

List of Publications

1 Articles published as sole author

- 1972 **Willshaw, D J** A simple network capable of inductive generalisation. *Proc Roy Soc B*, **182**: 233-247.
- 1980 **Willshaw, D J** Can the specificity of some nerve connections be accounted for by unspecific mechanisms? *Trends in Neuroscience*, **3**: 157-158.
- 1981 **Willshaw, D J** Holography, associative memory and inductive generalisation. In *Parallel models of associative memory*. G E Hinton & J A Anderson (eds), New Jersey, Erlbaum, 83-104.
Willshaw, D J The establishment and the subsequent elimination of poly-neuronal innervation of developing muscle: theoretical considerations. *Proc Roy Soc Lond B*, **212**: 233-252.
- 1988 **Willshaw, D J** Neural Systems and Models. In *Proceedings of the European Seminar on Neural Computing*, London, 1988.
- 1989 **Willshaw, D J** Neural aspects of Neural Networks. In *Proceedings of the Blenheim Conference on Neural Networks*, London, 1989.
- 1991 **Willshaw, D J** The Elastic Net: A neighbourhood preserving algorithm for the TSP. In *Proceedings of the TSP90*.
- 1991 **Willshaw, D J** David Marr's *Simple memory: a theory for archicortex*. In *From the Retina to the Neocortex: Selected papers of David Marr*, Vaina (ed), Birkhauser Boston
- 1993 **Willshaw, D J** Models for the formation of ordered retinotectal connections. In: *Formation and Regeneration of nerve connections*, Sharma & Fawcett (eds), Birkhauser Boston, 240-247
- 1995 **Willshaw, D J** Non-symbolic approaches to Artificial Intelligence and the Mind. *Phil Trans Roy Soc A*, **349**, 87-102.
Willshaw, D J Non-symbolic approaches to Artificial Intelligence and the Mind. In *Neural Computation and Psychology*, Smith & Hancock (eds), Springer Verlag, 3-18.
- 1996 **Willshaw, D J** Mechanisms of synaptic competition. In *Proceedings of the Physiological Society*.
- 2005 **Willshaw, D J** Self-organisation in the nervous system. In *Cognitive Systems: Information Processing Meets Brain Science*. Elsevier.
- 2006 **Willshaw, D J** Analysis of mouse EphA knockins and knockouts suggests that retinal axons programme target cells to form ordered retinotopic maps. *Development*, **133**, 2705-2717.

2 Joint articles published

- 1969 **Willshaw, D J & Longuet-Higgins, H C** The Holophone - recent developments. *Machine Intelligence*, **4**, 349-357.
Willshaw, D J, Buneman, O P & Longuet-Higgins, H C Non-holographic associative memory. *Nature*, **222**, 960-962.
- 1970 **Willshaw, D J & Longuet-Higgins, H C** Associative memory models. *Machine Intelligence*, **5**, 351-359.
Willshaw, D J, Longuet-Higgins, H C & Buneman, O P Models for the brain. *Nature*, **225**, 177-178.
Longuet-Higgins, H C & Willshaw, D J Theories of associative recall. *Qu.Rev.Biophys.*, **3**, 223-244.
- 1971 **Longuet-Higgins, H C & Willshaw, D J** The Holophone. In *Associative Information Techniques*, Jacks (ed).
- 1972 **Willshaw, D J & Buneman, O P** Parallel and serial methods of pattern matching. *Machine Intelligence*, **7**, 357-367.
- 1975 **Prestige, M C & Willshaw, D J** On a role for competition in the formation of patterned neural connexions. *Proc.Roy.Soc.B.*, **190**, 77-98.
Willshaw, D J & von der Malsburg, Ch The establishment of patterned neural connections according to a theory of self-organisation. *Pflugers Archiv.*, **359**, (Suppl.) R95.

