the dynamics of perception and action.* 3-hour workshop presented at the Fifth Biennial Motor Control & Human Skill Research Workshop, Gold Coast, Australia.

Warren, W.H. (2000) *Visual control of posture and locomotion.* Keynote Address, Fifth Biennial Motor Control & Human Skill Research Workshop, Gold Coast, Australia.

Warren, W.H. (2000) *Visual control laws for locomotion.* Invited paper, Fourth International Conference on Cognitive and Neural Systems, Boston University.

Warren, W.H. (2000) *Perception and control of self-motion from optic flow.* Invited symposium talk, Annual Meeting of the Optical Society of America, Providence, RI.

Warren, W.H. (2001) *Visual control laws for locomotion.* Invited talk, Optic Flow and Beyond Meeting, Boston University.

Warren, W.H. & Fajen, B.R. (2001) *Behavioral dynamics and the perception-action cycle.* Invited symposium talk, 11th International Conference on Perception and Action, Storrs, CT.

Warren, W.H. & Fajen, B.R. (2001) *Behavioral dynamics of locomotion.* Invited paper, Symposium on Nonlinear Dynamics and Complex Movement, Association des Chercheurs en Activités Physiques et Sportives, Valance, France.

Foo, P., Goldfield, E.C., Kay, B.A., & Warren, W.H. (2001) *Infant bouncing: The assembly, tuning, and transfer of action systems.* Invited talk, Symposium on Nonlinear Dynamics and Complex Movement, Association des Chercheurs en Activités Physiques et Sportives, Valance, France.

Warren, W.H. (2002) *Behavioral dynamics of human locomotion.* Invited paper, Symposium on Perception and Action, Faculty of Human Movement Sciences, Free University of Amsterdam.

Warren, W.H. (2002) *Behavioral dynamics of human locomotion.* Invited paper, 7th European Workshop on Ecological Psychology, Bendor, France.

Warren, W.H. (2002) *Why did Marr's program fail? A Gibsonian view.* Invited lecture, Symposium on "Marr's *Vision*: 20 years later." European Conference on Visual Perception, Glasgow, Scotland.

Warren, W.H. (2002) *Using information to guide action.* Invited discussant, 33rd Minnesota Symposium on Child Development: Action as an Organizer of Learning and Development, Minneapolis, MN.

Warren, W.H. (2003) *Behavioral dynamics of locomotor path generation.* Invited paper, 4th Euresco Conference on 3D Sensory and Motor Space: Computational Mechanisms for the Generation and Perception of Action in 3D space. Aquafredda di Maretea, Italy.

Warren, W.H. (2003) *Behavioral dynamics of human locomotion.* Invited paper, Panel on Complexity and the Dynamics of Perception and Action, Progress in Motor Control IV, Caen, France.

Warren, W.H. (2003) *Embedded perception-action systems: The dynamics of agent-environment interactions.* Invited presentation, NSF Workshop on Integrative Cognitive Science, Arlington, VA.

Warren, W.H. (2004) *Exploring the dynamics of perception and action.* Invited lecture, Symposium on Dynamics of Infant Bouncing: Retrospect and Prospect, International Society of Infancy Studies, Chicago.

Warren, W.H. (2004) *Behavioral dynamics of locomotor path formation.* Invited lecture, Eighth International Conference on Cognitive and Neural Systems, Boston University.

Warren, W.H. (2004) *Behavioral dynamics of goal-directed locomotion.* Invited lecture, Festschrift for Robert Shaw, University of Connecticut.

Warren, W.H. (2005) *Behavioral research in virtual reality.* Invited talk, Conference on Wounds of War: Rehabilitation Strategies for Recovery, Veterans Administration Hospital, Providence, RI.

Warren, W.H. (2005) *Why use virtual environments? Breaking the laws of physics and optics.* Invited talk, VSS Satellite Workshop on Perception and Action in Immersive Virtual Environments, Sarasota, FL.

Warren, W.H. (2005) *On-line path formation in human locomotion.* Invited talk, DARPA IPTO 2nd Cognitive Systems Conference, Washington, DC.

Warren, W.H. (2006) *Invariance and intentionality.* Invited talk, Festschrift for Joe Lappin, Vanderbilt University.

Warren, W.H. (2006) *Enactive knowledge: Sensory-motor expectancies or perception-action invariants?* Keynote address, 3rd International Conference on Enactive Interfaces, Montpelier, France.

Warren, W.H. (2007) *Behavioral dynamics of visually-guided locomotion.* Invited talk, Conference on Coordination: Neural, Behavioral, and Social Dynamics, Boca Raton, FL.

Warren, W.H. (2007) *Underestimation of distance in virtual environments.* Invited panelist, Workshop on Perception of Scale and Spatial Orientation in Environmental Space, University of Utah.

Warren, W.H. (2007) *Using virtual reality for the study, assessment, and rehabilitation of functional mobility.* Invited talk, Forum on Biohybrid Concepts in Limb Restoration: Blending Man and Machine, Center for Regenerative and Restorative Medicine, Brown University.

Warren, W.H. (2008) *The trouble with the gospel according to Rev. Bayes.* Invited panelist, Symposium on Application of Bayesian Methods to Vision, Oxford University.

Warren, W.H. (2008) *Dynamics of human behavior.* Invited talk, Miami Symposium on Computational Research: Dynamical Systems in Science, Arts, and Engineering, Miami University, Ohio.

Warren, W.H. (2008) *The geometry of spatial knowledge for navigation.* Invited talk, NSF/DFG International Workshop on Spatial Cognition, University of Freiburg, Germany.

Warren, W.H. (2008) *Using ambulatory VR to break the laws of physics and optics.* Invited talk, Symposium on Virtual Displays in Natural Tasks, Frontiers in Optics Annual Meeting, Optical Society of America, Rochester, NY.

Warren, W.H. (2009) *The geometry of spatial knowledge for navigation.* Invited talk, Scene Understanding Symposium (SUNS), MIT, Cambridge, MA.

Warren, W.H. (2009) *Behavioral dynamics of visually-guided locomotion.* Invited talk, International Conference on Vision in 3D Environments, Center for Vision Research, York University, Toronto, Canada.

Warren, W.H. (2009) *An overview of affordances, 25 years later.* Invited talk, Symposium on Affordances (organized on the occasion of the 25th anniversary of the publication of my dissertation). *Proceedings of the 15th International Conference on Perception and Action,* Minneapolis, MN.

