
BIBLIOGRAPHY

Most reference lists in published papers aim to cover the most recent literature. This list also aims to bring out the origins of our knowledge in the older literature. To make the best advantage of this list, use the 'Find' capability on your computer to search for authors whose name is not first in the reference and to search for topics indicated by the titles. This list is a beginning only. It is advisable to search also on the Internet and on the search engines of the most appropriate journals, using the topic, name and initials to find the recent bibliography of these authors.

- Adelson, E. and Bergen, J. 1985, 'Spatiotemporal energy models for the perception of motion', *Journal of the Optical Society of America*, vol. 2, pp. 284–99.
- Ali, M. A. (ed.) 1984, 'Photoreception and vision in invertebrates', Plenum, London and New York.
- Aloimonos, Y. (ed.) 1993, *Active Perception*, Erlbaum, Hillsdale, NJ.
- Anderson, A. 1972, 'The ability of honeybees to generalize visual stimuli', in R. Wehner (ed.), *Information Processing in the Visual Systems of Arthropods*, Springer, Berlin, pp. 207–12.
- Anderson, A. M. 1977a, 'Shape perception in the honeybee', *Animal Behaviour*, vol. 25, pp. 67–79.
- Anderson, A. M. 1977b, 'A model for landmark learning in the honey bee', *Journal of Comparative Physiology*, vol. 114, pp. 335–55.
- Arnett, D. W. 1972, 'Spatial and temporal integration properties of units in the first optic ganglion of dipterans', *Journal of Neurophysiology*, vol. 35, pp. 429–44.
- Arvanitaki, A. 1937–61 [see list of recordings from molluscs in Bullock and Horridge (1965:1372)].
- Aung, S., Srinivasan, M. V. and Zhang, S. W. 2003, 'Honeybee navigation, properties of the visually driven "odometer"', *Journal of Experimental Biology*, vol. 206, pp. 1265–73.
- Autrum, H. (ed.) 1979–81, *Vision in Invertebrates. Volume VII. Parts 6A, 6B and 6C*, Springer, Berlin.

- Autrum, H. and von Zwehl, V. 1962, 'Die spektrale Empfindlichkeit einzelner Sehzellen des Bienenauges', *Zeitschrift für vergleichende Physiologie*, vol. 48, pp. 357–84.
- Baader, A., Schäfer, M. and Rowell, C. H. F. 1992, 'The perception of the visual flowfield by flying locusts. A behavioural and neuronal analysis', *Journal of Experimental Biology*, vol. 165, pp. 137–60.
- Backhaus, W. 1991, 'Color opponent coding in the visual system of the honeybee', *Vision Research*, vol. 31, pp. 1381–97.
- Baerends, G. P. 1941, 'Fortpflanzungsverhalten und Orientierung der Grabwespe *Ammophila campestris*', *Tijdschrift Entomologie*, vol. 84, pp. 68–275.
- Baerends, G. P. 1959, 'Ethological studies of insect behaviour', *Annual Review of Entomology*, pp. 207–34.
- Barlow, H. B. 1952, 'The size of ommatidia in apposition eyes', *Journal of Experimental Biology*, vol. 29, pp. 675–84.
- Barlow, H. B. 1961, 'Possible principles underlying the transformations of sensory messages', in W. A. Rosenblith (ed.), *Sensory Communication*, MIT Press, Cambridge, Mass., pp. 217–34.
- Barlow, H. B. 1965, 'Visual resolution and the diffraction limit', *Science*, vol. 149, pp. 553–5.
- Barlow, H. B. and Levick, W. R. 1965, 'The mechanism of directionally selective units in rabbit's retina', *Journal of Physiology*, vol. 178, pp. 477–504.
- Barlow, H. B., Frisby, J. P., Horridge, A. and Jeeves, M. A. 1993, *Natural and Artificial Low-Level Seeing Systems*, Oxford University Press, Oxford.
- Barnett, P. D., Nordström, K. and O'Carroll, D. C. 2007, 'Retinotopic organization of small-field-target-detecting neurons in the insect visual system', *Current Biology*, vol. 17, pp. 1–10.
- Baumann, F. 1975, 'Electrophysiological properties of the honey bee retina', in G. A. Horridge (ed.), *The Compound Eye and Vision of Insects*, Oxford University Press, Oxford, pp. 53–74.
- Baumgärtner, H. 1928, 'Der Formensinn und der Sehschärfe der Bienen', *Zeitschrift für vergleichende Physiologie*, vol. 7, pp. 56–143.
- Benard, J., Stach, S. and Giurfa, M. 2006, 'Categorization of visual stimuli in the honeybee *Apis mellifera*', *Animal Cognition*, vol. 9, pp. 257–70.
- Bernard, C. G. (ed.) 1966, *The Functional Organization of the Compound Eye*, Pergamon, Oxford.