- 1976 **von der Malsburg, Ch & Willshaw, D J** A mechanism for producing continuous mappings: ocularity dominance stripes and ordered retinotectal mappings. *Exp.Br.Res.Supplementum.*, **1**, 463-469.
Willshaw, D J & von der Malsburg, Ch How patterned neural connexions can be set up by self-organisation. *Proc.Roy.Soc.B.*, **194**, 431-445.
- 1977 **von der Malsburg, Ch & Willshaw, D J** How to label nerve cells so that they can interconnect in an ordered fashion. *Proc.Natn.Acad.Sci.USA*, **74**, 5176-5178.
- 1978 **Lee, B B & Willshaw, D J** Responses of the various types of cat retinal ganglion cells to moving contours. *Vision Research*, **18**, 757-765.
- 1979 **Gardner-Medwin, A R, Gibson, Josephine, L & Willshaw, D J** The mechanisms of potassium dispersal in brain tissue. *J.Physiol.*, **193**, 37-38.
Willshaw, D J & von der Malsburg, Ch A marker induction mechanism for the establishment of ordered neural mappings: its application to the retinotectal problem. *Phil.Trans.Roy.Soc.B.*, **287**, 203-243.
- 1981 **von der Malsburg, Ch & Willshaw, D J** Co-operativity and brain organisation. *Trends in Neurosci.*, **4**, 80-83.
von der Malsburg, Ch & Willshaw, D J Differential equations for the development of topological nerve fibre projections. *SIAM-AMS Proceedings*, **13**, 39-47.
- 1982 **Fawcett, J W & Willshaw, D J** Compound eyes project stripes onto the optic tectum. *Nature*, **296**, 350-352.
- 1983 **Willshaw, D J, Fawcett, J W & Gaze, R M** The visuo-tectal projections made by *Xenopus* "pie-slice" compound eyes. *J.Embryol.Exp.Morph.*, **74**, 29-45.
- 1985 **Taylor, J S H, Willshaw, D J & Gaze, R M** The distribution of fibres in the optic tract after contralateral translocation of an eye in *Xenopus*. *J.Embryol.Exp.Morph.*, **85**, 225-328.
- 1986 **Willshaw, D J & Gaze, R M** The discontinuous visual projections on the *Xenopus* optic tectum following regeneration after unilateral nerve section. *J.Embryol.Exp.Morph.*, **94**, 121-136.
- 1987 **Durbin, R & Willshaw, D J** An analogue approach to the travelling salesman problem using an elastic net method. *Nature*, **126**, 689-691.
- 1990 **Goodhill, G J & Willshaw, D J** Application of the elastic net algorithm to the formation of ocular dominance stripes. *Network: Computation in Neural Systems*, **1**, 41-59.
Willshaw, D J & Dayan, P S Optimal Plasticity from Matrix Memories: What goes up must come down. *Neural Computation*, **1**, 85-93.
Willshaw, D J & Buckingham, J T An assessment of Marr's theory of the hippocampus as a temporary memory store. *Phil.Trans.Roy.Soc.B.*, **329**, 205-215.
- 1991 **Dayan, P S & Willshaw, D J** Optimising synaptic learning rules in linear associative memories. *Biol. Cybern.*, **65**, 253-265.
- 1992 **Tyrrell, L R T & Willshaw, D J** Cerebellar cortex: Its simulation and the relevance of Marr's theory. *Phil Trans Roy Soc B*, **336**, 239-257.
Buckingham, J T & Willshaw, D J Performance characteristics of the associative net. *Network: Computation in Neural Systems*, **3**, 407-414.
Willshaw, D J & Dayan, P S Learning rules for the hippocampus. *Proceedings of the 15th Annual Meeting of the European Neuroscience Association*, Munich.
- 1993 **Rasmussen, C E & Willshaw, D J** Presynaptic and postsynaptic competition in models for the development of neuromuscular connections. *Biol Cybern*, **68**, 409-419.
Walker, A, Hallam, J & Willshaw, D J Simple spatial memories for a mobile robot: A bee-haviour based approach. *Proceedings of the 6th International Conference on Industrial and Engineering Applications of Artificial Intelligence and Expert Systems*, Edinburgh.
Buckingham, J T & Willshaw, D J On setting unit thresholds in an incompletely connected associative net. *Network: Computation in Neural Systems*, **4**, 441-459.
Walker, A, Hallam, J & Willshaw, D J Bee-haviour in a mobile robot: The construction of a self-organised cognitive map and its use in robot navigation within a complex, natural environment. *IEEE Proceedings of International Conference on Neural Networks*, San Francisco.
- 1994 **Simmen, M W, Goodhill, G J & Willshaw, D J** Scaling and brain connectivity. Scientific Correspondence in *Nature*, **369**, 448-450.
Goodhill, G J & Willshaw, D J Elastic net model of ocular dominance: Overall stripe pattern and monocular deprivation. *Neural Computation*, **6**, 615-621.