Warren, W.H. (2009) *Behavioral dynamics of human locomotion.* Pellechia Memorial Lecture, University of Connecticut.

Warren, W.H. (2009) *Using VR to break the laws of physics and optics.* Keynote address, Society for Computers in Psychology, Boston, MA.

Warren, W.H. (2010) *Visual control of locomotion and navigation.* Invited talk, Workshop on Neural Encoding of Perception and Action, Max Planck Institute, Tübingen, Germany.

Warren, W.H. (2010) *Behavioral dynamics of visually guided locomotion.* Invited talk, Symposium on Natural Environments, Tasks, and Intelligence, University of Texas, Austin, TX.

Warren, W.H. (2011) *Panel discussant.* Workshop on the Unity of Consciousness and Sensory Integration, Brown University.

Warren, W.H. & Zhao, M. (2012) *Interaction of visual landmarks and path integration in human navigation.* Invited talk, Festschrift for Herb Pick, Realism to relevance: An ecological approach to perception, action, and cognition. International Society for Infant Studies, Minneapolis, MN.

Warren, W.H. (2012) *How are control laws combined?* Optic Flow Workshop, Boston University, Boston, MA.

Warren, W.H. (2012) *Visual control of locomotion: From agents to swarms.* Invited mini-talk, Center for Vision Research 5th Anniversary Celebration, Brown University.

Warren, W.H. (2013) *Behavioral dynamics: From individual to collective behavior.* Plenary speaker, Retecog Workshop on Agent-Environment Interaction, Zaragoza, Spain.

Zhao, M. & Warren, W.H. (2013) *Interaction of path integration and visual landmarks in human navigation.* Invited talk, Spatial Memory Conference, Richmond, VA.

Warren, W.H. (2013) *Behavioral dynamics of visually-guided locomotion.* Keynote lecture, Dynamic Walking conference, Carnegie-Mellon University, Pittsburgh, PA.

Warren, W.H. (2013) *Mixed control: How information modulates dynamics.* Keynote lecture, Inaugural Conference of the EuroMov Center, Montpellier, France.

Warren, W.H. (2013) *Using ambulatory VR to study and assess functional mobility.* Keynote lecture, International Conference for Virtual Rehabilitation, Philadelphia, PA.

Warren, W.H. (2014) *Behavioral dynamics of visually-guided walking: From stepping to swarming.* Keynote lecture, International Society for Posture and Gait Research, Vancouver, Canada.

Warren, W.H. (2015, Feb. 28) *Neighbor coordination in human swarms: Beyond rhythmic behavior.* Invited talk, Workshop on Social Coordination and Joint Action, University of Cincinnati, Ohio.

Warren, W.H. (2015, June 5) *Behavioral dynamics of locomotion: From stepping to swarming.* Keynote address, North American Society for the Psychology of Sport and Physical Activity, Portland, Oregon.

Warren, W.H. (2015, June 26) *Behavioral dynamics approach to pedestrian and crowd behavior.* Invited talk, Transdisciplinary Workshop on Human Motion Analysis and Synthesis, INRIA, University of Rennes, France.

Warren, W.H. (2015, July 2) *Maps, graphs, and views.* Invited talk, Workshop on view-based representations in human and machine vision, Microsoft Cambridge, England.

Warren, W.H. (2015, July 11) *Visually-guided locomotion: From individual to collective behavior.* Keynote address, Asia Pacific Conference on Vision, Singapore.

Warren, W.H. (2015, July 16) *Getting to the right place for the nth time.* Invited symposium talk, International Conference on Perception and Action, Minneapolis, MN.

Warren, W.H. (2015, Oct. 2) *From cognitive maps to cognitive graphs.* Keynote lecture, International Workshop on Moving the Senses: From Motion Sensing to Animals in Motion, Bielefeld, Germany.

Warren, W.H. (2016, Mar. 20) *Behavioral dynamics approach to pedestrian and crowd behavior.* Invited talk, Workshop on Virtual Humans and Crowds for Immersive Environments, IEEE Virtual Reality, Greenville, SC.

Warren, W.H. (2016, June 28) *From cognitive maps to cognitive graphs.* Invited talk, 1st Interdisciplinary Navigation Symposium (iNav), Bad Gastein, Austria.

Warren, W.H. (2016, Oct. 6) *Human locomotion and navigation.* Invited talk, Architecture and Collective Behavior Workshop, National Academy Keck Future Initiatives, Tempe, AZ.

Warren, W.H. (2017, Jan. 11-13) *The dynamics of perception and action: I. Locomotion, II. Crowd Behavior, III. Navigation.* Three invited lectures, 39th Distinguished Scholar Lecture Series, Dept. of Psychology, University of Alberta, Canada.

Warren, W.H. (2017, May 23) *Behavioral dynamics of collective crowd behavior.* Invited talk, Mini-symposium on Modeling, Dynamics, and Coordination of Human Behavior, SIAM-Conference on Dynamical Systems, Snowbird, UT.

Warren, W.H. (2017, Aug. 23) *Behavioral dynamics of pedestrian and crowd behavior.* Invited talk, Workshop on Pedestrian Dynamics: Modeling, Validation, and Calibration, Institute for Computational and Experimental Research in Mathematics (ICERM), Brown University.

Warren, W.H. (2017, Nov. 14) *Legged locomotion: What's vision got to do with it?* Co-organizer and speaker, Workshop on Sensorimotor Control of Animals and Robots, Mathematical Biosciences Institute, Ohio State University, Columbus, Ohio.

Warren, W.H. (2018, Feb. 16) *Ecological optics: Whence and whither?* Invited speaker, Workshop on Ecological Optics, University of Connecticut.

Warren, W.H. (2018, Mar. 24-28) *Non-Euclidean navigation.* Invited speaker, Journal of Experimental Biology Symposium: Linking brain and behaviour in animal navigation, Plaka Litochora, Greece.

Warren, W.H., Strickrodt, M., Meilinger, T., & Bülthoff, H.H. (2018, June 25-29) The impossible heptagon: A test of cognitive graph theory. Invited speaker, 2nd Interdisciplinary Navigation Symposium (iNav), Mont Tremblant, Quebec.

Warren, W.H. (2018, Aug. 2-4) *Behavioral dynamics and human agency*. Keynote speaker, Society for Chaos Theory in Psychology and Life Science, Raleigh, NC.

