References

Abbott, L. (1994) Decoding neuronal firing and modeling neural networks. *Quart. Rev. Biophys.*, **27**:291–331.

Abbott, L. F. (1991) Realistic synaptic inputs for model neural networks. *Network*, **2**: 245–258.

Abbott, L. F. and Kepler, T. B. (1990) Model neurons: from Hodgkin–Huxley to Hopfield. In Garrido, L., ed., *Statistical Mechanics of Neural Networks*, pp. 5–18. Springer, Berlin.

Abbott, L. F. and Nelson, S. B. (2000) Synaptic plastictiy – taming the beast. *Nature Neurosci.*, **3**:1178–1183.

Abbott, L. F. and van Vreeswijk, C. (1993) Asynchronous states in a network of pulse-coupled oscillators. *Phys. Rev. E*, **48**:1483–1490.

Abbott, L. F., Fahri, E., and Gutmann, S. (1991) The path integral for dendritic trees. *Biol. Cybern.*, **66**:49–60.

Abeles, M. (1991) *Corticonics*. Cambridge University Press, Cambridge.

Acebron, J., Bonilla, L., Perez Vicente, C., Ritort, F., and Spigler, R. (2005) The Kuramoto model: A simple paradigm for synchronization phenomena. *Rev. Mod. Phys.*, **77**: 137–185.

Adrian, E. D. (1926) The impulses produced by sensory nerve endings. *J. Physiol. (Lond.)*, **61**:49–72.

Ahmadian, Y., Packer, A. M., Yuste, R., and Paninski, L. (2011a) Designing optimal stimuli to control neuronal spike timing. *J. Neurophys.*, **106**(2):1038–1053.

Ahmadian, Y., Pillow, J., and Paninski, L. (2011b) Efficient Markov Chain Monte Carlo methods for decoding population spike trains. *Neural Comput.*, **1**(23):46–96.

Ahrens, M., Paninski, L., and Sahani, M. (2008) Inferring input nonlinearities in neural encoding models. *Network*, **19**:35–67.

Aizenman, C. and Linden, D. (1999) Regulation of the rebound depolarization and spontaneous firing patterns of deep nuclear neurons in slices of rat cerebellum. *J. Neurophysiol.*, **82**:1697–1709.

Albright, T., Desimone, R., and Gross, C. (1984) Columnar organization of directionally selective cells in visual area MT of the macaque. *J. Neurophysiol.*, **51**:16–31.

Amari, S. (1972) Characteristics of random nets of analog neuron-like elements. *IEEE Trans. Syst. Man. Cyber.*, **2**:643–657.

Amari, S. (1974) A method of statistical neurodynamics. *Kybernetik*, **14**:201–215.

Amari, S. (1977) A mathematical foundation of statistical neurodynamics. *SIAM J. Appl. Math.*, **33**:95–126.

Amit, D. J. (1989) *Modeling Brain Function: The World of Attractor Neural Networks*. Cambridge University Press, Cambridge.

Amit, D. J. and Brunel, N. (1997a) Dynamics of a recurrent network of spiking neurons before and following learning. *Network*, **8**:373–404.

Amit, D. J. and Brunel, N. (1997b) A model of spontaneous activity and local delay activity during delay periods in the cerebral cortex. *Cerebral Cortex*, **7**:237–252.

Amit, D. J., Gutfreund, H., and Sompolinsky, H. (1985) Storing infinite numbers of patterns in a spin-glass model of neural networks. *Phys. Rev. Lett.*, **55**:1530–1533.

Amit, D. J., Gutfreund, H., and Sompolinsky, H. (1987a) Information storage in neural networks with low levels of activity. *Phys. Rev. A*, **35**:2293–2303.

Amit, D. J., Gutfreund, H., and Sompolinsky, H. (1987b) Statistical mechanics of neural networks near saturation. *Ann. Phys. (NY)*, **173**:30–67.

Amit, D. J. and Tsodyks, M. V. (1991) Quantitative study of attractor neural networks retrieving at low spike rates. 1: Substrate — spikes, rates, and neuronal gain. *Network*, **2**:259–273.

Anderson, J. A. (1972) A simple neural network generating an interactive memory. *Math. Biosci.*, **14**:197–220.

Anderson, J. A. and Rosenfeld, E., eds (1988) *Neurocomputing: Foundations of Research*. MIT Press, Cambridge, MA.

Angelucci, A. and Bressloff, P. (2006) Contribution of feedforward, lateral and feedback connections to the classical receptive field center and extra-classical receptive field surround of primate v1 neurons. *Prog. Brain Res.*, **154**:93–120.

Aracri, P., Colombo, E., Mantegazza, M., *et al.* (2006) Layer-specific properties of the persistent sodium current in sensorimotor cortex. *J. Neurophysiol.*, **95**(6):3460–3468.

Artola, A. and Singer, W. (1993) Long-term depression of excitatory synaptic transmission and its relationship to long-term potentiation. *Trends Neurosci.*, **16**(11):480–487.

Artola, A., Bröcher, S., and Singer, W. (1990) Different voltage dependent thresholds for inducing long-term depression and long-term potentiation in slices of rat visual cortex. *Nature*, **347**:69–72.

Atkinson, K. (1997) *The Numerical Solution of Integral Equations of the Second Kind*, Vol. 4. Cambridge University Press, Cambridge.

Avery, R. B. and Johnston, D. (1996) Multiple channel types contribute to the low-voltage-activated calcium current in hippocampal CA3 pyramidal neurons. *J. Neurosci*, **16**(18):5567–82.

Aviel, Y. and Gerstner, W. (2006) From spiking neurons to rate models: a cascade model as an approximation to spiking neuron models with refractoriness. *Phys. Rev. E*, **73**:51908.

Badel, L., Lefort, S., Berger, T., Petersen, C., Gerstner, W., and Richardson, M. (2008a) Extracting non-linear integrate-and-fire models from experimental data using dynamic I-V curves. *Biol. Cybernetics*, **99**(4–5):361–370.

Badel, L., Lefort, S., Brette, R., Petersen, C., Gerstner, W., and Richardson, M. (2008b) Dynamic I-V curves are reliable predictors of naturalistic pyramidal-neuron voltage traces. *J. Neurophysiol*, **99**:656–666.

Bair, W. and Koch, C. (1996) Temporal precision of spike trains in extrastriate cortex of the behaving macaque monkey. *Neural Comput.*, **8**:1185–1202.

Bair, W., Koch, C., Newsome, W., and Britten, K. (1994) Power spectrum analysis of MT neurons in the behaving monkey. *J. Neurosci.*, **14**:2870–2892.

Balaguer-Ballester, E., Lapish, C., Seamans, J., and Durstewitz, D. (2011) Dynamics of frontal cortex ensembles during memory-guided decision-making. *PLOS Comput. Biol.*, **7**:e1002057.

Baras, D. and Meir, R. (2007) Reinforcement learning, spike-time-dependent plasticity, and the BCM rule. *Neural Comput.*, **19**(8):2245–2279.

Barbieri, F. and Brunel, N. (2008) Can attractor network models account for the statistics of firing during persistent activity in prefrontal cortex? *Front. Neurosci.*, **2**:114–122.

Bauer, H. U. and Pawelzik, K. (1993) Alternating oscillatory and stochastic dynamics in a model for a neuronal assembly. *Physica D*, **69**:380–393.

Bazhenov, M. and Timofeev, I. (2006) Thalamocortical oscillations. *Scholarpedia*, **1**:1319.

Bell, C., Han, V., Sugawara, Y., and Grant, K. (1997) Synaptic plasticity in a cerebellum-like structure depends on temporal order. *Nature*, **387**:278–281.

Ben Arous, G. and Guionnet, A. (1995) Large deviations for Langevin spin glass dynamics. *Prob. Theory Rel. Fields*, **102**:455–509.

Ben-Yishai, R., Bar-Or, R., and Sompolinsky, H. (1995) Theory of orientation tuning in visual cortex. *Proc. Natl. Acad. Sci. USA*, **92**:3844–3848.

Benabid, A., Chabardes, S., Mitrofanis, J., and Pollak, P. (2009) Deep brain stimulation of the subthalamic nucleus for the treatment of Parkinson's disease. *Lancet Neurol.*, **8**:67–81.

Benabid, A., Pollak, P., *et al.* (1991) Long-term suppression of tremor by chronic stimulation of the ventral intermediate thalamic nucleus. *Lancet*, **337**:403–406.

Benda, J. and Herz, A. V. M. (2003) A universal model for spike-frequency adaptation. *Neural Comput.*, **15**(11):2523–2564.

Berger, T. K., Perin, R., Silberberg, G., and Markram, H. (2009) Frequency-dependent disynaptic inhibition in the pyramidal network: a ubiquitous pathway in the developing rat neocortex. *J. Physiol.*, **587**(22):5411–5425.

Bernander, Ö., Douglas, R. J., Martin, K. A. C., and Koch, C. (1991) Synaptic background activity influences spatiotemporal integration in single pyramidal cells. *Proc. Natl. Acad. Sci. USA*, **88**:11569–11573.

Berry, M. and Meister, M. (1998) Refractoriness and neural precision. *J. Neurosci.*, **18**:2200–2211.

Berry, M. J., Warland, D. K., and Meister, M. (1997) The structure and precision of retinal spike trains. *Proc. Natl. Acad. Sci. USA*, **94**:5411–5416.

Bi, G. and Poo, M. (1998) Synaptic modifications in cultured hippocampal neurons: dependence on spike timing, synaptic strength, and postsynaptic cell type. *J. Neurosci.*, **18**:10464–10472.

Bi, G. and Poo, M. (1999) Distributed synaptic modification in neural networks induced by patterned stimulation. *Nature*, **401**:792–796.

Bi, G. and Poo, M. (2001) Synaptic modification of correlated activity: Hebb's postulate revisited. *Ann. Rev. Neurosci.*, **24**:139–166.

Bi, G.-Q. (2002) Spatiotemporal specificity of synaptic plasticity: cellular rules and mechanisms. *Biol. Cybernetics*, **87**(5–6):319–332.

Bialek, W., Rieke, F., de Ruyter van Stevenick, R. R., and Warland, D. (1991) Reading a neural code. *Science*, **252**:1854–1857.

Bienenstock, E., Cooper, L., and Munroe, P. (1982) Theory of the development of neuron selectivity: orientation specificity and binocular interaction in visual cortex. *J. Neurosci.*, **2**:32–48.

Binczak, S., Eilbeck, J., and Scott, A. C. (2001) Ephaptic coupling of myelinated nerve fibers. *Physica D*, **148**(1):159–174.

Bliss, T. V. P. and Collingridge, G. L. (1993) A synaptic model of memory: long-term potentiation in the hippocampus. *Nature*, **361**:31–39.

Bogacz, R., Brown, E., Moehlis, J., Holmes, P., and Cohen, J. (2006) The physics of optimal decision making: a formal analysis of models of performance in two-alternative forced-choice tasks. *Psychol. Rev.*, **113**:700–765.

Bonhoeffer, T. and Grinvald, A. (1991) Iso-orientation domains in cat visual cortex are arranged in pinwheel-like patterns. *Nature*, **353**:429–431.

Bower, J. M. and Beeman, D. (1995) *The Book of Genesis*. Springer, New York.

Brass, M. and Haggard, P. (2007) To do or not to do: the neural signature of self-control. *J. Neurosci.*, **27**:9141–9145.

Bressloff, P. C. and Cowan, J. D. (2002) The visual cortex as a crystal. *Physica D: Nonlinear Phenomena*, **173**(3-4):226–258.

Bressloff, P. C. and Taylor, J. G. (1994) Dynamics of compartmental model neurons. *Neural Networks*, **7**:1153–1165.

Brette, R. and Gerstner, W. (2005) Adaptive exponential integrate-and-fire model as an effective description of neuronal activity. *J. Neurophysiol.*, **94**:3637–3642.

Brette, R., Rudolph, M., *et al.* (2007) Simulation of networks of spiking neurons: a review of tools and strategies. *J. Comput. Neurosci.*, **23**(3):349–398.

Brillinger, D. R. (1988) Maximum likelihood analysis of spike trains of interacting nerve cells. *Biol. Cybern.*, **59**:189–200.

Brillinger, D. R. (1992) Nerve cell spike train data analysis: a progression of techniques. *J. Am. Stat. Assoc.*, **87**:260–271.

Brockwell, A., Rojas, A., and Kass, R. (2004) Recursive Bayesian decoding of motor cortical signals by particle filtering. *J. Neurophysiol.*, **91**(4):1899–1907.

Brockwell, A., Kass, R. E., and Schwartz, A. (2007) Statistical signal processing and the motor cortex. *Proc. IEEE*, **95**(5):881–898.