- 1995 **Goodhill, G, Simmen, M W & Willshaw, D J** An evaluation of the use of multidimensional scaling for understanding brain connectivity. *Phil Trans Roy Soc B*, **348**, 265-280.
- Graham, B P & Willshaw, D J** Capacity and information efficiency of a brain-like associative net. *Advances in Neural Information Processing Systems*, **4**, 513-520.
- Graham, P B & Willshaw, D J** Improving recall in a sparse autoassociative memory. *Biol Cyber*, **72**, 337-346.
- Henson, R N A & Willshaw, D J** Short-term associative memory. *Proceedings of the INNS World Congress on Neural Networks*, Washington DC, **1**, 438-441.
- 1996 **Joseph, S R H & Willshaw, D J** The role of activity in synaptic competition at the neuromuscular junction. In Touretzky, D, Mozer, M & Hasselmo, M (Eds), *Neural Information Processing Systems 8*, 96-102. MIT Press.
- Graham, B P & Willshaw, D** Information efficiency of the associative net at arbitrary coding rates. *Proceedings of ICANN96*, Bochum, 35-40.
- Graham, B P & Willshaw, D** An associative memory model with probabilistic synaptic transmission. *Proceedings of CNS96*.
- Joseph, S R H & Steuber, V and Willshaw, D J** The dual role of calcium in synaptic plasticity of the motor endplate. *Proceedings of CNS96*.
- 1996 **Budinich, M, Graham, B P & Willshaw, D J** Multiple cueing of an associative net *International Journal of Neural Networks*, supp: 171.
- Hely, T J, Willshaw, D J & Hayes, G M** Biologically realistic adaptation of Kanerva's Sparse Distributed Memory. *IEEE Transactions on Neural Networks*, **8**, 791-794.
- 1997 **Steuber, V & Willshaw, D J** How a single Purkinje cell could learn the adaptive timing of the classically conditioned eye-blink response. *Proceedings of ICANN97*, Lausanne, 115-120.
- Graham, B P & Willshaw, D J** Capacity and information efficiency of the associative net. *Network: Computation in Neural Systems*, **8**, 35-54.
- Graham, B & Willshaw, D J** A model of clipped Hebbian learning in a neocortical pyramidal cell. W Gerstner et al, (eds), *Lecture Notes in Computer Science*, **1327**, 151-156, Springer.
- Willshaw, D J & Hallam, J C T & Gingell, S & Lau, S L** Marr's theory of the neocortex as a self-organising neural network. *Neural Computation*, **9**, 911-936.
- Joseph, S, Steuber, V, & Willshaw, D J** The dual role of calcium in synaptic plasticity at the motor endplate. *Computational Neuroscience: Trends in Research 97*, 7-12. J. Bower, ed., Plenum Press.
- Hely, T A, van Ooyen, A, & Willshaw, D J** A simulation of growth cone filopodia dynamics based on Turing morphogenesis patterns. In: Paton, R C, Holcombe, M. (eds.) *Information Processing in Cells and Tissues* Plenum, New York. *Proceedings of International Workshop on Information Processing in Cells and Tissues*.
- Hely, T, Willshaw, D J & Hayes, G** A new approach to Kanerva's sparse distributed memory. *IEEE Transactions on Neural Networks*, **8**, 791-794.
- van Ooyen, A & Willshaw, D J** Competition amongst neurons for neurotrophins. *Proceedings of ICANN97*, Lausanne, 139-144.
- Ijspeert, A J, Hallam, J & Willshaw, D J** Artificial lampreys: comparing naturally and artificially evolved swimming controllers. *Proceedings of the Fourth European Conference on Artificial Life (ECAL97)*, 256-265. P. Husbands and I. Harvey (eds), MIT Press.
- 1998 **Steuber, V & Willshaw, D J** Modelling the control of calcium oscillations by phosphorylation of metabotropic glutamate receptors. *Computational Neuroscience: Trends in Research 98*, 273-277. J. Bower, ed., Plenum Press.
- Ijspeert, A J, Hallam, J & Willshaw, D J** From lampreys to salamanders: evolving neural controllers for swimming and walking. *From Animals to Animats, Proceedings of the Fifth International Conference of The Society for Adaptive Behavior (SAB98)*, R. Pfeiffer (ed), MIT Press.
- Steuber, V, van Ooyen, A & Willshaw, D J** Computational models of synaptic delay learning by phosphorylation of metabotropic glutamate receptors. *Eur. J. Neurosci. Suppl.*, **10**, 14-20.
- Hely, T A & Willshaw, D J** Short term interactions between microtubules and actin filaments underlie long term behaviours in neuronal growth cones. *Proceedings of the Royal Society B*, **265**, 1801-1807.
- 1999 **Steuber, V & Willshaw, D J** Adaptive leaky integrator models of cerebellar Purkinje cells can learn the clustering of temporal patterns. *Neurocomputing*, **26**, 271-276.