Warren, W.H. (2018, Sept. 5-8) *From cognitive maps to cognitive graphs.* Keynote speaker, Spatial Cognition Conference, Tubingen, Germany.

Warren, W.H. (2019, May 30-31) *Behavioral dynamics of pedestrian-building interaction: Locomotion, crowd motion, and navigation.* Invited speaker, NSF Workshop on Human-Building Interaction, University of Southern California.

Warren, W.H. (2019, Aug. 25-29) *Information is where you find it.* Invited speaker, Symposium on the Ecological Approach of James J. Gibson, European Conference on Visual Perception, Leuven, Belgium.

Warren, W.H. (2019, Dec 12) *Information is where you find it: Optic flow, affordances, and collective behavior.* Distinguished Speaker Series, Science of Intelligence cluster, Technical University of Berlin, Germany.

Warren, W.H. (2020, Feb. 6-7) *Behavioral dynamics of pedestrian and crowd motion.* Invited speaker, NSF Workshop on Pedestrian Dynamics and Epidemic Modeling, University of West Florida, Pensacola.

Warren, W.H. (2020, Mar. 4-6) *A visual model of collective motion in human crowds*. Invited speaker, Workshop on Collective Information Processing, Humboldt University, Berlin.

Warren, W.H., Dachner, G.C., Wirth, T.D., Richmond, E. (2022, Jan. 17) *A visual explanation of 'flocking' in human crowds.* Special Session on Perception of Collective Behavior, Human Vision and Electronic Imaging Conference (HVEI), virtual.

Warren, W.H. (2022, May 19-22) *Anticipation in perception and action: The case of collision avoidance with moving obstacles.* Symposium on Active Vision, Center for Visual Science, University of Rochester.

Warren, W.H. (2023, May 22) *Vision outside-in.* Ken Nakayama Medal for Excellence in Vision Science, Award session, Vision Sciences Society, St. Pete Beach, FL.

Veprek, K. & Warren, W.H. (2023, June 29) *Human collision avoidance with multiple moving obstacles*. Invited symposium talk, 21st International Conference on Perception and Action, Guadalajara, Mexico.

Warren, W.H. (2023, June 29) *Strong anticipation in perception and action: An introduction to reservoir networks*. Invited symposium talk, 21st International Conference on Perception and Action, Guadalajara, Mexico.

Warren, W.H. & Yoshida, K. (2023, June 29) *Human crowds as visual influence networks: The question of leadership*. Invited symposium talk, 21st International Conference on Perception and Action, Guadalajara, Mexico.

Warren, W.H. (2023, Sept. 28) *The perception-action coupling in collective dynamics.* Invited lecture, Progress in Motor Control, Rome, Italy.

Warren, W.H. (2024, Aug. 28). *Perception-action coupling in collective dynamics.* Invited symposium talk, REPAIRS Closing Conference, Groningen, Netherlands.

Warren, W.H. (2024, Nov. 6). *Studying visual behavior in crowds using virtual reality.* Invited symposium talk, NIH Behavioral and Social Sciences Research Festival, Bethesa, MD.

Warren, W.H. (2025, July 15, invited) *Collective dynamics of human crowds.* Invited talk, Team and Multi-Agent Dynamics Workshop, Montpellier, France.

Warren, W.H. (2025, Aug. 27, invited) The Rank Prize Lecture, European Conference on Visual Perception, Mainz, Germany.

Public Lectures

Warren, W.H. (1995) *Why do things look as they do? The ecology of perception and action.* Faculty Colloquium, Brown University, Providence, RI.

Warren, W.H. & Miller, W. (2012, Mar 11) *Double take: Monet's "Basin at Argenteuil" and Spencer Finch's "Painting Air".* Gallery talk, Museum of Art, Rhode Island School of Design, Providence, RI.

Warren, W.H. (2012) *Spatial metamers: Illusion and disillusion in virtual space.* Public lecture, Symposium on Reality and Illusions, Georgetown University, Washington, DC.

Warren, W.H. (2019, Nov. 7) *Visualizing human crowds.* Public lecture, Hyundai Mobility Innovators Forum, San Francisco.

Invited Colloquia and Talks (recent)

2013: University of Pennsylvania; Indiana University; LEMS (Engineering), Brown University.

2014: Beijing University.

2016: Institute of Vision, Paris; EuroMov Center, University of Montpellier; Max Planck Institute for Biological Cybernetics, Tübingen, Germany; Collective Animal Behavior Lab, University of Toulouse.

2017: University of Alberta (3 lectures); Rochester Institute of Technology; Perception & Action Seminar, Brown University; University of Cincinnati.

2018: Visual Attention Lab, Harvard Medical School; INRIA, University of Rennes, France; NYU-ECNU Institute, Shanghai; Eastern China Normal University, Shanghai.

2019: Technical University of Berlin, Germany; Boston Action Club, Northeastern University.

2023: University of California, Merced; Northwestern University; Scuola Superiore Meridianle, University of Naples, Italy.

2024: SUNY School of Optometry.

Conference Presentations

Warren, W.H. (1976) *Object identity and transformation under apparent movement conditions.* Paper presented at the 31st Intercollegiate Psychology Conference, Mt. Holyoke College, and the Greater Boston Psychology Undergraduate Research Conference, Brandeis University.

Norcia, A.M., Yonas, A., & **Warren, W.H.** (1979) Saccadic eye-movement latency as a function of target directional uncertainty. Paper presented at the Annual Meeting of the Association for Vision Research and Ophthalmology, Sarasota, FL. *Investigative Ophthalmology and Visual Science (Suppl.), 18,* 147.

Warren, W.H. & Todd, J.T. (1979) *Sliding and colliding: Visual perception of friction and mass in dynamic events.* Paper presented at the 20th Annual Meeting of the Psychonomic Society, Phoenix, AZ.

Warren, W.H. & Verbrugge, R.R. (1980) *Them's the breaks: Acoustic information for bouncing and breaking.* Paper presented at the 51st Annual Meeting of the Eastern Psychological Association, Hartford, CT.

Shaw, R.E. & **Warren, W.H.** (1981) *Information and energy: An ecological approach to event perception.* Paper presented at the 1st International Conference on Event Perception, Storrs, CT.

Warren, W.H. (1982) *Perception and the energetics of stair climbing.* Paper presented at the 3rd Meeting of the International Society for Ecological Psychology, Adelphi University, Garden City, NY.