Brown, E., Barbieri, R., Ventura, V., Kass, R., and Frank, L. (2002) The time-rescaling theorem and its application to neural spike train data analysis. *Neural Comput.*, **14**: 325–346.

Brown, E., Frank, L., Tang, D., Quirk, M., and Wilson, M. (1998) A statistical paradigm for neural spike train decoding applied to position prediction from ensemble firing patterns of rat hippocampal place cells. *J. Neurosci.*, **18**:7411–7425.

Brown, T. H., Ganong, A. H., Kairiss, E. W., Keenan, C. L., and Kelso, S. R. (1989) Long-term potentiation in two synaptic systems of the hippocampal brain slice. In Byrne, J. and Berry, W., eds, *Neural Models of Plasticity*, pp. 266–306. Academic Press, San Diego, CA.

Brown, T. H., Zador, A. M., Mainen, Z. F., and Claiborne, B. J. (1991) Hebbian modifications in hippocampal neurons. In Baudry, M. and Davis, J., eds, *Long–term Potentiation*, pp. 357–389. MIT Press, Cambridge, MA.

Brunel, N. (2000) Dynamics of sparsely connected networks of excitatory and inhibitory neurons. *Comput. Neurosci.*, **8**:183–208.

Brunel, N., Chance, F., Fourcaud, N., and Abbott, L. (2001) Effects of synaptic noise and filtering on the frequency response of spiking neurons. *Phys. Rev. Lett.*, **86**: 2186–2189.

Brunel, N. and Hakim, V. (1999) Fast global oscillations in networks of integrate-and-fire neurons with low firing rates. *Neural Comput.*, **11**:1621–1671.

Bryant, H. L. and Segundo, J. P. (1976) Spike initiation by transmembrane current: a white noise analysis. *J. Physiol.*, **260**:279–314.

Buck, J. and Buck, E. (1976) Synchronous fireflies. *Scientific American*, **234**:74–85.

Bugmann, G., Christodoulou, C., and Taylor, J. G. (1997) Role of temporal integration and fluctuation detection in the highly irregular firing of a leaky integrator neuron model with partial reset. *Neural Comput.*, **9**:985–1000.

Burkitt, A. N. and Clark, G. M. (1999) Analysis of integrate-and-fire neurons: synchronization of synaptic input and spike output. *Neural Comput.*, **11**:871–901.

Bussgang, J. J. (1952) Cross-correlation function of amplitude-distorted Gaussian signals. In *Tech. Rep. 216, Research Lab. Electronics*, Institute of Technology, Cambridge, MA.

Buzsaki, G. (2011) Hippocampus. *Scholarpedia*, **6**:1468.

Calvin, W. and Stevens, C. (1968) Synaptic noise and other sources of randomness in motoneuron interspike intervals. *J. Neurophysiol.*, **31**:574–587.

Canavier, C. (2006) Phase response curve. *Scholarpedia*, **1**:1332.

Capocelli, R. M. and Ricciardi, L. M. (1971) Diffusion approximation and first passage time problem for a neuron model. *Kybernetik*, **8**:214–223.

Caporale, N. and Dan, Y. (2008) Spike timing-dependent plasticity: a Hebbian learning rule. *Ann. Rev. Neurosci.*, **31**:25–46.

Carnevale, N. and Hines, M. (2006) *The Neuron Book*. Cambridge University Press, Cambridge.

Cessac, B. (2008) A discrete time neural network model with spiking neurons: rigorous results on the spontaneous dynamics. *J. Math. Biol.*, **56**:311–345.

Cessac, B., Doyon, B., Quoy, M., and Samuleides, M. (1994) Mean-field equations, bifurcation map and route to chaos in discrete time neural networks. *Physica D*, **74**:24–44.

Chacron, M., Longtin, A., St-Hilaire, M., and Maler, L. (2000) Suprathreshold stochastic firing dynamics with memory in *P*-type electroreceptors. *Phys. Rev. Lett.*, **85**: 1576–1579.

Chichilnisky, E. J. (2001) A simple white noise analysis of neuronal light responses. *Network*, **12**:199-213.

Chornoboy, E., Schramm, L., and Karr, A. (1988) Maximum likelihood identification of neural point process systems. *Biol. Cybernetics*, **59**:265–275.

Chow, C. C. (1998) Phase-locking in weakly heterogeneous neuronal networks. *Physica D*, **118**:343–370.

Chow, C. C. and White, J. (1996) Spontaneous action potential fluctuations due to channel fluctuations. *Biophys. J.*, **71**:3013–3021.

Churchland, M., Cunningham, J., Kaufman, *et al.* (2012) Neural population dynamics during reaching. *Nature*, **487**:51–56.

Clopath, C., Busing, L., Vasilaki, E., and Gerstner, W. (2010) Connectivity reflects coding: A model of voltage-based spike-timing-dependent-plasticity with homeostasis. *Nature Neurosci.*, **13**:344–352.

Cohen, M. A. and Grossberg, S. (1983) Absolute stability of global pattern formation and parallel memory storage by competitive neural networks. *IEEE Trans. Sys. Man Cybernetics*, **13**:815–823.

Collins, J., Chow, C., Capela, A., and Imhoff, T. (1996) Aperiodic stochastic resonance. *Phy. Rev. E*, **54**:5575–5584.

Connors, B. W. and Gutnick, M. J. (1990) Intrinsic firing patterns of diverse cortical neurons. *Trends Neurosci.*, **13**:99–104.

Contreras, D., Destexhe, A., and Steriade, M. (1997) Intracellular and computational characterization of the intracortical inhibitory control of synchronized thalamic inputs in vivo. *J. Neurophysiol.*, **78**(1):335–350.

Cover, T. and Thomas, J. (1991) *Elements of Information Theory*. Wiley, New York.

Cox, D. R. (1962) *Renewal Theory*. Methuen, London.

Cox, D. R. and Lewis, P. A. W. (1966) *The Statistical Analysis of Series of Events*. Methuen, London.

Crisanti, A. and Sompolinsky, H. (1988) Dynamics of spin systems with randomly asymmetric bonds – Ising spins and Glauber dynamics. *Phys. Rev. A*, **37**:4865–4874.

Crochet, S. and Petersen, C. (2006) Correlating whisker behavior with membrane potential in barrel cortex of awake mice. *Nature Neurosci.*, **9**:608–610.

Crochet, S., Poulet, J. F. A., Kremer, Y., and Petersen, C. C. H. (2011) Synaptic mechanisms underlying sparse coding of active touch. *Neuron*, **69**(6):1160–75.

Cullheim, S., Fleshman, J. W., Glenn, L. L., and Burke, R. E. (1987) Membrane area and dendritic structure in type-identified triceps surae alpha motoneurons. *J. Comp. Neurol.*, **255**(1):68–81.

Curti, E., Mongillo, G., La Camera, G., and Amit, D. (2004) Mean field and capacity in realistic networks of spiking neurons storing sparsely coded random memories. *Neural Comput.*, **16**:2597–2637.

Dayan, P. and Abbott, L. F. (2001) *Theoretical Neuroscience*. MIT Press, Cambridge, MA.

de Boer, E. and Kuyper, P. (1968) Triggered correlation. *IEEE Trans. Biomed. Enging*, **15**:169–179.

de Ruyter van Stevenink, R. R. and Bialek, W. (1988) Real-time performance of a movement-sensitive neuron in the blowfly visual system: coding and information transfer in short spike sequences. *Proc. R. Soc. Lond. B*, **234**:379–414.

de Ruyter van Stevenink, R. R., Lowen, G. D., Strong, S. P., Koberle, R., and Bialek, W. (1997) Reproducibility and variability in neural spike trains. *Science*, **275**:1805.

Debanne, D., Gähwiler, B., and Thompson, S. (1998) Long-term synaptic plasticity between pairs of individual CA3 pyramidal cells in rat hippocampal slice cultures. *J. Physiol.*, **507**:237–247.

Debanne, D., Campanac, E., Bialowas, A., Carlier, E., and Alcaraz, G. (2011) Axon physiology. *Phys. Rev.*, **91**(2):555–602.

deCharms, R. and Merzenich, M. (1996) Primary cortical representation of sounds by the coordination of action-potential timing. *Nature*, **381**:610–613.

Deco, G., Rolls, E., and Romo, R. (2009) Stochastic dynamics as a principle of brain function. *Progr. Neurobiol.*, **88**:1–16.

Deco, G., Rolls, E., and Romo, R. (2010) Synaptic dynamics and decision-making. *Proc. Natl. Acad. Sci. USA*, **107**:7545–7549.

Deger, M., Schwalger, T., Naud, R., and Gerstner, W. (2013) Dynamics of interacting finite-sized networks of spiking neurons with adaptation. *arXiv*: 1311.4206.

DeAngelis, G. C., Ohzwaw, I., and Freeman, R. D. (1995) Receptive-field dynamics in the central visual pathways. *Trends Neurosci.*, **18**:451–458.

Derrida, B., Gardner, E., and Zippelius, A. (1987) An exactly solvable asymmetric neural network model. *Europhys. Lett.*, **4**:167–173.

Destexhe, A., Contreras, D., Sejnowski, T. J., and Steriade, M. (1994a) A model of spindle rhythmicity in the isolated thalamic reticular nucleus. *J. Neurophysiol.*, **72**(2): 803–818.

Destexhe, A., Mainen, Z., and Sejnowski, T. (1994b) Synthesis of models for excitable membranes, synaptic transmission and neuromodulation using a common kinetic formalism. *J. Comput. Neurosci.*, **1**:195–230.

Destexhe, A. and Pare, D. (1999) Impact of network activity on the integrative properties of neocortical pyramidal neurons in vivo. *J. Neurophysiol.*, **81**:1531–1547.

Destexhe, A., Rudolph, M., and Pare, D. (2003) The high-conductance state of neocortical neurons in vivo. *Nature Rev. Neurosci.*, **4**:739–751.

DiMattina, C. and Zhang, K. (2011) Active data collection for efficient estimation and comparison of nonlinear neural models. *Neural Comput.*, **23**(9):2242–88.

Dobson, A. and Barnett, A. (2008) *Introduction to Generalized Linear Models*, 3rd edn. Chapman and Hall, London.

Donoghue, J. (2002) Connecting cortex to machines: recent advances in brain interfaces. *Nature Neurosci.*, **5**:1085–1088.

Donoghue, J. P., Sanes, J. N., Hatsopoulos, N. G., and Gaál, G. (1998) Neural discharge and local field potential oscillations in primate motor cortex during voluntary movements. *J. Neurophys.*, **79**(1):159–173.

Douglass, J., Wilkens, L., Pantazelou, E., and Moss, F. (1993) Noise enhancement of information transfer in crayfish mechanoreceptors by stochastic resonance. *Nature*, **365**:337–340.

Druckmann, S., Bannitt, Y., Gidon, A. A., Schuermann, F., and Segev, I. (2007) A novel multiple objective optimization framework for constraining conductance-based neuron models by experimental data. *Front Neurosci*, **1**:1.

Eckhorn, R., Bauer, R., Jordan, W., Brosch, M., Kruse, W., Munk, M., and Reitboeck, H. J. (1988) Coherent oscillations: a mechanism of feature linking in the visual cortex? *Biol. Cybern.*, **60**:121–130.

Eckhorn, R., Krause, F., and Nelson, J. L. (1993) The RF-cinematogram: a cross-correlation technique for mapping several visual fields at once. *Biol. Cybern.*, **69**:37–55.

Eden, U., Truccolo, W., Fellows, M., Donoghue, J., and Brown, E. (2004) Reconstruction of hand movement trajectories from a dynamic ensemble of spiking motor cortical neurons. In *Engineering in Medicine and Biology Society, 2004. IEMBS '04. 26th Annual International Conference of the IEEE*, Vol. 2, pp. 4017–4020. IEEE.

Edwards, B. and Wakefield, G. H. (1993) The spectral shaping of neural discharges by refractory effects. *J. Acoust. Soc. Am.*, **93**:3553–3564.

Eggermont, J. J., Aertsen, A. M., and Johannesma, P. I. (1983) Quantitative characterisation procedure for auditory neurons based on the spectro-temporal receptive field. *Hearing Res.*, **10**(2):167–90.

Ermentrout, G. B. (1996) Type I membranes, phase resetting curves, and synchrony. *Neural Comput.*, **8**(5):979–1001.

Ermentrout, G. B. and Kopell, N. (1984) Frequency plateaus in a chain of weakly coupled oscillators. *SIAM J. Math. Anal.*, **15**:215–237.