- 1999 **Steuber, V & Willshaw, D J** A model of intracellular signalling can implement Radial Basis Function learning in cerebellar Purkinje cells. J Bower (ed), *Computational Neuroscience: Trends in Research 99*, Plenum Press.
- Isjpeert, A J, Hallam, J & Willshaw, D J** Evolving swimming controllers for a simulated lamprey with inspiration from neurobiology. *Adaptive Behaviour* 7(2), 151-172.
- van Ooyen, A & Willshaw, D J** Influence of dendritic morphology on axonal competition. *Proceedings of ICANN99*, Edinburgh, 1000-1005.
- Gillies, A J & Willshaw, D J** A massively connected subthalamic nucleus leads to the generation of widespread pulses. *Proceedings of the Royal Society B*, **265**, 2101-2109.
- Reid, A & Willshaw, D J** Modelling prefrontal cortex delay cells: the role of dopamine in schizophrenia. *Progress in Brain Research*, **121**, 351-373.
- Westermann, G, Willshaw, D J & Penke, M** A constructivist neural network model of German verb inflection in agrammatic aphasia. *Proceedings of ICANN99*, Edinburgh, 916-921.
- van Ooyen, A & Willshaw, D J** Competition for neurotrophic factor in the development of nerve connections. *Proc. R. Soc. Lond. B.*, **266**, 883-892.
- van Ooyen, A & Willshaw, D J** Poly- and mononeuronal innervation in a model for the development of neuromuscular connections. *J. Theor. Biol.*, **196**, 495-511.
- Graham, B P & Willshaw, D J** Probabilistic synaptic transmission in the associative net. *Neural Computation*, **11**, 117-137.
- 2000 **Eglen, S J, van Ooyen, A, & Willshaw, D J** Lateral cell movement driven by dendritic interactions is sufficient to form retinal mosaics. *Network: Computation in Neural Systems*, **11**, 103-118.
- Eglen, S J & Willshaw, D J** Estimating the influence of cell fate, mediated by lateral inhibition, upon the development of retinal mosaics. *European Journal of Neuroscience*, **12 (Suppl S)**, 486-486.
- van Ooyen, A & Willshaw, D J** Development of nerve connections under the control of neurotrophic factors: parallels with consumer-resource systems in population biology. *J. Theor. Biol.*, **206**, 195-210.
- van Ooyen, A, Willshaw, D J, & Ramakers, G J** Influence of dendritic morphology on axonal competition. *Neurocomputing*, **32-33**, 255-260.
- 2001 **Gillies, A, Willshaw, D J & Li, Z** Subthalamic-pallidal interactions are critical in determining normal and abnormal functioning of the basal ganglia. *Proc Roy Soc B*, 545-551.
- 2002 **Gillies, A, Willshaw, D J, Atherton, J & Arbutnott, G** Functional interactions within the subthalamic nucleus. In *The Basal Ganglia VII*, Nicholson & Faull (Eds), Kluwer Academic/Plenum Publishers, 357-368.
- Eglen, S J & Willshaw, D J** Influence of cell fate mechanisms upon retinal mosaic formation: a modelling study. *Development*, **129(23)**, 5399-5408.
- Longden, K & Willshaw, D J** An evaluation of recurrent feedforward memory networks and their relevance to the hippocampus. *Neurocomputing*, **44**, 527-531.
- The OECD Working Group on Neuroinformatics: Amari, S-I, Beltrame, F, Bjaalie, J, Dalkara, T, De Schutter, E, Egan, G F, Goddard, N H, Gonzalez, C, Grillner, S, Herz, A, Hoffmann, K-P, Jaaskelainen, I, Koslow, S H, Lee, S-Y, Matthiessen, L, Miller, P L, da Silva, F M D, Novak, M, Ravindranath, V, Ritz, R, Ruotsalainen, U, Sebestra, V, Subramaniam, S, Tang, Y, Toga, A W, Usui, S, van Pelt, J, Verschure, P, Willshaw, D J & Wrobel, A** Neuroinformatics: the integration of shared databases and tools towards integrative neuroscience. *Journal of Integrative Neuroscience*, **1**, 117-128.
- 2003 **The OECD Working Group on Neuroinformatics: Eckersley, P, Egan, G, Amari, S-I, Beltrame, F, Bennett, R, Bjaalie, J G, Dalkara, T, De Schutter, E, Gonzalez, C, Grillner, S, Herz, A, Hoffmann, K-P, Jaaskelainen, I, Koslow, S H, Lee, S-Y, Matthiessen, L, Miller, P L, da Silva, F M D, Novak, M, Ravindranath, V, Ritz, R, Ruotsalainen, U, Sebestra, V, Subramaniam, S, Toga, A W, Usui, S, van Pelt, J, Verschure, P, Willshaw, D J & Wrobel, A, Yiyuan, T** Neuroscience data and tool sharing: a legal and policy framework for neuroinformatics. *Neuroinformatics Journal*, **1**, 149-165.
- Willshaw, D & Price D J** Models for topographic map formation. In *Modeling Neural Development*, A van Ooyen (Ed.) MIT Press, 213-244.