Warren, W.H. (1983) *A biomechanical basis for the visual guidance of stair climbing.* Poster presented at the Conference on Brain Mechanisms and Spatial Vision, Lyon, France.

Warren, W.H. (1984) *Visual control of running: One step at a time.* Paper presented at the 6th Meeting of the International Society for Ecological Psychology, Trinity College, Hartford, CT.

Whang, S. & **Warren, W.H.** (1984) *Visual guidance of walking through apertures.* Poster presented at the 7th Meeting of the International Society for Ecological Psychology, SUNY at Binghamton, NY.

Warren, W.H. (1985) *The way the ball bounces: Visual perception of elasticity.* Paper and poster presented at the 3rd International Conference on Event Perception, University of Uppsala, Sweden.

Warren, W.H. (1987) *Four propositions about affordances.* Paper presented at the 4th International Conference on Event Perception and Action, University of Trieste, Italy.

Mestre, D. & **Warren, W.H.** (1988) *Perception of curvilinear movement from optical flow.* Poster presented at the 13th Meeting of the International Society for Ecological Psychology, Antioch College, Yellow Springs, OH.

Kalish, M. & **Warren, W.H.** (1988) *Detecting approaching objects with a neural network.* Poster presented at the 2nd Annual Meeting of the Neural Network Society, Boston, MA.

Warren, W.H. & Hannon, D.J. (1988) *Eye movements and perception of heading from optical flow.* Paper presented at the 29th Annual Meeting of the Psychonomic Society, Chicago, IL.

Mestre, D. & **Warren, W.H.** (1989) *Perception of curvilinear heading from optical flow.* Paper presented at the 5th International Conference on Event Perception and Action, Miami University, Oxford, OH.

Hatsopoulos, N.G. & **Warren, W.H.** (1990) *Visual navigation with a neural network.* Poster presented at the International Joint Conference on Neural Networks, Washington, DC.

Warren, W.H. (1990) *Is the velocity field sufficient to perceive heading?* Paper presented at the 31st Annual Meeting of the Psychonomic Society, New Orleans, LA.

Warren, W.H., Kay, B., & Yilmaz, E. (1991) *Postural adjustments to visual oscillation during walking.* Poster presented at the 6th International Conference on Event Perception and Action, Free University of Amsterdam, The Netherlands.

Warren, W.H., Kay, B., & Yilmaz, E. (1991) *Postural adjustments to optical oscillation during walking.* Paper presented at the 32nd Annual Meeting of the Psychonomic Society, San Francisco, CA.

Warren, W.H. & Yilmaz, E. (1992) *2nd-order optical expansion is used to control braking.* Poster presented at the Annual Meeting of the Association for Vision Research and Ophthalmology, Sarasota, FL. *Investigative Ophthalmology and Visual Science, 33,* 1144.

Bennett, D.J. & **Warren, W.H.** (1992) *Does size-scaling depend on retinal or environmental size?* Poster presented at the Annual Meeting of the Association for Vision Research and Ophthalmology, Sarasota, FL. *Investigative Ophthalmology and Visual Science, 33,* 960.

Warren, W.H., Kay, B., & Yilmaz, E. (1992) *Anisotropy in visual control of posture during walking.* Paper presented at the 33rd Annual Meeting of the Psychonomic Society, San Francisco, CA.

Hatsopoulos, N.G., **Warren, W.H.**, & Sanes, J.N. (1992) *Sensing the physical dynamics in rhythmic movements.* Poster presented at the Annual Meeting of the Society for Neuroscience, Anaheim, CA.

Bennett, D.J. & **Warren, W.H.** (1993) *Information about environmental size affects size scaling.* Poster presented at the Annual Meeting of the Association for Vision Research and Ophthalmology, Sarasota, FL. *Investigative Ophthalmology and Visual Science, 34,* 1081.

Diedrich, F. & **Warren, W.H.** (1993) *Dynamics of the walk-run transition in humans.* Poster presented at the 7th International Conference on Event Perception and Action, Vancouver, BC, Canada.

Diedrich, F. & **Warren, W.H.** (1993) *Dynamics of the walk-run transition in humans.* Poster presented at the Annual Meeting of the Society for Neuroscience, Washington, DC.

Warren, W.H. (1993) *Perception of heading in the presence of moving objects.* Paper presented at the 34th Annual Meeting of the Psychonomic Society, Washington, DC.

Warren, W.H. & Saunders, J.A. (1994) *Perceiving heading in the presence of moving objects.* Paper presented at the Annual Meeting of the Association for Vision Research and Ophthalmology, Sarasota, FL.

Warren, W.H. (1994) *Adaptive nonrepresentational control*. Workshop on Systems Level Models of Visual Behavior, Telluride, CO.

Diedrich, F. & **Warren, W.H.** (1994) *A dynamic theory of the walk-run transition: Effects of grade and load.* Poster presented at the Annual Meeting of the Society for Neuroscience, Miami, FL.

Duchon, A.P. & **Warren, W.H.** (1994) *Robot navigation from a Gibsonian viewpoint.* IEEE International Conference on Systems, Man, andCybernetics, San Antonio, TX.

Kay, B.A. & **Warren, W.H.** (1995) *Frequency response of postural sway to visual oscillations and the coupling between posture and locomotion.* New England Sequencing and Timing Meeting, Providence, RI.

Warren, W.H. & Saunders, J.A. (1995) *Perceived heading depends on the direction of local object motion.* Annual Meeting of the Association for Vision Research and Ophthalmology, Fort Lauderdale, FL.

Saunders, J.A. & **Warren, W.H.** (1995) *An expansion template model accounts for biases in perceived heading.* Poster presented at the Annual Meeting of the Association for Vision Research and Ophthalmology, Fort Lauderdale, FL.

Duchon, A.P. & **Warren, W.H.** (1995) *Ecological robotics: Controlling behavior with optical flow.* Annual Meeting of the Cognitive Science Society, Pittsburgh, PA.

Warren, W.H. & Kay, B.A. (1995) *Visual-motor dynamics in locomotion: Mode-locking of posture and gait.* Paper presented at the 36th Annual Meeting of the Psychonomic Society, Los Angeles, CA.

Diedrich, F. & **Warren, W.H.** (1995) *Dynamics of human locomotion: Hysteresis at the walk-run transition.* Poster presented at the Annual Meeting of the Society for Neuroscience, San Diego, CA.