Ermentrout, G. B. and Kopell, N. (1986) Parabolic bursting in an excitable system coupled with a slow oscillation. *SIAM J. Appl. Math.*, **46**:233–253.

Erneux, T. and Nicolis, G. (1993) Propagating waves in discrete bistable reaction-diffusion systems. *Physica D*, **67**(1):237–244.

Ernst, U., Pawelzik, K., and Geisel, T. (1995) Synchronization induced by temporal delays in pulse-coupled oscillators. *Phys. Rev. Lett.*, **74**:1570–1573.

Erwin, E., Obermayer, K., and Schulten, K. (1995) Models of orientation and ocular dominance columns in the visual cortex: a critcal comparison. *Neural Comput.*, **7**:425–468.

Faisal, A., Selen, L., and Wolpert, D. (2008) Noise in the nervous system. *Nat. Rev. Neurosci.*, **9**:202.

Faugeras, O., Touboul, J., and Cessac, B. (2009) A constructive mean-field analysis of multi-population neural networks with random synaptic weights and stochastic inputs. *Front. Comput. Neurosci.*, **3**:1.

Feldman, J. L. and Cowan, J. D. (1975) Large-scale activity in neural nets I: Theory with application to motoneuron pool responses. *Biol. Cybern.*, **17**:29–38.

Feng, J. (2001) Is the integrate-and-fire model good enough? – a review. *Neural Networks*, **14**:955–975.

Feynman, R. P., Hibbs, A. R., and Styer, D. F. (2010) *Quantum Mechanics and Path Integrals*, 2nd edn. Dover, New York.

Fisher, R., van Emde Boas, W., Blume, W., *et al.* (2005) Epileptic seizures and epilepsy: definitions proposed by the International League Against Epilepsy (ILAE) and the International Bureau for Epilepsy (IBE). *Epilepsia*, **46**:470–472.

Fishman, H. M., Poussart, D. J. M., Moore, L. E., and Siebenga, E. (1977) Conduction description from the low frequency impedance and admittance of squid axon. *J. Membrane Biol.*, **32**:255–290.

FitzHugh, R. (1961) Impulses and physiological states in models of nerve membrane. *Biophys. J.*, **1**:445–466.

Fleidervish, I. A., Friedman, A. and Gutnick, M. J. (1996) Slow inactivation of Na$^+$ current and slow cumulative spike adaptation in mouse and guinea-pig neocortical neurones in slices. *J. Physiol.*, **493**:83–97.

Florian, R. V. (2007) Reinforcement learning through modulation of spike-timing-dependent synaptic plasticity. *Neural Comput.*, **19**:1468–1502.

Fourcaud, N. and Brunel, N. (2002) Dynamics of the firing probability of noisy integrate-and-fire neurons. *Neural Comput.*, **14**:2057–2110.

Fourcaud, N. and Brunel, N. (2005) Dynamics of the instantaneous firing rate in response to changes in input statistics. *J. Comput. Neurosci.*, **18**:311–321.

Fourcaud-Trocme, N., Hansel, D., van Vreeswijk, C., and Brunel, N. (2003) How spike generation mechanisms determine the neuronal response to fluctuating input. *J. Neurosci.*, **23**:11628–11640.

Fremaux, N., Sprekeler, H., and Gerstner, W. (2010) Functional requirements for reward-modulated spike-timing-dependent plasticity. *J. Neurosci.*, **40**:13326–13337.

French, A. and Stein, R. (1970) A flexible neural analog using integrated circuits. *IEEE Trans. Bio-med. Enging.*, **17**(3):248–253.

Froemke, R. and Dan, Y. (2002) Spike-timing dependent plasticity induced by natural spike trains. *Nature*, **416**:433–438.

Froemke, R. C., Merzenich, M. M., and Schreiner, C. E. (2007) A synaptic memory trace for cortical receptive field plasticity. *Nature*, **450**:425–429.

Froemke, R. C., Tsay, I., Raad, M., Long, J., and Dan, Y. (2006) Contribution of individual spikes in burst-induced long-term synaptic modification. *J. Neurophysiol.*, **95**:1620–1629.

Fuortes, M. and Mantegazzini, F. (1962) Interpretation of the repetitive firing of nerve cells. *J. Gen. Physiol.*, **45**:1163–1179.

Fusi, S. and Mattia, M. (1999) Collective behavior of networks with linear (VLSI) integrate and fire neurons. *Neural Comput.*, **11**:633–652.

Fuster, J. and Jervey, J. (1982) Neuronal firing in the inferotemporal cortex of the monkey in a visual memory task. *J. Neurosci.*, **2**:361–375.

Gabbiani, F. and Koch, C. (1998) Principles of spike train analysis. In Koch, C. and Segev, I., eds, *Methods in Neuronal Modeling*, 2nd edn, pp. 312–360. MIT Press, Cambridge, MA.

Gabbiani, F., Midtgaard, J., and Knopfel, T. (1994) Synaptic integration in a model of cerebellar granule cells. *J. Neurophys.*, **72**(2):999–1009.

Gammaitoni, L., Hänggi, P., Jung, P., and Marchesoni, F. (1998) Stochastic resonance. *Rev. Mod. Phys.*, **70**:223–287.

Ganguli, S., Huch, D., and Sompolinsky, H. (2008) Memory traces in dynamics systems. *Proc. Natl. Acad. Sci. USA*, **105**:18970–18975.

Gawne, T. J., Richmond, B. J., and Optican, L. M. (1991) Interactive effects among several stimulus parameters on the response of striate cortical complex cells. *J. Neurophys.*, **66**(2):379–389.

Geisler, C. and Goldberg, J. (1966) A stochastic model of repetitive activity of neurons. *Biophys. J.*, **6**:53–69.

Georgopoulos, A. P., Schwartz, A., and Kettner, R. E. (1986) Neuronal population coding of movement direction. *Science*, **233**:1416–1419.

Georgopoulos, A., Kettner, R., and Schwartz, A. (1988) Primate motor cortex and free arm movements to visual targets in three-dimensional space. II. Coding of the direction of movement by a neuronal population. *J. Neurosci.*, **8**:2928–2937.

Gerhard, F., Haslinger, R., and Pipa, G. (2011) Applying the multivariate time-rescaling theorem to neural population models. *Neural Comput.*, **23**:1452–1483.

Gerstein, G. L. and Perkel, D. H. (1972) Mutual temporal relations among neuronal spike trains. *Biophys. J.*, **12**:453–473.

Gerstner, W. (1991) Associative memory in a network of 'biological' neurons. In Lippmann, R. P., Moody, J. E., and Touretzky, D. S., eds, *Advances in Neural Information Processing Systems 3*, pp. 84–90. Morgan Kaufmann, San Mates, CA. Conference in Denver 1990.

Gerstner, W. (1995) Time structure of the activity in neural network models. *Phys. Rev. E*, **51**(1):738–758.

Gerstner, W. (2000) Population dynamics of spiking neurons: fast transients, asynchronous states and locking. *Neural Comput.*, **12**:43–89.

Gerstner, W. (2008) Spike-response model. *Scholarpedia*, **3**(12):1343.

Gerstner, W. and Brette, R. (2009) Adaptive exponential integrate-and-fire model. *Scholarpedia*, **4**:8427.

Gerstner, W. and Kistler, W. K. (2002) *Spiking Neuron Models: Single Neurons, Populations, Plasticity*. Cambridge University Press, Cambridge.

Gerstner, W. and van Hemmen, J. L. (1992) Associative memory in a network of 'spiking' neurons. *Network*, **3**:139–164.

Gerstner, W. and van Hemmen, J. L. (1993) Coherence and incoherence in a globally coupled ensemble of pulse emitting units. *Phys. Rev. Lett.*, **71**(3):312–315.

Gerstner, W., Ritz, R., and van Hemmen, J. L. (1993) Why spikes? Hebbian learning and retrieval of time–resolved excitation patterns. *Biol. Cybern.*, **69**:503–515.

Gerstner, W., Kempter, R., van Hemmen, J., and Wagner, H. (1996a) A neuronal learning rule for sub-millisecond temporal coding. *Nature*, **383**(6595):76–78.

Gerstner, W., van Hemmen, J. L., and Cowan, J. D. (1996b) What matters in neuronal locking. *Neural Comput.*, **8**:1653–1676.

Gigante, G., Mattia, M., and Del Giudice, P. (2007) Diverse population-bursting modes of adapting spiking neurons. *Phys. Rev. Lett.*, **98**:148101.

Gilson, M., Burkitt, A., Grayden, D., Thomas, D., and van Hemmen, J. L. (2009) Emergence of network structure due to spike-timing-dependent plasticity in recurrent neuronal networks IV: Structuring synaptic pathways among recurrent connections. *Biol. Cybern.*, **27**:427–444.

Giorno, V., Nobile, A. G., and Ricciardi, L. M. (1992) Instantaneous return processes and neuronal firings. In Trappl, R., ed., *Cybernetics and Systems Research*, Vol. 1, pp. 829–236. World Scientific Press, Hackensack, NJ.

Glimcher, P., Fehr, E., Camerer, C., and Poldrack, R. (2008) *Neuroeconomics*. Academic Press, Salt Lake City, UT.

Gluss, B. (1967) A model of neuron firing with exponential decay of potential resulting in diffusion equations for the probability density. *Bull. Math. Biophys.*, **29**:233–243.

Gold, J. and Shadlen, M. (2007) The neural basis of decision making. *Ann. Rev. Neurosci.*, **30**:535–547.

Goldberg, J., Adrian, H., and Smith, F. (1964) Response of neurons of the superior olivary complex of the cat to acoustic stimuli of long duration. *J. Neurophys.*, **27**:706–749.

Golding, N., Mickus, T. J., Katz, Y., Kath, W. L., and Spruston, N. (2005) Factors mediating powerful voltage attenuation along CA1 pyramidal neuron dendrites. *J. Physiol.*, **568**:69–82.

Gollisch, T. and Meister, M. (2008) Rapid neural coding in the retina with relative spike latencies. *Science*, **319**:1108–1111.

Golomb, D., Hansel, D., Shraiman, B., and Sompolinsky, H. (1992) Clustering in globally coupled phase oscillators. *Phys. Rev. A*, **45**:3516–3530.

Golomb, D. and Rinzel, J. (1994) Clustering in globally coupled inhibitory neurons. *Physica D*, **72**:259–282.

Gray, C. M. and Singer, W. (1989) Stimulus-specific neuronal oscillations in orientation columns of cat visual cortex. *Proc. Natl. Acad. Sci. USA*, **86**:1698–1702.

Grossberg, S. (1969) On learning, information, lateral inhibition, and transmitters. *Math. Biosci.*, **4**:255–310.

Grossberg, S. (1973) Contour enhancement, short term memory and constancies in reverberating neural networks. *Stud. Appl. Math.*, **52**:217–257.

Grossberg, S. (1976) Adaptive pattern classification and universal recoding I: Parallel development and coding of neuronal feature detectors. *Biol. Cybern.*, **23**:121–134.

Gütig, R., Aharonov, S., Rotter, S., and Sompolinsky, H. (2003) Learning input correlations through nonlinear temporally asymmetric Hebbian plasticity. *J. Neurosci.*, **23**(9):3697–3714.

Gutkin, B. S., Ermentrout, G. B., and Reyes, A. D. (2005) Phase-response curves give the responses of neurons to transient inputs. *J. Neurophysiol.*, **94**:1623–1635.

Haggard, P. (2008) Human volition: towards a neuroscience of will. *Nat. Rev. Neurosci.*, **9**:934–946.

Hale, J. K. and Koçac, H. (1991) *Dynamics and Bifurcations*. Text in Applied Mathematics 3. Springer, Berlin.

Hamill, O. P., Huguenard, J. R., and Prince, D. A. (1991) Patch-clamp studies of voltage-gated currents in identified neurons of the rat cerebral cortex. *Cerebral Cortex*, **1**(1):48–61.

Hansel, D. and Mato, G. (2001) Existence and stability of persistent states in large neuronal networks. *Phys. Rev. Lett.*, **86**:4175–4178.

Hansel, D. and Sompolinsky, H. (1998) Modeling feature selectivity in local cortical circuits. In Koch, C. and Segev, I., eds, *Methods in Neuronal Modeling*. MIT Press, Cambridge, MA.

Hay, E., Hill, S., Schürmann, F., Markram, H., and Segev, I. (2011) Models of neocortical layer 5b pyramidal cells capturing awide range of dendritic and perisomatic active properties. *PLoS Comput. Biol.*, **7**(7):e1002107.

Haykin, S. (1994) *Neural Networks*. Prentice Hall, Upper Saddle River, NJ.

Hebb, D. O. (1949) *The Organization of Behavior*. Wiley, New York.