- 2004 **Gillies, A & Willshaw, D J** Models of the subthalamic nucleus: the importance of intranuclear connectivity. *Journal of Medical Engineering & Physics*, **26**, 723-732.
Steuber, V & Willshaw, D J A biophysical model of synaptic delay learning and temporal pattern recognition in a cerebellar purkinje cell. *Journal of Computational Neuroscience* **17**, 149-164.
Aguiar, P & Willshaw, D J Hippocampal mossy fibre boutons as dynamical synapses. *Neurocomputing*, **58**, 699-703.
- 2006 **Gillies, A & Willshaw, D J** Membrane channel interactions underlying rat subthalamalmic projection neuron rhythmic and bursting activity. *Journal of Neurophysiology*, **95(4)**, 2352-2365.
Steuber, V, Willshaw, D J & van Ooyen, A Generation of time delays: simplified models of intracellular signalling in cerebellar Purkinje cells. *Network: Computation in Neural Systems*, **17**, 173-191.
Kronhaus, D & Willshaw, D J. The cingulate as a catalyst region for global dysfunction: a dynamical modelling paradigm. *Cerebral Cortex*, **16(8)**, 1212-1224.

3 Important notes, reviews and review articles

- 1987 **Willshaw, D J & Morris, R G M** The function and structure of the hippocampus. *MRC News*, **37**, 20-21.
Morris, R G M & Willshaw, D J Only connect... *Nature*, **327**, 469-470.
- 1988 **Willshaw, D J** Review of *Neural Darwinism* by G M Edelman. In *Trends in Neurosciences*, **11**, 511-512.
- 1989 **Morris, R G M & Willshaw, D J** Must what goes up come down? *Nature*, **339**, 175-176.
Willshaw, D J Review of *Neural Computing Architectures: the Design of Brain-like Machines* by I Aleksander. In *Connection Science*, **1**, 223-224.
- 1990 **Willshaw, D J** Ceded Memories. Review of *Sparse Distributed Memory* by P Kanerva. In *Cognitive Neuropsychology*, **7 (3)**, 245-246.
Willshaw, D J Review of *Models of Brain Function* by R J Cotterill. In *Network*, **1**, 247-248.
- 1991 **Willshaw, D J** Review of *Neural Computing: An Introduction* by R Beale & T Jackson. In *Network*, **2**, 521-522.
- 1992 **Willshaw, D J & Dayan, P S** Synaptic Learning Rules. *Abstracts of the 15th Annual Meeting of the European Neuroscience Association*, Munich 13-17 September 1992. Oxford University Press.
- 1993 **Willshaw, D J** Review of *Foundation of the neuron doctrine* by G M Shepherd. In *Network*, **4**, 537-539.
Trevelyan, A J, Thompson, I D & Willshaw, D J Waves in the retina: The implications for the development of retinotopicity. In *Proceedings of the Society for Neuroscience*, 1993.
- 1994 **Willshaw, D J** Review of new journal *Neural Computing and Applications* for *Nature*, **371**, 453.
Goodhill, G J, Simmen, M W & Willshaw, D J An evaluation of the use of multidimensional scaling for understanding brain connectivity. *Phil Trans Roy Soc B*, **348**, 265-280.
- 1996 **Willshaw, D J** Review of *The Physics of Neural Networks*, *Trends in Neurosciences*

4 Books edited

- 1999 **Willshaw, D J & Murray, A** Proceedings of the Ninth International Conference on Artificial Neural Networks, ICANN99. Institution of Electrical Engineers, London.
- 2001 **Wermter, S, Austin, J & Willshaw, D J** Emergent Neural Computational Architectures based on Neuroscience. Springer, Heidelberg, New York (in press).

5 Books published

- 2000 **Price, D J & Willshaw D J** Mechanisms of Cortical Development. Monograph commissioned by the Physiological Society. Oxford University Press, Oxford.