Bardy, B.G., & **Warren, W.H.** (1995) *Le controle visuel de l'equilibre pendant la marche (visual control of balance during walking).* XIIeme congres annuel du club locomotion et motricite rythmique. Garches (France).

Warren, W.H., Li, L.Y., Ehrlich, S.M., Crowell, J.A., & Banks, M.S. (1996) *Perception of heading during eye movements uses both optic flow and eye position information.* Paper presented at the Annual Meeting of the Association for Vision Research and Ophthalmology, Fort Lauderdale, FL.

Saunders, J.A. & **Warren, W.H.** (1996) *Perceived heading biased by a moving object: Effects of disparity and object position.* Paper presented at the Annual Meeting of the Association for Vision Research and Ophthalmology, Fort Lauderdale, FL.

Duchon, A.P. & **Warren, W.H.** (1996) *Information for visual control of steering.* Poster presented at the Annual Meeting of the Association for Vision Research and Ophthalmology, Fort Lauderdale, FL.

Bardy, B.G., **Warren, W.H.**, & Kay, B.A. (1996) *Visual control of balance during walking: Model and data.* Paper presented at the Fourth European Conference on Ecological Psychology, Zeist, The Netherlands.

Kay, B.A. & **Warren, W.H.** (1996) *A dynamical model of the coupling between posture and locomotion.* Paper presented at the International Conference on Bernstein's Tradition in Motor Control, Penn State University.

Warren, W.H. & Kay, B.A. (1996) *Is the focus of expansion used to control steering during walking?* Paper presented at the Annual Meeting of the Psychonomic Society, Chicago, IL.

Kay, B.A. & **Warren, W.H.** (1996) *A dynamical model of the coupling between posture and gait.* Paper presented at the Annual Meeting of the Society for Neuroscience, Washington, DC.

Warren, W.H., Li, L.Y., Ehrlich, S.M., & Banks, M.S. (1997) *Is perception of heading during simulated rotation based on radial foreground flow?* Paper presented at the Annual Meeting of the Association for Vision Research and Ophthalmology, Fort Lauderdale, FL.

Li, L.Y. & **Warren, W.H.** (1997) *Effects of motion parallax and reference objects on heading perception during translation and rotation.* Poster presented at the Annual Meeting of the Association for Vision Research and Ophthalmology, Fort Lauderdale, FL.

Duchon, A.P. & **Warren, W.H.** (1997) *Path planning vs. on-line control in visually guided locomotion.* Poster presented at the Annual Meeting of the Association for Vision Research and Ophthalmology, Fort Lauderdale, FL.

Li, L. & **Warren, W.H.** (1997) *Perceiving heading during translation and rotation.* Poster presented at the International Conference on Vision and Action, York University, Toronto.

Duchon, A. & **Warren, W.H.** (1997) *Balancing optic flow for steering.* Poster presented at the International Conference on Vision and Action, York University, Toronto.

Warren, W.H. & Kay, B.A. (1997) *The focus of expansion is used to control walking.* Poster presented at the 9th International Conference on Perception and Action, University of Toronto at Scarborough.

Duchon, A.P. & **Warren, W.H.** (1997) *An ecological approach to mobile robotics.* Poster presented at the 9th International Conference on Perception and Action, University of Toronto at Scarborough.

Li, L. & **Warren, W.H.** (1997) *Heading perception during combined observer translation and rotation.* Poster presented at the 9th International Conference on Perception and Action, University of Toronto at Scarborough.

Warren, W.H. & Kay, B.A. (1997) *Control law switching during visually guided walking.* Paper presented at the Annual Meeting of the Psychonomic Society, Philadelphia, PA.

Warren, W.H. & Li, L. (1998) *Perception of heading during simulated rotation: Influence of dot density and depth range.* Talk presented at the Annual Meeting of the Association for Vision Research and Ophthalmology, Fort Lauderdale, FL.

Duchon, A.P. & **Warren, W.H.** (1998) *Interaction of two strategies for controlling locomotion.* Talk presented at the Annual Meeting of the Association for Vision Research and Ophthalmology, Fort Lauderdale, FL.

Li, L. & **Warren, W.H.** (1998) *Ambiguity of the flow field during simulated rotation: Influence of instructions and fixation.* Poster presented at Annual Meeting of the Association for Vision Research and Ophthalmology, Fort Lauderdale, FL.

Yum, J., Duchon, A.P., & **Warren, W.H.** (1998) *A moving object biases both active steering and perceived heading.* Poster presented at the Annual Meeting of the Association for Vision Research and Ophthalmology, Fort Lauderdale, FL.

Warren, W.H. (1998) *Interaction of heading and equalization strategies for controlling locomotion.* Talk presented at the Annual Meeting of the Psychonomic Society, Dallas, TX.

Li, L. & **Warren, W.H.** (1999) *Active control of steering during translation and rotation.* Talk presented at the Vision/Attention Mini-Conference, Eastern Psychological Association, Providence, RI.

Duchon, A.P. & **Warren, W.H.** (1999) *Equalization strategy for steering.* Talk presented at the Vision/Attention Mini-Conference, Eastern Psychological Association, Providence, RI.

Warren, W.H. & Duchon, A.P. (1999) *Interaction of heading and equalization strategies for steering.* Talk presented at the Vision/Attention Mini-Conference, Eastern Psychological Association, Providence, RI.

Li, L. & **Warren, W.H.** (1999) *Active control of steering during translation and rotation.* Poster presented at the Annual Meeting of the Association for Vision Research and Ophthalmology, Fort Lauderdale, FL.

Duchon, A.P. & **Warren, W.H.** (1999) *Equalization strategy for steering.* Poster presented at the Annual Meeting of the Association for Vision Research and Ophthalmology, Fort Lauderdale, FL.

Duchon, A.P. & **Warren, W.H.** (1999) *From insects to robots to humans: Bridging the gap.* Talk presented at the 10th International Conference on Perception and Action, Edinburgh, Scotland.

Warren, W.H. & Kay, B.A. (1999) *Control of walking from optic flow.* Talk presented at the European Conference on Visual Perception, Trieste, Italy.

Aginsky, V., Duchon, A., Warren, W., & Tarr, M. (1999) Landmarks vs. path integration in virtual reality. Talk presented at the Conference on Object Perception and Memory, Los Angeles, CA.

Duchon, A., Bud, M., Warren, W., & Tarr, M. (1999) The role of optic flow in human path integration. Poster presented at the Annual Meeting of the Psychonomic Society, Los Angeles, CA.