Helmchen, F., Konnerth, A., and Yuste, R. (2011) *Imaging in Neuroscience: A Laboratory Manual*. Cold Spring Harbor Laboratory Press.

Hennequin, G. (2013) Amplification and stability in cortical circuits. Thesis, Ecole Polytechnique Fédérale de Lausanne.

Hennequin, G., Vogels, T., and Gerstner, W. (2014) Optimal control of transient dynamics in balanced networks supports generation of complex movements. *Neuron*, to appear.

Herrmann, A. and Gerstner, W. (2001) Noise and the PSTH response to current transients: I. General theory and application to the integrate-and-fire neuron. *J. Comput. Neurosci.*, **11**:135–151.

Hertz, J., Krogh, A., and Palmer, R. G. (1991) *Introduction to the Theory of Neural Computation*. Addison-Wesley, Redwood City, CA.

Herz, A. V. M., Sulzer, B., Kühn, R., and van Hemmen, J. L. (1988) The Hebb rule: Representation of static and dynamic objects in neural nets. *Europhys. Lett.*, **7**: 663–669.

Herz, A. V. M., Sulzer, B., Kühn, R., and van Hemmen, J. L. (1989) Hebbian learning reconsidered: Representation of static and dynamic objects in associative neural nets. *Biol. Cybern.*, **60**:457–467.

Hessler, N. A., Shirke, A. M., and Malinow, R. (1993) The probability of transmitter release at a mammalian central synapse. *Nature*, **366**:569–572.

Hill, A. (1936) Excitation and accommodation in nerve. *Proc. R. Soc. Lond. B*, **119**:305–355.

Hille, B. (1992) *Ionic Channels of Excitable Membranes*. Sinauer, Sunderland.

Hille, B. (2001) *Ion Channels of Excitable Membranes*, 3rd edn. Sinauer, Sunderland.

Hodgkin, A. L. (1948) The local electric changes associated with repetitive action in a non-medullated axon. *J. Physiol. (Lond.)*, **107**:165–181.

Hodgkin, A. L. and Huxley, A. F. (1952) A quantitative description of membrane current and its application to conduction and excitation in nerve. *J. Physiol*, **117**(4):500–544.

Hoehn, K., Watson, T. W., and MacVicar, B. A. (1993) A novel tetrodotoxin-insensitive, slow sodium current in striatal and hippocampal beurons. *Neuron*, **10**(3):543 – 552.

Hoerzer, G., Legenstein, R., and Maass, W. (2012) Emergence of complex computational structures from chaotic neural networks through reward-modulated Hebbian learning. *Cerebral Cortex*, xx:doi:10.1093/cercor/bhs348.

Hopfield, J. J. (1982) Neural networks and physical systems with emergent collective computational abilities. *Proc. Natl. Acad. Sci. USA*, **79**:2554–2558.

Hopfield, J. J. (1984) Neurons with graded response have computational properties like those of two-state neurons. *Proc. Natl. Acad. Sci. USA*, **81**:3088–3092.

Hoppensteadt, F. C. and Izhikevich, E. M. (1997) *Weakly Connected Neural Networks*. Springer, Berlin.

Horn, R. A. and Johnson, C. R. (1985) *Matrix Analysis*. Cambridge University Press, Cambridge.

Hubel, D. H. (1988) *Eye, Brain, and Vision*. W. H. Freeman, New York.

Hubel, D. and Wiesel, T. (1968) Receptive fields and functional architecture of monkey striate cortex. *J. Physiol.*, **195**:215–243.

Hubel, D. H. and Wiesel, T. N. (1962) Receptive fields, binocular interaction and functional architecture in the cat's visual cortex. *J. Physiol. (Lond.)*, **160**:106–154.

Huguenard, J. R., Hamill, O. P., and Prince, D. A. (1988) Developmental changes in Na+ conductances in rat neocortical neurons: appearance of a slowly inactivating component. *J. Neurophysiol.*, **59**(3):778–795.

Hunter, J. D. and Milton, J. G. (2003) Amplitude and frequency dependence of spike timing: implications for dynamic regulation. *J. Neurophysiol.*, **90**(1):387–94.

Huys, Q. J. M., Ahrens, M. B., and Paninski, L. (2006) Efficient estimation of detailed single-neuron models. *J. Neurophysiol.*, **96**(2):872–890.

Itti, L., Koch, C., and Niebur, E. (1998) A model of saliency-based visual attention for rapid scene analysis. *IEEE Trans. Patt. Anal. Mach. Intell.*, **20**:1254–1259.

Izhikevich, E. M. (2003) Simple model of spiking neurons. *IEEE Trans. Neural Networks*, **14**(6):1569–1572.

Izhikevich, E. (2007a) Solving the distal reward problem through linkage of STDP and dopamine signaling. *Cerebral Cortex*, **17**:2443–2452.

Izhikevich, E. M. (2007b) *Dynamical Systems in Neuroscience: The Geometry of Excitability and Bursting*. MIT Press, Cambridge, MA.

Jackson, J. (1962) *Classical Electrodynamics*. Wiley, New York.

Jaeger, H. and Haas, H. (2004) Harnessing nonlinearity: Predicting chaotic systems and saving energy in wireless communication. *Science*, **304**:78–80.

James, W. (1890) *Psychology (Briefer Course)*, Ch. 16. Holt, New York.

Johannesma, P. I. M. (1968) Diffusion models for the stochastic acticity of neurons. In Caianiello, E. R., ed., *Neural Networks*, pp. 116–144. Springer, Berlin.

Johansson, R. and Birznieks, I. (2004) First spikes in ensembles of human tactile afferents code complex spatial fingertip events. *Nature Neurosci.*, **7**:170–177.

Jolivet, R., Lewis, T., and Gerstner, W. (2004) Generalized integrate-and-fire models of neuronal activity approximate spike trains of a detailed model to a high degree of accuracy. *J. Neurophysiol.*, **92**:959–976.

Jolivet, R., Rauch, A., Lüscher, H.-R., and Gerstner, W. (2006) Predicting spike timing of neocortical pyramidal neurons by simple threshold models. *J. Comput. Neurosci.*, **21**:35–49.

Jolivet, R., Kobayashi, R., Rauch, A., Shinomoto, S., and Gerstner, W. (2008a) A benchmark test for a quantitative assessment of simple neuron models. *J. Neurosci. Methods*, **169**:417–424.

Jolivet, R., Schurmann, F., Berger, T., Naud, R., Gerstner, W., and Roth, A. (2008b) The quantitative single-neuron modeling competition. *Biol. Cybern.*, **99**:417–426.

Kandel, E. C., Schwartz, J. H., and Jessell, T. (2000) *Principles of Neural Science*, 4th edn. Elsevier, New York.

Kaschube, M., Schnabel, M., Lowel, S., Coppola, D., White, L., and Wolf, F. (2010) Universality in the evolution of orientation columns in the visual cortex. *Science*, **330**:1113–1116.

Kass, R. and Raftery, A. (1995) Bayes factors. *J. Am. Stat. Assoc.*, **90**:773–795.

Kass, R. E. and Ventura, V. (2001) A spike-train probability model. *Neural Comput.*, **13**:1713–1720.

Keat, J., Reinagel, P., Reid, R., and Meister, M. (2001) Predicting every spike: A model for the responses of visual neurons. *Neuron*, **30**:803–817.

Kempter, R., Gerstner, W., van Hemmen, J. L., and Wagner, H. (1998) Extracting oscillations: Neuronal coincidence detection with noisy periodic spike input. *Neural Comput.*, **10**:1987–2017.

Kempter, R., Gerstner, W., and van Hemmen, J. L. (1999a) Hebbian learning and spiking neurons. *Phys. Rev. E*, **59**:4498–4514.

Kempter, R., Gerstner, W., van Hemmen, J. L., and Wagner, H. (1999b) The quality of coincidence detection and ITD-tuning: a theoretical framework. In Dau, T., Hohmann,

V., and Kollmeier, B., eds, *Psychophysics, Physiology and Models of Hearing*, pp. 185–192. World Scientific, Singapore.

Kempter, R., Gerstner, W., and van Hemmen, J. L. (2001) Intrinsic stabilization of output rates by spike-based Hebbian learning. *Neural Comput.*, **13**:2709–2741.

Kepler, T. B., Abbott, L. F., and Marder, E. (1992) Reduction of conductance-based neuron models. *Biol. Cybern.*, **66**:381–387.

Kistler, W. M. and De Zeeuw, C. I. (2002) Dynamical working memory and timed responses: The role of reverberating loops in the olivo-cerebellar system. *Neural Comput.*, **14**(11):2597–2626.

Kistler, W. M. and van Hemmen, J. L. (2000) Modeling synaptic plasticity in conjunction with the timing of pre- and postsynaptic potentials. *Neural Comput.*, **12**:385–405.

Kistler, W. M., Gerstner, W., and van Hemmen, J. L. (1997) Reduction of Hodgkin-Huxley equations to a single-variable threshold model. *Neural Comput.*, **9**:1015–1045.

Klausberger, T. and Somogyi, P. (2008) Neuronal diversity and temporal dynamics: The unity of hippocampal circuit operations. *Science*, **321**:53–57.

Knight, B. W. (1972) Dynamics of encoding in a population of neurons. *J. Gen. Physiol.*, **59**:734–766.

Knight, B. W. (2000) Dynamics of encoding in neuron populations: some general mathematical features. *Neural Comput.*, **12**:473–518.

Kobayashi, R. and Shinomoto, S. (2007) State space method for predicting the spike times of a neuron. *Phys. Rev. E*, **75**(1):011925.

Kobayashi, R., Tsubo, Y., and Shinomoto, S. (2009) Made-to-order spiking neuron model equipped with a multi-timescale adaptive threshold. *Front. Comput. Neurosci.*, **3**:9.

Koch, C. (1999) *Biophysics of Computation*. Oxford University Press, Oxford.

Koch, C., Bernander, Ö., and Douglas, R. (1995) Do neurons have a voltage or a current threshold for action potential initiation? *J. Comput. Neurosci.*, **2**:63–82.

Kohonen, T. (1972) Correlation matrix memories. *IEEE Trans. Comp.*, **C-21**:353–359.

Kohonen, T. (1984) *Self-Organization and Associative Memory*. Springer-Verlag, Berlin.

Kole, M. H. P., Hallermann, S., and Stuart, G. J. (2006) Single Ih channels in pyramidal neuron dendrites: properties, distribution, and impact on action potential output. *J. Neurosci.*, **26**(6):1677–1687.

König, P., Engel, A. K., and Singer, W. (1996) Integrator or coincidence detector? The role of the cortical neuron revisited. *Trends Neurosci.*, **19**(4):130–137.

Konishi, M. (1993) Listening with two ears. *Scientific American*, **268**:34–41.

Kopell, N. (1986) Symmetry and phase locking in chains of weakly coupled oscillators. *Comm. Pure Appl. Math.*, **39**:623–660.

Korngreen, A. and Sakmann, B. (2000) Voltage-gated K+ channels in layer 5 neocortical pyramidal neurones from young rats: subtypes and gradients. *J. Physiol.*, **525**(3): 621–639.

Koyama, S., Castellanos Pérez-Bolde, L., Shalizi, C. R., and Kass, R. E. (2010) Approximate methods for state-space models. *J. Am. Stat. Assoc.*, **105**(489):170–180.

Kree, R. and Zippelius, A. (1991) Asymmetrically diluted neural networks. In Domany, E., van Hemmen, J., and Schulten, K., eds, *Models of Neural Networks*, pp. 193–212. Springer, Berlin.

Kreuz, T., Haas, J., Morelli, A., Abarbanel, H., and Politi, A. (2007) Measuring spike train synchrony. *J. Neurosci. Methods*, **165**(1):151–161.

Kreuz, T., Chicharro, D., Andrzejak, R. G., Haas, J. S., and Abarbanel, H. D. I. (2009) Measuring multiple spike train synchrony. *J. Neurosci. Methods*, **183**(2):287–99.

Kulkarni, J. E. and Paninski, L. (2007) Common-input models for multiple neural spike-train data. *Network: Comp. in Neural Sys.*, **18**(4):375–407.

Kuramoto, Y. (1984) *Chemical Oscillations, Waves, and Turbulence.* Springer, Berlin.

Laing, C. R. and Chow, C. C. (2001) Stationary bumps in a network of spiking neurons. *Neural Comput.*, **13**:1473–1494.

Lansky, P. (1984) On approximations of Stein's neuronal model. *J. Theor. Biol.*, **107**: 631–647.

Lansky, P. (1997) Sources of periodical force in noisy integrate-and-fire models of neuronal dynamics. *Phys. Rev. E*, **55**:2040–2043.

Lansky, P. and Lanska, V. (1987) Diffusion approximation of the neuronal model with synaptic reversal potentials. *Biol. Cybern.*, **56**:19–26.

Lapicque, L. (1907) Recherches quantitatives sur l'excitation electrique des nerfs traitée comme une polarization. *J. Physiol. Pathol. Gen.*, **9**:620–635. Cited in H. C. Tuckwell, *Introduction to Theoretic Neurobiology* (Cambridge University Press, Cambridge, 1988).

Larkum, M. and Nevian, T. (2008) Synaptic clustering by dendritic signalling mechanisms. *Curr. Opinion Neurobiol.*, **18**:321–331.

Larkum, M., Zhu, J., and Sakmann, B. (2001) Dendritic mechanisms underlying the coupling of the dendritic with the axonal action potential initiation zone of adult rat layer 5 pyramidal neurons. *J. Physiol. (Lond.)*, **533**:447–466.

Latham, P. E., Richmond, B., Nelson, P., and Nirenberg, S. (2000) Intrinsic dynamics in neuronal networks. I. Theory. *J. Neurophysiol.*, **83**:808–827.

Laurent, G. (1996) Dynamical representation of odors by oscillating and evolving neural assemblies. *Trends Neurosci.*, **19**:489–496.

Lefort, S., Tomm, C., Sarria, J., and Petersen, C. (2009) The excitatory neuronal network of the C2 barrel column in mouse primary somatosensory cortex. *Neuron*, **61**:301–316.

Legenstein, R., Pecevski, D., and Maass, W. (2008) A learning theory for reward-modulated spike-timing-dependent plasticity with application to biofeedback. *PLOS Comput. Biol.*, **4**:e1000180.

Levy, W. B. and Stewart, D. (1983) Temporal contiguity requirements for long-term associative potentiation/depression in hippocampus. *Neurosci.*, **8**:791–797.

Lewi, J., Butera, R., and Paninski, L. (2009) Sequential optimal design of neurophysiology experiments. *Neural Comput.*, **21**:619–687.

Libet, B. (1985) Unconscious cerebral initiative and the role of conscious will in voluntary action. *Behav. Brain Sci.*, **8**:529–566.

Lindner, B. and Schimansky-Geier, L. (2001) Transmission of noise coded versus additive signals through a neuronal ensemble. *Phys. Rev. Lett.*, **86**:2934–2937.

Lindner, B., Doiron, B., and Longtin, A. (2005) Theory of oscillatory firing induced by spatially correlated noise and delayed inhibitory feedback. *Phys. Rev. E*, **72**(6):061919.

Linsker, R. (1986) From basic network principles to neural architecture: emergence of spatial-opponent cells. *Proc. Natl. Acad. Sci. USA*, **83**:7508–7512.

Linz, P. (1985) *Analytical and Numerical Methods for Volterra Equations*, Vol. 7. SIAM, Philadelphia, PA.

Lisman, J. (2003) Long-term potentiation: outstanding questions and attempted synthesis. *Phil. Trans. R. Soc. Lond. B*, **358**:829–842.

Lisman, J., Schulman, H., and Cline, H. (2002) The molecular basis of CaMKII function in synaptic and behavioural memory. *Nat. Rev. Neurosci.*, **3**:175–190.

Little, W. A. (1974) The existence of persistent states in the brain. *Math. Biosc.*, **19**: 101–120.

Liu, Y.-H. and Wang, X.-J. (2001) Spike-frequency adaptation of a generalized leaky integrate-and-fire model neuron. *J. Comput. Neurosci.*, **10**:25–45.

Loewenstein, Y. (2008) Robustness of learning that is based on covariance-driven synaptic plasticity. *PLOS Comput. Biol.*, **4**:e1000007.

Loewenstein, Y. and Seung, H. (2006) Operant matching is a generic outcome of synaptic plasticity based on the covariance between reward and neural activity. *Proc. Natl. Acad. Sci. USA*, **103**:15224–15229.

Longtin, A. (1993) Stochastic resonance in neuron models. *J. Stat. Phys.*, **70**:309–327.

Lubenov, E. and Siapas, A. G. (2008) Decoupling through synchrony in neuronal circuits with propagation delays. *Neuron*, **58**:118–131.

Lund, J., Angelucci, A., and Bressloff, P. (2003) Anatomical substrates for functional columns in macaque monkey primary visual cortex. *Cerebral Cortex*, **12**:15–24.

Lundstrom, B., Higgs, M., Spain, W., and Fairhall, A. (2008) Fractional differentiation by neocortical pyramidal neurons. *Nature Neurosci.*, **11**:1335–1342.

Maass, W., Joshi, P., and Sontag, E. (2007) Computational aspects of feedback in neural circuits. *PLOS Comput. Biol.*, **3**:e165.

Maass, W., Natschläger, T., and Markram, H. (2002) Real-time computing without stable states: a new framework for neural computation based on perturbations. *Neural Comput.*, **14**:2531–2560.

Mach, E. (1865) Über die Wirkung der räumlichen Verteilung des Lichtreizes auf die Netzhaut. *Sitz. -Ber. Akad. Wiss. Wien*, **52**:303–322.

Mach, E. (1906) *Die Analyse der Empfindungen*, 5th edn, Chapter X. Gustav Fischer, Jena, www.uni-leipzig.de/ psycho/wundt/opera/mach/empfndng/AlysEmIn.htm.

Machens, C. (2002) Adaptive sampling by information maximization. *Phys. Rev. Lett.*, **88**:228104–228107.

Machens, C., Romo, R., and Brody, C. (2005) Flexible control of mutual inhibition: a neuron model of two-interval discrimination. *Science*, **307**:1121–1124.

Mackay, D. (1992) Information-based objective functions for active data selection. *Neural Comput.*, **4**:589–603.

MacKay, D. J. C. and Miller, K. D. (1990) Analysis of Linsker's application of Hebbian rules to linear networks. *Network*, **1**:257–297.

MacPherson, J. M. and Aldridge, J. W. (1979) A quantitative method of computer analysis of spike train data collected from behaving animals. *Brain Res.*, **175**(1):183–7.

MacLeod, C. M. (1991) Half a century of research on the Stroop effect: An integrative review. *Psych. Bull.*, **109**:163–203.

Magee, J. C. (1998) Dendritic hyperpolarization-activated currents modify the integrative properties of hippocampal CA1 pyramidal neurons. *J. Neurosci.*, **18**(19):7613–7624.

Mainen, Z. F., Joerges, J., Huguenard, J. R., and Sejnowski, T. J. (1995) A model of spike initiation in neocortical pyramidal neurons. *Neuron*, **15**(6):1427–1439.

Mainen, Z. F. and Sejnowski, T. J. (1995) Reliability of spike timing in neocortical neurons. *Science*, **268**:1503–1506.

Mainen, Z. F. and Sejnowski, T. J. (1996) Influence of dendritic structure on firing pattern in model neocortical neurons. *Nature*, **382**:363–366.

Makram, H., Sjostrom, J., and Gerstner, W. (2011) A history of spike-timing dependent plasticity. *Front. Syn. Neurosci.*, **3**:4.

Manwani, A. and Koch, C. (1999) Detecting and estimating signals in noisy cable structures, I: Neuronal noise sources. *Neural Comput.*, **11**:1797–1829.

Markram, H. and Tsodyks, M. (1996) Redistribution of synaptic efficacy between neocortical pyramidal neurons. *Nature*, **382**:807–810.

Markram, H., Lübke, J., Frotscher, M., and Sakmann, B. (1997) Regulation of synaptic efficacy by coincidence of postsynaptic AP and EPSP. *Science*, **275**:213–215.

Markram, H., Toledo-Rodriguez, M., Wang, Y., Gupta, A., Silberberg, G., and Wu, C. (2004) Interneurons of the neocortical inhibitory system. *Nature Rev. Neurosci.*, **5**:793–807.

Marsalek, P., Koch, C., and Maunsell, J. (1997) On the relationship between synaptic input and spike output jitter in individual neurons. *Proc. Natl. Acad. Sci. USA*, **94**:735–740.

Mascaro, M. and Amit, D. J. (1999) Effective neural response function for collective population states. *Network*, **10**:351–373.

Mauro, A., Conti, F., Dodge, F., and Schor, R. (1970) Subthreshold behavior and phenomenological impedance of the squid giant axon. *J. Gen. Physiol.*, **55**(4):497–523.

McCormick, D. A., Wang, Z., and Huguenard, J. (1993) Neurotransmitter control of neocortical neuronal activity and excitability. *Cereb. Cortex*, **3**(5):387–398.

McCulloch, W. S. and Pitts, W. (1943) A logical calculus of ideas immanent in nervous activity. *Bull. Math. Biophys.*, **5**:115–133.

McNamara, B. and Wiesenfeld, K. (1989) Theory of stochastic resonance. *Phys. Rev. A*, **39**:4854–4869.

Mel, B. W. (1994) Information processing in dendritic trees. *Neural Comput.*, **6**:1031–1085.

Mensi, S., Naud, R., and Gerstner, W. (2011) From stochastic nonlinear integrate-and-fire to generalized linear models. In Shawe-Taylor, J., Zemel, R., Bartlett, P., Pereira, F., and Weinberger, K., eds, *Advances in Neural Information Processing System* 24, p. **0794**.

Mensi, S., Naud, R., Avermann, M., Petersen, C. C. H., and Gerstner, W. (2012) Parameter extraction and classification of three neuron types reveals two different adaptation mechanisms. *J. Neurophys.*, **107**:1756–1775.

Mensi, S., Pozzorini, C., Hagens, O., and Gerstner, W. (2013) Evidence for a nonlinear coupling between firing threshold and subthreshold membrane potential. *Cosyne Abstracts*, Salt Lake City, UT.

Meyer, C. and van Vreeswijk, C. (2002) Temporal correlations in stochastic networks of spiking neurons. *Neural Comput.*, **14**:369–404.

Miller, E. and Cohen, J. (2001) An integrative theory of prefrontal cortex function. *Ann. Rev. Neurosci.*, **24**:167–202.

Miller, K. and Fumarola, F. (2012) Mathematical equivalence of two common forms of firing rate models of neural networks. *Neural Comput.*, **24**:25–31.

Miller, K., Keller, J. B., and Stryker, M. P. (1989) Ocular dominance column development: analysis and simulation. *Science*, **245**:605–615.

Miller, K. D. (1994) A model for the development of simple cell receptive fields and the ordered arrangement of orientation columns through activity dependent competition between ON- and OFF-center inputs. *J. Neurosci.*, **14**:409–441.

Miller, K. D. and MacKay, D. J. C. (1994) The role of constraints in Hebbian learning. *Neural Comput.*, **6**:100–126.

Miller, M. I. and Mark, K. (1992) A statistical study of cochlear nerve discharge patterns in reponse to complex speech stimuli. *J. Acoust. Soc. Am.*, **92**:202–209.

Mirollo, R. E. and Strogatz, S. H. (1990) Synchronization of pulse coupled biological oscillators. *SIAM J. Appl. Math.*, **50**:1645–1662.

Miyashita, Y. (1988a) Neuronal correlate of visual associative long-term memory in the primate temporal cortex. *Nature*, **335**:817–820.

Miyashita, Y. (1988b) Neuronal correlate of visual associative long-term memory in the primate temporal cortex. *Nature*, **335**(6193):817–820.

Mongillo, G., Barak, O., and Tsodyks, M. (2008) Synaptic theory of working memory. *Science*, **319**:1543–1546.

Moreno-Bote, R. and Parga, N. (2004) Role of synaptic filtering on the firing response of simple model neurons. *Phys. Rev. Lett.*, **92**:28102.

Morris, C. and Lecar, H. (1981) Voltage oscillations in the barnacle giant muscle fiber. *Biophys. J.*, **35**:193–213.

Morrison, A., Diesmann, M., and Gerstner, W. (2008) Phenomenological models of synaptic plasticity based on spike timing. *Biol. Cybern.*, **98**:459–478.

Mountcastle, V. B. (1957) Modality and topographic properties of single neurons of cat's somatosensory cortex. *J. Neurophysiol.*, **20**:408–434.

Murray, J. D. (1993) *Mathematical Biology*, 2nd edn. Biomathematics Texts 19. Springer–Verlag, Berlin.

Nagumo, J., Arimoto, S., and Yoshizawa, S. (1962) An active pulse transmission line simulating nerve axon. *Proc. IRE*, **50**:2061–2070.

Naud, R. and Gerstner, W. (2012a) Coding and decoding in adapting neurons: A population approach to the peri-stimulus time histogram. *PLoS Comput. Biol.*, **8**:e1002711.