Warren, W.H. & Li, L. (1999) *Heading from optic flow: A resolution of the rotation problem.* Talk presented at the Annual Meeting of the Psychonomic Society, Los Angeles, CA.

Bud,M.J., Duchon, A.P., **Warren, W.H.**, & Tarr, M.J. (2000) *The roles of optic flow and non-visual information in human path integration.* Cognitive Neuroscience Conference, San Francisco, CA.

Li, L, Peli, E., & **Warren, W.H.** (2000) *How do tunnel vision patients use vision to determine direction of self-motion?* American Neurological Association, Boston, MA.

Warren, W.H., Zosh, W.D., Sahuc,S., Duchon, A.P., & Kay, B.A. (2000) *Optic flow vs. egocentric direction in the visual control of walking.* Poster presented at the Annual Meeting of the Association for Vision Research and Ophthalmology, Fort Lauderdale, FL.

Bud, M.J., **Warren, W.H.**, & Tarr, M.T. (2000) *The role of optic flow and body senses in path integration.* Talk presented at the Conference on Object Perception and Memory, New Orleans, LA.

Warren, W.H. & Fajen, B.R. (2000) *Behavioral dynamics of steering and obstacle avoidance.* Talk presented at the Annual Meeting of the Psychonomic Society, New Orleans, LA.

Zosh, W.D., Duchon, A.P., & **Warren, W.H.** (2000) *The role of optic flow in adaptation to visual displacements during walking.* Poster presented at the Annual Meeting of the Psychonomic Society, New Orleans, LA.

Warren, W.H. (2000) *The mutual construction of knowledge.* Paper presented to the Wayland Faculty Seminar on Science Studies, Brown University.

Warren, W., Fajen, B., & Belcher, D. (2001) Behavioral dynamics of steering, obstacle avoidance, and route selection. *Journal of Vision, 1(3),* 184.

Foo, P, Duchon, A., Warren, W., & Tarr, M. (2001) Do humans integrate routes into a "cognitive map"? *Journal of Vision, 1(3),* 186.

Fajen, B. & Warren, W. (2001) Interception of moving objects on foot. *Journal of Vision, 1,* 187.

Kearns, M.J., **Warren, W.H.**, Tarr, M.J, & Duchon, A.P. (2001) Does optic flow contribute to human path integration? *Journal of Vision, 1(3),* 134.

Harrison, M., **Warren, W.H.**, & Tarr, M.J. (2001) The geometry of "cognitive maps:" Metric vs. ordinal structure. *Journal of Vision, 1(3),* 137.

Fajen, B.R. & **Warren, W.H.** (2001) *Behavioral dynamics of on-line route selection in complex scenes.* Poster presented at the Annual Meeting of the Psychonomic Society, Orlando, FL.

Foo, P.S., Duchon, A., **Warren, W.H.**, & Tarr, M.J. (2001) *Local landmarks are used to take short-cuts during navigation.* Poster presented at the Annual Meeting of the Psychonomic Society, Orlando, FL.

Kearns, M.B. & **Warren, W.H.** (2001) *The role of visual landmarks during path integration.* Poster presented at the Annual Meeting of the Psychonomic Society, Orlando, FL.

Fink, P.W. & **Warren, W.H.** (2002) Velocity dependence of optic flow strategy for steering and obstacle avoidance. *Journal of Vision, 2(7),* 430.

Fajen, B.R., Beem, N., & **Warren, W.H.** (2002) *Route selection emerges from the dynamics of steering and obstacle avoidance. Journal of Vision, 2(7),* 418.

Kearns, M.J., Durgin, F., & **Warren, W.H.** (2002) Sensitivity to the gain of optic flow during walking. *Journal of Vision, 2(7),* 431.

Foo, P.S., **Warren, W.**, & Tarr, M.J. (2002) Dependence on path integration and landmarks when learning a new environment. *Journal of Vision, 2(7),* 419.

Harrison, M.C., **Warren, W.H.**, & Tarr, M.J. (2002) Ordinal structure in route navigation. *Journal of Vision, 2(7),* 636.

Warren, W.H. & Fajen, B.R. (2002) *Behavioral dynamics of intercepting a moving target.* Paper presented at the Annual Meeting of the Psychonomic Society, Kansas City, MO.

Fink, P.W. & **Warren, W.H.** (2002) *Velocity dependence of optic flow strategy for steering.* Poster presented at the Annual Meeting of the Psychonomic Society, Kansas City, MO.

Foo, P.S., **Warren, W.H.** & Tarr, M.J. (2002) *Landmarks vs. path integration when learning a new environment.* Poster presented at the Annual Meeting of the Psychonomic Society, Kansas City, MO.

Warren, W.H., Sun, D., & Fajen, B.R. (2003) Behavioral dynamics of avoiding a moving obstacle. *Journal of Vision, 3(9),* 134.

Foo, P.S., **Warren, W.H.**, & Tarr, M.J. (2003) Human shortcut performance in a structured maze environment. *Journal of Vision, 3(9)*, 156.

Fink, P.W. Foo, P.S. & **Warren, W.H.** (2003) Mapping vision to action in the outfielder problem. *Journal of Vision, 3(9),* 135.

Siegler, I., Mantel, B., **Warren, W.H.**, & Bardy, B. (2003). *Behavioral dynamics of a rhythmic ball-bouncing task.* Paper presented at the Progress in Motor Control IV, Caen, France.

Foo, P.S., Goldfield, E., Kay, B., & **Warren, W.H.** (2003) *The dynamics of infant bouncing: Learning to bounce at resonance.* Poster presented at the Annual Meeting of the Psychonomic Society, Vancouver, Canada.

Warren, W.H., Fink, P.W., & Foo, P.S. (2003) *Catching fly balls in VR: Manipulation of ball trajectory and gravity.* Paper presented at the Annual Meeting of the Psychonomic Society, Vancouver, Canada.

Siegler, I., Mantel, B., **Warren, W.**, & Bardy, B. (2003) *Le controle du rebond en situation de jonglage virtuel: Dynamique du comportement avant et après perturbations des parameters environnementaux.* Association des Chercheurs en Activités Physiques et Sportives, France.

Owens, J. & **Warren, W.H.** (2004) Intercepting moving targets on foot: Target acceleration and direction change. *Journal of Vision, 4(8),* 801.

Chardenon, A. & **Warren, W.H.** (2004) Intercepting moving targets on foot: Control of walking speed and direction. *Journal of Vision, 4(8),* 805.