Naud, R. and Gerstner, W. (2012b) The performance (and limits) of simple neuron models: Generalizations of the leaky integrate-and-fire model. In Le Novère, N. L., ed., *Computational Systems Neurobiology*. Springer, Berlin.

Naud, R., Marcille, N., Clopath, C., and Gerstner, W. (2008) Firing patterns in the adaptive exponential integrate-and-fire model. *Biol. Cybernetics*, **99**:335–347.

Naud, R., Gerhard, F., Mensi, S., and Gerstner, W. (2011) Improved similarity measures for small sets of spike trains. *Neural Comput.*, **23**:3016–3069.

Nelder, J. and Wederburn, R. (1972) Generalized linear models. *J. R. Stat. Soc. A*, **135**:370–384.

Nelken, I., Prut, Y., Vaadia, E., and Abeles, M. (1994) In search of the best stimulus: an optimization procedure for finding efficient stimuli in the cat auditory cortex. *Hearing Res.*, **72**:237–253.

Nelson, M. and Rinzel, J. (1995) The Hodgkin-Huxley model. In Bower, J. M. and Beeman, D., ed, *The Book of Genesis*, Chapter 4, pp. 27–51. Springer, New York.

Newsome, W., Britten, K., and Movshon, J. (1989) Neuronal correlates of a perceptual decision. *Nature*, **341**:52–54.

Ngezahayo, A., Schachner, M., and Artola, A. (2000) Synaptic activation modulates the induction of bidirectional synaptic changes in adult mouse hippocampus. *J. Neurosci.*, **20**:2451–2458.

Nini, A., Feingold, A., Slovin, H., and Bergman, H. (1995) Neurons in the globus pallidus do not show correlated activity in the normal monkey, but phase-locked oscillations appear in the MPTP model of parkinsonism. *J. Neurophysiol.*, **74**:1800–1805.

Nützel, K. (1991) The length of attractors in asymmetric random neural networks with deterministic dynamics. *J. Phys. A.*, **24**:L151–L157.

Nykamp, D. and Tranchina, D. (2000) A population density approach that facilitates large-scale modeling of neural networks: Analysis and application to orientation tuning. *J. Comput. Neurosci.*, **8**:19–50.

Oja, E. (1982) A simplified neuron model as a principal component analyzer. *J. Math. Biol.*, **15**:267–273.

O'Keefe, J. and Recce, M. (1993) Phase relationship between hippocampal place units and the hippocampal theta rhythm. *Hippocampus*, **3**:317–330.

Okun, M. and Lampl, I. (2008) Instantaneous correlation of excitation and inhibition during ongoing and sensory-evoked activities. *Nat. Neurosci.*, **11**:535–537.

Omurtag, A., Knight, B., and Sirovich, L. (2000) On the simulation of a large population of neurons. *J. Comput. Neurosci.*, **8**:51–63.

Optican, L. M. and Richmond, B. J. (1987) Temporal encoding of two-dimensional patterns by single units in primate inferior temporal cortex. 3. Information theoretic analysis. *J. Neurophysiol.*, **57**:162–178.

Ostojic, S. and Brunel, N. (2011) From spiking neuron models to linear-nonlinear models. *PLOS Comput. Biol.*, **7**:e1001056.

Ozeki, H., Finn, I., Schaffer, E., Miller, K., and Ferstner, D. (2009) Inhibitory stabilization of the cortical network underlies visual surround suppression. *Neuron*, **62**:587–592.

Paiva, A. R. C., Park, I., and Príncipe, J. (2009a) A comparison of binless spike train measures. *Neural Comp. Appl.*, **19**(3):1–15.

Paiva, A. R. C., Park, I., and Príncipe, J. (2009b) A reproducing kernel hilbert space framework for spike train signal processing. *Neural Comput.*, **21**(2):424–449.

Paiva, A. R. C., Park, I., and Príncipe, J. (2010) Inner products for representation and learning in the spike train domain. In Oweiss, K. G., ed., *Statistical Signal Processing for Neuroscience and Neurotechnology*. Academic Press, New York.

Paninski, L. (2003) Convergence properties of three spike-triggered analysis techniques. *Network*, **14**:437–464.

Paninski, L. (2004) Maximum likelihood estimation of cascade point-process neural encoding models. *Network*, **15**:243–262.

Paninski, L. (2005) Asymptotic theory of information-theoretic experimental design. *Neural Comput.*, **17**:1480–1507.

Paninski, L., Fellows, M., Shoham, S., Hatsopoulos, N., and Donoghue, J. (2004) Superlinear population encoding of dynamic hand trajectory in primary motor cortex. *J. Neurosci.*, **24**:8551–8561.

Paninski, L., Pillow, J., and Lewi, J. (2007) Statistical models for neural encoding, decoding, and optimal stimulus design. In Cisek, P., Drew, T., and Kalaska, J., eds, *Computational Neuroscience: Theoretical Insights into Brain Function*, Progress in Brain Research, 165, pp. 493–508. Elsevier Science, Amsterdam.

Paninski, L., Ahmadian, Y., Ferreira, D. G., Koyama, S., Rad, K. R., Vidne, M., Vogelstein, J., and Wu, W. (2010) A new look at state-space models for neural data. *J. Comput. Neurosci.*, **29**(1–2):107–126.

Paninski, L., Pillow, J., and Simoncelli, E. (2005) Comparing integrate-and-fire-like models estimated using intracellular and extracellular data. *Neurocomputing*, **65**:379–385.

Papoulis, A. (1991) *Probability, Random Variables, and Stochastic Processes*. McGraw-Hill, New York.

Pare, D., Curro'Dossi, R., and Steriade, M. (1990) Neuronal basis of the parkinsonian resting tremor: A hypothesis and its implications for treatment. *Neurosci.*, **35**: 217–226.

Park, I., Seth, S., Rao, M., and Principe, J. (2012) Strictly positive-definite spike train kernels for point-process divergences. *Neural Comput.*, **24**(8):2223–2250.

Patlak, J. and Ortiz, M. (1985) Slow currents through single sodium channels of the adult rat heart. *J. Gen. Phys.*, **86**(1):89–104.

Pawlak, V. and Kerr, J. (2008) Dopamine receptor activation is required for corticostriatal spike-timing-dependent plasticity. *J. Neurosci.*, **28**:2435–2446.

Pawlak, V., Wickens, J., Kirkwood, A., and Kerr, J. (2010) Timing is not everything: neuromodulation opens the STDP gate. *Front. Synaptic Neurosci.*, **2**:146.

Perkel, D. H., Gerstein, G. L., and Moore, G. P. (1967a) Neuronal spike trains and stochastic point processes I. The single spike train. *Biophys. J.*, **7**:391–418.

Perkel, D. H., Gerstein, G. L., and Moore, G. P. (1967b) Neuronal spike trains and stochastic point processes II. Simultaneous spike trains. *Biophys. J.*, **7**:419–440.

Pfister, J.-P. and Gerstner, W. (2006) Triplets of spikes in a model of spike timing-dependent plasticity. *J. Neurosci.*, **26**:9673–9682.

Pfister, J.-P. and Tass, P. (2010) STDP in oscillatory recurrent networks: Theoretical conditions for desynchronization and applications to deep brain stimulation. *Front. Comput. Neurosci.*, **4**:22.

Pfister, J.-P., Toyoizumi, T., Barber, D., and Gerstner, W. (2006) Optimal spike-timing dependent plasticity for precise action potential firing in supervised learning. *Neural Comput.*, **18**:1318–1348.

Pikovsky, A. and Rosenblum, M. (2007) Synchronization. *Scholarpedia*, **2**:1459.

Pillow, J., Paninski, L., Uzzell, V., Simoncelli, E., and E. J. Chichilnisky (2005) Prediction and decoding of retinal ganglion cell responses with a probabilistic spiking model. *J. Neurosci.*, **25**:11003–11023.

Pillow, J., Shlens, J., Paninski, L., Sher, A., Litke, A. M., Chichilnisky, E. J., and Simoncelli, E. (2008) Spatio-temporal correlations and visual signalling in a complete neuronal population. *Nature*, **454**:995–999.

Pillow, J. W., Ahmadian, Y., and Paninski, L. (2011) Model-based decoding, information estimation, and change-point detection techniques for multineuron spike trains. *Neural Comput.*, **23**(1):1–45.

Platt, M. and Huettel, S. (2008) Risky business: the neuroeconomics of decision making under uncertainty. *Nat. Neurosci.*, **11**:398–403.

Plesser, H. (1999) *Aspects of Signal Processing in Noisy Neurons*. PhD thesis, Georg-August-Universität, Göttingen.

Plesser, H. E. (2000) The ModUhl software collection. Technical report, MPI für Strömungsforschung, Göttingen. www.chaos.gwgd.de/plesser/ModUhl.htm.

Plesser, H. E. and Gerstner, W. (2000) Noise in integrate-and-fire models: from stochastic input to escape rates. *Neural Comput.*, **12**:367–384.

Plesser, H. E. and Tanaka, S. (1997) Stochastic resonance in a model neuron with reset. *Phys. Lett. A*, **225**:228–234.

Pozzorini, C., Naud, R., Mensi, S., and Gerstner, W. (2013) Temporal whitening by power-law adaptation in neocortical neurons. *Nature Neurosci.*, **16**:942–948.

Prinz, W. (2004) Der Mensch ist nicht frei. Ein Gespräch. In Geyer, C., ed., *Hirnforschung und Willensfreiheit*. Suhrkamp, Frankfurt.

Purves, D., Augustine, G. J., Fitzpatrick, D., Hall, W. C., LaMantia, A.-S., and White, L. E. (2008) *Neuroscience*, 4th edn. Sinauer, Sunderland, MA.

Quiroga, R. Q., Kreuz, T., and Grassberger, P. (2002) Event synchronization: A simple and fast method to measure synchronicity and time delay patterns. *Phys. Rev. E*, **66**(4):041904.

Quiroga, R. Q., Reddy, L., Kreiman, G., Koch, C., and Fried, I. (2005) Invariant visual representation by single neurons in the human brain. *Nature*, **435**:1102–1107.

Rainer, G. and Miller, E. (2002) Timecourse of object-related neural activity in the primate prefrontal cortex during a short-term memory task. *Europ. J. Neurosci.*, **15**: 1244–1254.

Rajan, K. and Abbott, L. (2006) Eigenvalue spectra of random matrices for neural networks. *Phys. Rev. Lett.*, **97**:188104.

Rall, W. (1989) Cable theory for dendritic neurons. In Koch, C. and Segev, I., eds., *Methods in Neuronal Modeling*, pp. 9–62. MIT Press, Cambridge, MA.

Ramirez, A. D., Ahmadian, Y., Schumacher, J., Schneider, D., Woolley, S. M. N., and Paninski, L. (2011) Incorporating naturalistic correlation structure improves spectrogram reconstruction from neuronal activity in the songbird auditory midbrain. *J. Neurosci.*, **31**(10):3828–3842.

Ramòn y Cajal, S. (1909) *Histologie du système nerveux de l'homme et des vertébré*. A. Maloine, Paris.

Randall, A. D. and Tsien, R. W. (1997) Contrasting biophysical and pharmacological properties of T-type and R-type calcium channels. *Neuropharmacology*, **36**(7):879–93.

Rangel, A., Camerer, C., and Montague, P. (2008) A framework for studying the neurobiology of value-based decision making. *Nat. Rev. Neurosci.*, **9**:545–556.

Ranjan, R., Khazen, G., Gambazzi, L., Ramaswamy, S., Hill, S. L., Schürmann, F., and Markram, H. (2011) Channelpedia: an integrative and interactive database for ion channels. *Front. Neuroinform.*, **5**:36.

Rapp, M., Yarom, Y., and Segev, I. (1994) Physiology, morphology and detailed passive models of guinea-pig cerebellar Purkinje cells. *J. Physiol.*, **474**:101–118.

Ratcliff, R. and McKoon, G. (2008) The diffusion decision model: theory and data for two-choice decision tasks. *Neural Comput.*, **20**:873–922.

Ratcliff, R. and Rouder, J. (1998) Modeling response times for two-choice decisions. *Psychol. Sci.*, **9**:347–356.

Ratnam, R. and Nelson, M. (2000) Nonrenewal statistics of electrosensory afferent spike trains: Implications for the detection of weak sensory signals. *J. Neurosci*, **10**:6672–6683.

Redish, A., Elga, A., and Touretzky, D. (1996) A coupled attractor model of the rodent head direction system. *Network*, **7**:671–685.

Reich, D., Victor, J., and Knight, B. (1998) The power ratio and the interval map: spiking models and extracellular recordings. *J. Neurosci.*, **18**(23):10090–10104.

Renart, A., de la Rocha, J., Hollender, L., Parta, N., Reyes, A., and Harris, K. (2010) The asynchronous state in cortical circuits. *Science*, **327**:587–590.

Rettig, J., Wunder, F., Stocker, M., *et al.* (1992) Characterization of a shaw-related potassium channel family in rat brain. *EMBO J*, **11**(7):2473–86.

Reuveni, I., Friedman, A., Amitai, Y., and Gutnick, M. (1993) Stepwise repolarization from Ca^{2+} plateaus in neocortical pyramidal cells: evidence for nonhomogeneous distribution of HVA Ca^{2+} channels in dendrites. *J. Neurosci.*, **13**(11):4609–4621.

Reynolds, J. and Wickens, J. (2002) Dopamine-dependent plasticity of corticostriatal synapses. *Neural Networks*, **15**:507–521.

Ricciardi, L. (1976) Diffusion approximation for a multi-input neuron model. *Biol. Cybern.*, **24**:237–240.

Richardson, M. (2004) The effects of synaptic conductance on the voltage distribution and firing rate of spiking neurons. *Phys. Rev. E*, **69**:51918.

Richardson, M. (2007) Firing-rate response of linear and nonlinear integrate-and-fire neurons to modulated current-based and conductance-based synaptic drive. *Phys. Rev. E*, **76**:021919.

Richardson, M. (2009) Dynamics of populations and networks of neurons with voltage-activated and calcium-activated currents. *Phys. Rev. E*, **80**:021928.

Richardson, M. and Gerstner, W. (2005) Synaptic shot noise and conductance fluctuations affect the membrane voltage with equal significance. *Neural Comput.*, **17**:923–947.

Richardson, M., Brunel, N., and Hakim, V. (2003) From subthreshold to firing-rate resonance. *J. Neurophysiol.*, **89**(5):2538–2554.

Rieke, F., Warland, D., de Ruyter van Steveninck, R., and Bialek, W. (1997) *Spikes: Exploring the Neural Code*. MIT Press, Cambridge, MA.

Rinzel, J. (1985) Excitation dynamics: insights from simplified membrane models. *Theor. Trends Neurosci.*, **44**(15):2944–2946.

Rinzel, J. and Ermentrout, G. B. (1998) Analysis of neural excitability and oscillations. In Koch, C. and Segev, I., eds, *Methods in Neuronal Modeling,* 2nd edn, pp. 251–291. MIT Press, Cambridge, MA.

Risken, H. (1984) *The Fokker Planck Equation: Methods of Solution and Applications*. Springer-Verlag, Berlin.

Ritz, R. and Sejnowski, T. (1997) Synchronous oscillatory activity in sensory systems: new vistas on mechanisms. *Current Opinion Neurobiol.*, **7**:536–546.

Roberts, P. and Bell, C. (2000) Computational consequences of temporally asymmetric learning rules: II. Sensory image cancellation. *Comput. Neurosci.*, **9**:67–83.

Roitman, J. and Shadlen, M. (2002) Response of neurons in the lateral intraparietal area during a combined visual discrimination reaction time task. *J. Neurosci.*, **22**: 9475–9489.

Romo, R. and Salinas, E. (2003) Flutter discrimination: neural codes, perception, memory and decision making. *Nat. Rev. Neurosci.*, **4**:203–218.

Rosin, B., Slovik, M., Mitelman, R., *et al.* (2011) Closed-loop deep brain stimulation is superior in ameliorating parkinsonism. *Neuron*, **72**:370–384.

Rospars, J. P. and Lansky, P. (1993) Stochastic model neuron without resetting of dendritic potential: application to the olfactory system. *Biol. Cybern.*, **69**:283–294.

Roxin, A. and Ledberg, A. (2008) Neurobiological models of two-choice decision making can be reduced to a one-dimensional nonlinear diffusion equation. *PLOS Comput. Biol.*, **4**:e1000046.

Rubin, J., Lee, D. D., and Sompolinsky, H. (2001) Equilibrium properties of temporally asymmetric Hebbian plasticity. *Phys. Rev. Lett.*, **86**:364–367.

Rubin, J. and Terman, D. (2004) High frequency stimulation of the subthalamic nucleus eliminates pathological thalamic rhythmicity in a computational model. *J. Comput. Neurosci.*, **16**:211–235.

Rust, N., Mante, V., Simoncelli, E., and Movshon, J. (2006) How MT cells analyze the motion of visual patterns. *Nature Neurosci.*, **11**:1421–1431.

Sabah, N. H. and Leibovic, K. N. (1969) Subthreshold oscillatory responses of the Hodgkin-Huxley cable model for the squid giant axon. *Biophys. J.*, **9**(10):1206–1222.

Sahani, M. and Linden, J. (2003) Evidence optimization techniques for estimating stimulus-response functions. In *Advances in Neural Information Processing Systems* 15, pp. 301–308. MIT Press, Cambridge, MA.

Sakata, S. and Harris, K. (2009) Laminar structure of spontaneous and sensory-evoked population activity in auditory cortex. *Neuron*, **64**:298–300.

Salzman, C., Britten, K., and Newsome, W. (1990) Cortical microstimulation influences perceptual judgements of motion directions. *Nature*, **346**:174–177.

Sanfey, A. and Chang, L. (2008) Multiple systems in decision making. *Ann. NY. Acad. Sci*, **1128**:53–62.

Schneidman, E., Freedman, B., and Segev, I. (1998) Ion channel stochasticity may be critical in determining the reliability and precision of spike timing. *Neural Comput.*, **10**:1679–1703.

Schrauwen, B. and Campenhout, J. (2007) Linking non-binned spike train kernels to several existing spike train metrics. *Neurocomputing*, **70**(7-9):1247–1253.

Schreiber, S., Fellous, J., Whitmer, D., Tiesinga, P., and Sejnowski, T. J. (2003) A new correlation-based measure of spike timing reliability. *Neurocomputing*, **52**(54): 925–931.

Schrödinger, E. (1915) Zur Theorie der Fall- und Steigversuche and Teilchen mit Brownscher Bewegung. *Phys. Zeitschrift*, **16**:289–295.

Schultz, W. (2007) Behavioral dopamine signals. *Trends Neurosci.*, **30**(5):203–210.

Schultz, W. (2010) Dopamine signals for reward value and risk: basic and recent data. *Behav. Brain Funct.*, **6**:24.

Schultz, W., Dayan, P., and Montague, R. (1997) A neural substrate for prediction and reward. *Science*, **275**:1593–1599.

Schwalger, T., Fisch, K., Benda, J., and Lindner, B. (2010) How noisy adaptation in neurons shapes interspike interval histograms and correlations. *PLOS Comput. Biol.*, **6**:e1001026.

Segev, I., Rinzel, J., and Shepherd, G. M. (1994) *The Theoretical Foundation of Dendritic Function*. MIT Press, Cambridge, MA.

Sejnowski, T. (1977) Storing covariance with nonlinearly interacting neurons. *J. Math. Biol.*, **4**:303–321.

Sejnowski, T. J. (1999) The book of Hebb. *Neuron*, **24**:773–776.

Sejnowski, T. J. and Tesauro, G. (1989) The Hebb rule for synaptic plasticity: algorithms and implementations. In Byrne, J. H. and Berry, W. O., eds., *Neural Models of Plasticity*, Ch. 6, pp. 94–103. Academic Press, Salt Lake City, UT.

Senn, W. (2002) Beyond spike timing: the role of non-linear plasticity and unreliable synapses. *Biol. Cyber.*, **87**:344–355.

Senn, W., Tsodyks, M., and Markram, H. (2001) An algorithm for modifying neurotransmitter release probability based on pre- and postsynaptic spike timing. *Neural Comput.*, **13**:35–67.

Shadlen, M. N. and Newsome, W. T. (1994) Noise, neural codes and cortical organization. *Current Opinion Neurobiol.*, **4**:569–579.

Shatz, C. (1992) The developing brain. *Sci. Am.*, **267**:60–67.

Shenoy, K., Kaufman, M., Sahani, M., and Churchland, M. (2011) A dynamical systems view of motor preparation: implications for neural prosthetic system design. *Progr. Brain Res.*, **192**:33–58.

Shoham, S. (2001) Advances towards an implantable motor cortical interface. PhD thesis, University of Utah.

Shriki, O., Hansel, D., and Sompolinsky, H. (2003) Rate models for conductance-based cortical neuronal networks. *Neural Comput.*, **15**:1809–1841.

Siebert, W. M. and Gray, P. R. (1963) Random process model for the firing pattern of single auditory nerve fibers. Quarterly Progress Report No. 71, Research Laboratory of Electronics, MIT, pp. 241–245.

Siegert, A. (1951) On the first passage time probability problem. *Phys. Rev.*, **81**:617–623.

Silberberg, G., Bethge, M., Markram, H., Pawelzik, K., and Tsodyks, M. (2004) Dynamics of population rate codes in ensembles of neocortical neurons. *J. Neurophysiol.*, **91**:704–709.

Simoncelli, E., Paninski, L., Pillow, J., and Schwarz, O. (2004) Characterization of neural responses with stochastic stimuli. In Gazzaninga, M., ed., *The Cognitive Neurosciences*, 3rd edn. MIT Press, Cambridge, MA.

Singer, W. (1993) Synchronization of cortical activity and its putative role in information processing and learning. *Ann. Rev. Physiol.*, **55**:349–374.

Singer, W. (2007) Binding by synchrony. *Scholarpedia*, **2**:1657.

Sirovich, L. and Knight, B. W. (1977) On subthreshold solutions of the Hodgkin-Huxley equations. *Proc. Nat. Acad. Sci.*, **74**(12):5199–5202.

Sjöström, J. and Gerstner, W. (2010) Spike-timing dependent plasticity. *Scholarpedia*, **5**:1362.

Sjöström, P., Turrigiano, G., and Nelson, S. (2001) Rate, timing, and cooperativity jointly determine cortical synaptic plasticity. *Neuron*, **32**:1149–1164.

Smith, A. and Brown, E. (2003) Estimating a state-space model from point process observations. *Neural Comput.*, **15**:965–991.

Smyth, D., Willmore, B., Baker, G. E., Thompson, I. D., and Tolhurst, D. J. (2003) The receptive-field organization of simple cells in primary visual cortex of ferrets under natural scene stimulation. *J. Neurosci.*, **23**(11):4746–4759.

Softky, W. R. (1995) Simple codes versus efficient codes. *Current Opinion Neurobiol.*, **5**:239–247.

Softky, W. R. and Koch C. (1993) The highly irregular firing pattern of cortical cells is inconsistent with temporal integration of random EPSPs. *J. Neurosci.*, **13**:334–350.

Sompolinsky, H. and Kanter, I. (1986) Temporal association in asymmetric neural networks. *Phys. Rev. Lett.*, **57**:2861–2864.

Sompolinksy, H., Crisanti, A., and Sommers, H. (1988) Chaos in random neural networks. *Phys. Rev. Lett.*, **61**:259–262.

Song, S., Miller, K., and Abbott, L. (2000) Competitive Hebbian learning through spike-time-dependent synaptic plasticity. *Nature Neurosci.*, **3**:919–926.

Soon, C., Brass, M., Heinze, H., and Haynes, J. (2008) Unconscious determinants of free decisions in the human brain. *Nat. Neurosci.*, **11**:543–545.

Spiridon, M. and Gerstner, W. (2001) Effect of lateral connections on the accuracy of the population code for a network of spiking neurons. *Network*, **12**(4):409–421.

Spiridon, M., Chow, C., and Gerstner, W. (1998) Frequency spectrum of coupled stochastic neurons with refractoriness. In Niklasson, L., Bodén, M., and Ziemke, T., eds, *ICANN 98*, pp. 337–342. Springer, Berlin.

Srinivasan, L. and Brown, E. N. (2007) A state-space framework for movement control to dynamic goals through brain-driven interfaces. *IEEE Trans. Biomed. Engng.*, **54**(3): 526–535.

Stein, R. B. (1965) A theoretical analysis of neuronal variability. *Biophys. J.*, **5**:173–194.

Stein, R. B. (1967a) The information capacity of nerve cells using a frequency code. *Biophys. J.*, **7**:797–826.

Stein, R. B. (1967b) Some models of neuronal variability. *Biophys. J.*, **7**:37–68.

Steinmetz, P. N., Roy, A., Fitzgerald, P. J., Hsiao, S. S., Johnson, K., and Niebur, E. (2000) Attention modulates synchronized neuronal firing in primate somatosensory cortex. *Nature*, **404**:187–190.