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Warren, W.H. & Zhao, M. (2013) *Is information optimally integrated in human navigation?* Society of Experimental Psychologists, Providence, RI. (talk)

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Warren, W.H. & Bonneaud, S. (2014) Multi-agent simulation of collective behavior in human crowds. *Journal of Vision, 14*(10): 4. (talk)

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Dachner, G.C. & **Warren, W.H.** (2014) Behavioral dynamics of alignment in pedestrian following. *7th International Conference on Pedestrian and Evacuation Dynamics,* Delft, NL. (talk)

Rio, K.W. & **Warren, W.H.** (2014) The visual coupling between neighbors in real and virtual crowds. *7th International Conference on Pedestrian and Evacuation Dynamics,* Delft, NL. (talk)

Warren, W.H. (2015) *The local coupling between neighbors in a virtual crowd.* Society of Experimental Psychologists, University of Virginia. (talk)

Kinateder, M. & **Warren, W.H.** (2015) Neighbor influence on evacuation behavior in real and virtual environments. *Journal of Vision, 15*(12): 409.

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Warren, W.H. (2017, Mar. 3) *The local neighborhood in a human crowd.* Society of Experimental Psychologists, Vanderbilt University. (talk)

Dachner, G. & **Warren, W.H.** (2017) A vision-based model for the joint control of speed and heading in pedestrian following. *Journal of Vision*, *17*(10): 716.

Wirth, T. & **Warren, W.H.** (2017) Recruitment of pedestrians into collective crowd motion. *Journal of Vision*, *17*(10): 717.

Warren, W.H. & Dachner, G. (2017) Simulating collective motion with a model of pedestrian following. *Journal of Vision*, *17*(10): 718.

Comunale, B., Kinateder, M., & **Warren, W.H.** (2017, May 26) *Exit choice in an emergency evacuation scenario is influenced by exit familiarity and neighbor behavior.* Association for Psychological Science Convention, Boston, MA.

Baxter, B.A. & **Warren, W.H.** (2017, June 26) *Waypoint selection in barrier avoidance.* International Society for Posture and Gait Research, Ft. Lauderdale, Florida.

Warren, W.H. (2017, July 5) *The local neighbourhood in a human crowd.* International Conference on Perception and Action, Seoul, South Korea. (talk)

Warren, W.H. & Dachner, G.C. (2018, Mar. 2) *Follow the crowd: A vision-based model.* Society of Experimental Psychologists, University of Arizona. (talk)

Ericson, J.D., Chrastil, E.R., & **Warren W.H.** (2018, June 6-9). *Evaluating a space syntax measure at high resolution*. Environmental Design Research Association (EDRA), Oklahoma City, OK. (talk)

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Baxter, B. & **Warren, W.H.** (2018) Optical variables influencing barrier avoidance. *Journal of Vision*, *18*(10): 1038.

Warren, W.H. (2019) *The cognitive map meets the impossible heptagon*. Society of Experimental Psychologists, Rutgers University, NJ. (talk)

Wirth, T.D. & **Warren, W.H.** (2019) Collective decision-making in human crowds: Majority rule emerges from local averaging. *Journal of Vision*, *19*(10): 52a (talk).

Bai, J. & **Warren, W.H.** (2019) The relative rate of optical expansion controls speed in 1D pedestrian following. *Journal of Vision*, *19*(10): 52. (talk)

Dachner, G. & **Warren, W.H.** (2019) Both optical expansion and depth information are used to control 2D pedestrian following. *Journal of Vision*, *19*(10): 178c.

Baxter, B.A. & **Warren, W.H.** (2019, July 2) *Spatial updating of remembered goal position during online control of obstacle avoidance.* International Society for Posture and Gait Research, Edinburgh, Scotland, UK.

Warren, W.H. & Dachner, G. (2019) *Multi-agent crowd dynamics: Visual coupling and network reconstruction.* International Conference on Perception and Action, Groningen, The Netherlands. (talk)

Dachner, G. & **Warren, W.H.** (2019) *Dynamic occlusion reduces the influence of neighbors in human crowds.* International Conference on Perception and Action, Groningen, The Netherlands. (talk)

Warren, W.H. & Dachner, G. (2019) A visual model of collective motion in human crowds. *Perception, 48* (2S): 26. (talk)

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Mullick, P., Appert-Rolland, **Warren, W.H.** & Pettré, J. (2022, Oct. 15) *Methods of density estimation for pedestrians moving without a spatial boundary.* Traffic and Granular Flow, Deli, India.

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Yoshida, K. & **Warren, W.H.** (2023, June 28) *Structural analysis and topological manipulation of visual influence networks in walking crowds.* 11th International Conference on Pedestrian and Evacuation Dynamics, Eindhoven, The Netherlands.

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Veprek, K. & **Warren, W.H.** (2024) How many moving obstacles do we respond to at once? A temporal threshold model best accounts for collision avoidance in a crowd. *Journal of Vision,* 24(10), 1313.

Yoshida, K., Taylor, H., & **Warren, W.H.** (2024) Can covert and explicit 'leaders' steer and split real human crowds? *Journal of Vision,* 24(10), 1325.

Engstrom, C. & **Warren, W.H.** (2024, June 18) *Naive navigation strategies utilize local perceptual information and are modulated by destination proximity.* International Navigation Symposium (iNAV), Merano, Italy.

Veprek, K. & **Warren, W.H**. (2024, Jun. 27) *How many potential collisions do we respond to at once? Investigating the efficacy of visual thresholds in human crowds.* International Conference on Perception and Action, Trondheim, Norway.

Engstrom, C. & **Warren, W.H.** (2024, Jun. 27) *Local navigation strategies guide global route selection.* International Conference on Perception and Action, Trondheim, Norway.

Feldmann, S., Veprek, K. & **Warren, W.H.** (2024, Dec. 2) *Formation of lanes and stripes in crossing pedestrian flows using an empirical human model.* Traffic and Granular Flows, Lyon, France.

Yoshida, K., Taylor, H., & **Warren, W.H.** (2024, Dec. 4) *The influence of explicit and covert leaders on human crowd motion.* Traffic and Granular Flows, Lyon, France (talk).

Media

Research on optic flow featured in "Researchers find neurons that may help us navigate." *Science (1996), 273,* 1489-90.

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Research featured in *Science News,* Feb 2001.