Stevens, C. F. and Zador, A. M. (1998) Novel integrate-and-fire like model of repetitive firing in cortical neurons. In *Proceedings of the 5th Joint Symposium on Neural Computation*. Available at: http://cnl.salk.edu/zador/PDF/increpfire.pdf.

Strogatz, S. H. (1994) *Nonlinear Dynamical Systems and Chaos*. Addison Wesley, Reading, MA.

Stroop, J. (1935) Studies of interference in serial verbal reactions. *J. Exp. Psychol.*, **18**:643–662.

Stuart, G., Spruston, N., and Häusser, M. (2007) *Dendrites*, 2nd edn. Oxford University Press, Oxford.

Sussillo, D. and Abbott, L. (2009) Generating coherent patterns of activity from chaotic neural networks. *Neuron*, **63**: 544–447.

Sussillo, D. and Barak, O. (2013) Opening the black box: Low-dimensional dynamics in high-dimensional recurrent neural networks. *Neural Comput.*, **25**:626–649.

Tass, P. (2003) A model of desynchronizing deep brain stimulation with a demand-controlled coordinated reset of neural subpopulations. *Biol. Cybern.*, **89**:81–88.

Tass, P., Adamchic, I., Freund, H.-J., von Stackelberg, T., and Hauptmann, C. (2012a) Counteracting tinnitus by acoustic coordinated reset neuromodulation. *Restor. Neurol. Neurosci,*, **30**:137–159.

Tass, P., Qin, L., *et al.* (2012b) Coordinated reset has sustained aftereffects in parkinsonian monkeys. *Ann. Neurol.*, **72**:816–820.

Tass, P., Smirnov, D., *et al.* (2010) The causal relationship between subcortical local field potential oscillations and parkinsonian resting tremor. *J. Neur. Eng.*, **7**:016009.

Taube, J. S. and Muller, R. U. (1998) Comparisons of head direction cell activity in the postsubiculum and anterior thalamus of freely moving rats. *Hippocampus*, **8**:87–108.

Tchumatchenko, T., Malyshev, A., Wolf, F., and Volgushev, M. (2011) Ultrafast population encoding by cortical neurons. *J. Neurosci.*, **31**:12171–12179.

Theunissen, F. and Miller, J. (1995) Temporal encoding in nervous systems: a rigorous definition. *J. Comput. Neurosci,*, **2**:149–162.

Thompson, R. F. (1993) *The Brain*, 2nd edn. W. H. Freeman, New York.

Thorpe, S., Fize, D., and Marlot, C. (1996) Speed of processing in the human visual system. *Nature*, **381**:520–522.

Tiesinga, P. H. E. (2004) Chaos-induced modulation of reliability boosts output firing rate in downstream cortical areas. *Phys. Rev. E*, **69**(3 Pt 1):031912.

Toledo-Rodriguez, M., Blumenfeld, B., Wu, C., Luo, J., Attali, B., Goodman, P., and Markram, H. (2004) Correlation maps allow neuronal electrical properties to be predicted from single-cell gene expression profiles in rat neocortex. *Cerebral Cortex*, **14**:1310–1327.

Touboul, J. (2009) Importance of the cutoff value in the quadratic adaptive integrate-and-fire model. *Neural Comput.*, **21**:2114–2122.

Touboul, J. and Brette, R. (2008) Dynamics and bifurcations of the adaptive exponential integrate-and-fire model. *Biol. Cybernetics*, **99**:319–334.

Tovee, M. J. and Rolls, E. T. (1995) Information encoding in short firing rate epochs by single neurons in the primate temporal visual cortex. *Visual Cogn.*, **2**(1):35–58.

Traub, R. (2006) Fast oscillations. *Scholarpedia*, **1**:1764.

Treves, A. (1993) Mean-field analysis of neuronal spike dynamics. *Network*, **4**:259–284.

Troyer, T. W. and Miller, K. (1997) Physiological gain leads to high ISI variability in a simple model of a cortical regular spiking cell. *Neural Comput.*, **9**:971–983.

Truccolo, W., Eden, U. T., Fellows, M. R., Donoghue, J. P., and Brown, E. N. (2005) A point process framework for relating neural spiking activity to spiking history, neural ensemble, and extrinsic covariate effects. *J. Neurophysiol.*, **93**(2):1074–1089.

Tsodyks, M. and Feigelman, M. (1986) The enhanced storage capacity in neural networks with low activity level. *Europhys. Lett.*, **6**:101–105.

Tsodyks, M., Mitkov, I., and Sompolinsky, H. (1993) Patterns of synchrony in inhomogeneous networks of oscillators with pulse interaction. *Phys. Rev. Lett.*, **71**:1281–1283.

Tsodyks, M., Skaggs, W., Sejnowski, T., and McNaughton, B. (1997) Paradoxical effects of external modulation of inhibitory interneurons. *J. Neurosci.*, **17**:4382–4388.

Tuckwell, H. C. (1988) *Introduction to Theoretic Neurobiology*. Cambridge University Press, Cambridge.

Tuckwell, H. C. (1989) *Stochastic Processes in the Neurosciences*. SIAM, Philadelphia, PA.

Uhlenbeck, G. E. and Ornstein, L. S. (1930) On the theory of the Brownian motion. *Phys. Rev*, **36**:823–841.

Uzzell, V. and Chichilnisky, E. (2004) Precision of spike trains in primate retinal ganglion cells. *J. Neurophysiol.*, **92**:780–789.

van Kampen, N. G. (1992) *Stochastic Processes in Physics and Chemistry*, 2nd edn. North-Holland, Amsterdam.

van Rossum, M. C. W. (2001) A novel spike distance. *Neural Comput.*, **13**:751–763.

van Rossum, M. C. W., Bi, G. Q., and Turrigiano, G. G. (2000) Stable Hebbian learning from spike timing-dependent plasticity. *J. Neurosci.*, **20**:8812–8821.

van Vreeswijk, C. and Sompolinsky, H. (1996) Chaos in neuronal networks with balanced excitatory and inhibitory activity. *Science*, **274**:1724–1726.

van Vreeswijk, C. and Sompolinsky, H. (1998) Chaotic balanced state in a model of cortical circuits. *Neural Comput.*, **10**:1321–1371.

Victor, J. D. and Purpura, K. (1996) Nature and precision of temporal coding in visual cortex: a metric-space analysis. *J. Neurophysiol.*, **76**(2):1310–1326.

Victor, J. and Purpura, K. (1997) Metric-space analysis of spike trains: theory, algorithms and application. *Network*, **8**:127–164.

Vidne, M., Ahmadian, Y., Shlens, J. *et al.* (2012) Modeling the impact of common noise inputs on the network activity of retinal ganglion cells. *J. Comput. Neurosci.*, **33**(1):97–121.

Vogels, T. P. and Abbott, L. (2005) Signal propagation and logic gating in networks of integrate-and-fire neurons. *J. Neurosci.*, **25**:10786–10795.

Vogels, T. P. and Abbott, L. (2009) Gating multiple signals through detailed balance of excitation and inhibition in spiking networks. *Nature Neurosci.*, **12**:438–491.

Vogels, T., Sprekeler, H., Zenke, F., Clopath, C., and Gerstner, W. (2011) Inhibitory plasticity balances excitation and inhibition in sensory pathways and memory networks. *Science*, **334**:1569–1573.

von der Malsburg, C. (1973) Self-organization of orientation selective cells in the striate cortex. *Kybernetik*, **14**:85–100.

von der Malsburg, C. (1981) The correlation theory of brain function. Internal Report 81-2, MPI für Biophysikalische Chemie, Göttingen. Reprinted in *Models of Neural Networks II*, Domany *et al.* (eds.), Springer, Berlin, 1994, pp. 95–119.

Wang, H.-X., Gerkin, R., Nauen, D., and Wang, G.-Q. (2005) Coactivation and timing-dependent integration of synaptic potentiation and depression. *Nature Neurosci.*, **8**:187–193.

Wang, X.-J. (2002) Probabilistic decision making by slow reverberation in cortical circuits. *Neuron*, **36**:955–968.

Wang, Y., Gupta, A., Toledo-Rodriguez, M., Wu, C., and Markram, H. (2002) Anatomical, physiological, molecular and circuit properties of nest basket cells in the developing somatosensory cortex. *Cerebral Cortex*, **12**:395–410.

Waxman, S. G. (1980) Determinants of conduction velocity in myelinated nerve fibers. *Musc. Nerve*, **3**(2):141–150.

Wehmeier, U., Dong, D., Koch, C., and van Essen, D. (1989) Modeling the mammalian visual system. In Segev, I., ed., *Methods in Neuronal Modeling*, pp. 335–359. MIT Press, Cambridge, MA.

Weiss, T. (1966) A model of the peripheral auditory system. *Kybernetik*, **3**:153–175.

Welsh, J., Lang, E., and Llinas, I. S. (1995) Dynamic organization of motor control within the olivocerebellar system. *Nature*, **374**:453–457.

Willshaw, D. J., Bunemann, O. P., and Longuet-Higgins, H. C. (1969) Non-holographic associative memory. *Nature*, **222**:960–962.

Willshaw, D. J. and von der Malsburg, C. (1976) How patterned neuronal connections can be set up by self-organization. *Proc. R. Soc. Lond. B*, **194**:431–445.

Wilson, C., Beverlin, B., and Netoff, T. (2011) Chaotic desynchronization as the therapeutic mechanism of deep brain stimulation. *Front. Syst. Neurosci.*, **5**:50.

Wilson, H. R. and Cowan, J. D. (1972) Excitatory and inhibitory interactions in localized populations of model neurons. *Biophys. J.*, **12**:1–24.

Wilson, H. R. and Cowan, J. D. (1973) A mathematical theory of the functional dynamics of cortical and thalamic nervous tissue. *Kybernetik*, **13**:55–80.

Wilson, M. A. and McNaughton, B. L. (1993) Dynamics of the hippocampal ensemble code for space. *Science*, **261**:1055–1058.

Winfree, A. T. (1980) *The Geometry of Biological Time*. Springer-Verlag, Berlin.

Wiskott, L. and Sejnowski, T. (1998) Constraint optimization for neural map formation: a unifying framework for weight growth and normalization. *Neural Comput.*, **10**: 671–716.

Wolff, L. and Lindner, B. (2011) Mean, variance, and autocorrelation of subthreshold potential fluctuations driven by filtered conductance shot noise. *Neural Comput.*, **22**:94–120.

Wong, K. and Wang, X. (2006) A recurrent network mechanism of time integration in perceptual decisions. *J. Neurosci.*, **26**:1314–1328.

Woosley, T. A. and Van der Loos, H. (1970) The structural organization of layer IV in the somatosensory region (SI) of mouse cerebral cortex: The description of a cortical field composed of discrete cytoarchitectonic units. *Brain Res.*, **17**:205–242.

Wu, M., David, S., and Gallant, J. (2006) Complete functional characterization of sensory neurons by system identification. *Ann. Rev. Neurosci.*, **29**(1):477–505.

Wu, W. and Srivastava, A. (2012) Estimating summary statistics in the spike-train space. *J. Comput. Neurosci.*, **34**(3):391–410.

Yamada, W. M., Koch, C., and Adams, P. R. (1989) Multiple channels and calcium dynamics. In Koch, C. and Segev, I., eds, *Methods in Neuronal Modeling*. MIT Press, Cambridge, MA.

Yu, B. M., Cunningham, J. P., Santhanam, G., Ryu, S. I., Shenoy, K. V., and Sahani, M. (2009) Gaussian-process factor analysis for low-dimensional single-trial analysis of neural population activity. *J. Neurophysiol.*, **102**:614–635.

Zeldovich, Y. B. and Frank-Kamenetskii, D. (1938) Thermal theory of flame propagation. *Zh. Fiz. Khim*, **12**(1):100–105.

Zhang, J.-C., Lau, P.-M., and Bi, G.-Q. (2009) Gain in sensitivity and loss in temporal contrast of STDP by dopaminergic modulation at hippocampal synapses. *Proc. Natl. Acad. Sci. USA*, **106**:13–28–13033.

Zhang, K. (1996) Representaton of spatial orientation by the intrinsic dynamics of the head-direction ensemble: a theory. *J. Neurosci.*, **16**:2112–2126.

Zhang, L., Tao, H., Holt, C., W. A. Harris, and Poo, M.-M. (1998) A critical window for cooperation and competition among developing retinotectal synapses. *Nature*, **395**:37–44.

Zugaro, M., Arleo, A., Berthoz, A., and Wiener, S. I. (2003) Rapid spatial reorientation and head direction cells. *J. Neurosci.*, **23**(8):3478–3482.