Research featured in "Going with the optic flow," *Science Now*, Jan. 30, 2001 (*Science* magazine online).

Research featured in "Virtual Reality and Vision," *Science and Technology News Network,* (http://www.stn2.com/articles/view.php3?language=english&type=article&article_id=218391596).

Research featured in *Science Daily*, "Virtual reality shows our need for optic flow in finding our way," (11/16/07).

Research featured in *Technology Trends* (11/16/07) (http://www.primidi.com/2007/11/16.html).

Research featured in *Medical News Today*, "Improved understanding of optic flow," (11/18/07).

Research featured in *PhysOrg* online, "Optic flow: A step in the right direction," (11/15/07).

Research featured by Associated Press (2010), picked up by NewYorkTimes.com, LATimes.com, ABC.com, CBS.com, Yahoo!Sports.com, FoxNews.com, *Wired*Wiki, etc.

Research featured in *Technology Review* online, "Can virtual reality improve people's real lives?", by Kristin Majcher (10/22/14)

Interviewed by Xconomy.com, "Brown University and the Future of Virtual Reality" , by Daniel Faggella (10/22/14)

Research featured on National Geographic Channel program, "Crowd Control: Emergency Exit" , with Daniel Pink (12/22/14).

Interviewed by Associated Press, "Did Usain Bolt Olympic Dash Trigger JFK Airport Scare?" (8/15/16)

Interviewed by Richard French, Regional News Network TV, "Pandemonium at JFK Airport" (8/25/16)

Research featured in *SIAM News Blog*, "Self-Organization and Collective Motion in Crowds," by Lina Sorg, Society for Industrial and Applied Mathematics (5/24/17)

Interviewed by Jocelyn Kaiser, *Science* Magazine News online, "Basic scientists still feel pinch of new NIH clinical trial policy" (5/4/18).

Research featured on Association for Psychological Science (APS) website, "How Humans Move With The Crowd" (8/6/18).

Research featured on *Today Show* website, "Researchers explain that awkward sidewalk dance," by Meghan Holohan (9/11/18).

Research featured in Hsu, J. (2019) "Machines on mission possible," *Nature Machine Intelligence, 1, 124-127.*

Research featured on *New Scientist* website, "Honeybees can fly sideways to fit through tight gaps" by Leah Crane. (11/23/20)

Research reported on BBC broadcast, *The Newsroom* (at 20:00 min), by Beth Timmins, (11/24/20).

Research featured in Brebner, J. & Chittka, L. (2021) "Animal cognition: The self-image of a bumblebee." *Current Biology, 31,* R207-R209.

Research reported in News from Brown, "Seen and 'herd': Collective motion in crowds is largely determined by participants' field of vision," by Corrie Pikul. (3/21/22). Featured on National Eye Institute website and Futurity website.

Research reported in *Brown Daily Herald*, "Brown researchers offer novel model to study human crowds," by Maya Davis. (4/18/22)

Research featured on AAC&U's *Academic Minute* broadcast, produced by WAMC, "Studying human 'flocking' to understand collective behavior." (5/9/22)

Interview about the Itaewon, Korea, crowd disaster on Radio Health Journal, "Why getting stuck in a crowd is more dangerous than you think," broadcast to 640+ radio affiliates (12/11/22)

Research featured on AAAS EurekAlert website, "Human crowds are best modeled by a 'visual neighborhood' " (5/16/23)

Interview for a segment of *Animal Crowds,* a three-part documentary for ARTE (French-German channel), produced by Bonne Pioche (known for *March of the Penguins*). (Scheduled for Apr. 2025)

Service

Board of Directors, International Society for Ecological Psychology, 1986-present

Consulting Editor, *Ecological Psychology,* 1989-present

Consulting Editor, *Journal of Experimental Psychology: Human Perception and Performance,* 1989-2012

Editorial Board, *Human Movement Science,* 1992-2017

Editorial Board, *Journal of Motor Behavior,* 1997-2012?

NSF Advisory Panel on Human Cognition and Perception, 1995-1998

Review Committee, Vision Sciences Society, 2000-2016

Committee of Visitors, NSF Division of Social and Behavioral Sciences, 2003

Scientific Advisor, Network for Sensory Research, 2011-present

NSF College of Reviewers, 2013-present

Scientific Advisory Board, Aging in Vision and Action Laboratory, Institute of Vision, Paris. 2014-16

President, International Society for Ecological Psychology, 2015-present

Organizing committee, International Conference on Perception and Action, Guadalajara, Mexico, 2023.

Ad Hoc Editor, *Proceedings of the National Academy of Sciences*.

Ad Hoc Reviewer, *Nature; Nature Neuroscience; Nature Machine Intelligence; Proceedings of the National Academy of Sciences; PNAS Nexus; Current Biology; Journal of the Royal Society Interface; iScience; Journal of Experimental Biology; Psychological Science; Psychological Review; Psychological Bulletin; Cognition; Cognitive Psychology; Cognitive Science; Journal of Vision; Vision Research; Journal of the Optical Society of America A; Perception; iPerception; Journal of Experimental Psychology: Human Perception and Performance; Journal of Experimental Psychology: Learning, Memory, & Cognition; Journal of Experimental Psychology: General; Attention, Perception & Psychophysics; Psychonomic Bulletin and Review; Acta Psychologica; Applied Optics; Physica A; Journal of Statistical Mechanics; Frontiers in Physics; Complexity; Journal of Neurophysiology; Experimental Brain Research; Neural Computation; Adaptive Behavior; Ecological Psychology; Scientific Reports; NeuroReport; PLoS-One; PLoS Computational Biology; Behavioral and Brain Sciences; Motor Control; Journal of Motor Behavior; Gait & Posture; ACM Transactions on Applied Perception; IEEE Transactions on Visualization and Computer Graphics; IEEE Transactions on Human-Machine Systems; Journal of Intelligent Systems; Spatial Cognition & Computation; Quarterly Journal of Experimental Psychology; Philosophical Psychology; Cognitive Neuropsychology; Developmental Psychology; Developmental Psychobiology; Journal of Neuroengineering and Rehabilitation; Journal of Behavioral Decision Making; Perceptual and Motor Skills;* National Science Foundation; National Institutes of Health; National Institute of Mental Health; NWO (Netherlands); National Sciences and Research Council of Canada; The Wellcome Trust, England; Canada Council for the Arts; SIGGRAPH; IEEE Virtual Reality; IEEE Mixed and Augmented Reality.