- Berry, R., Stange, G., Olberg, R. and van Kleef, J. 2006, 'The mapping of visual space by identified large second-order neurons in the dragonfly median ocellus', *Journal of Comparative Physiology*, vol. 192, pp. 1105–23.
- Bethe, A. 1898, 'Dürfen wir den Ameisen und Bienen psychische Qualitäten zuschreiben?', *Archiv für gesammte Physiologie*, vol. 70, pp. 15–100.
- Beusekom, G. van, 1948, 'Some experiments on the optical orientation in *Philanthus triangulum*', *Behaviour*, vol. 1, pp. 195–226.
- Bidwell, N. J. and Goodman, L. J. 1993, 'Possible functions of a population of descending neurons in the honeybee's visuo-motor pathway', *Apidologie*, vol. 24, pp. 333–54.
- Bishop, L. G. and Keehn, D. G. 1967, 'Neural correlates of the optomotor response in the fly', *Kybernetik*, vol. 3, pp. 288–95.
- Borst, A. 1991, 'Fly visual interneurons responsive to image expansion', *Zoologische Jahrbücher, Physiologie*, vol. 95, pp. 305–13.
- Borst, A. and Bahde, S. 1988, 'Visual information processing in the fly's landing system', *Journal of Comparative Physiology*, vol. 163, pp. 167–73.
- Boycott, B. B. 1961, 'The functional organization of the brain of the cuttlefish *Sepia officinalis*', *Proceedings of the Royal Society*, vol. 153, pp. 503–34.
- Braddick, O. J. and Sleigh, A. C. (eds) 1982, *The Physical and Biological Processing of Images*, Springer, Berlin.
- Braitenberg, V. 1967, 'Patterns of projection in the visual system of the fly. I. Retina-lamina projections', *Experimental Brain Research*, vol. 3, pp. 271–98.
- Brünnert, U., Kelber, A. and Zeil, J. 1994, 'Ground nesting bees determine the location of their nests relative to a landmark by other than angular size cues', *Journal of Comparative Physiology*, vol. 175, pp. 363–9.
- Buchner, E. 1976, 'Elementary movement detectors in an insect visual system', *Biological Cybernetics*, vol. 24, pp. 85–101.
- Buchner, E. 1984, 'Behavioural analysis of spatial vision in insects', in M. A. Ali (ed.), *Photoreception and Vision in Invertebrates*, Plenum Press, New York, pp. 561–622.
- Buchner, E., Götz, K. G. and Straub, C. 1978, 'Elementary detectors for vertical movement in the visual system of *Drosophila*', *Biological Cybernetics*, vol. 31, pp. 235–42.
- Buddenbroch, W. von, 1937, *Grundriss des vergleichende Physiologie*, Borntraeger, Berlin.

- Buddenbroch, W. von, 1952, *Vergleichende Physiologie. Volume 1. Sinnesphysiologie*, Birkhäuser, Basel.
- Bullock, T. H. and Horridge, G. A. 1965, *Structure and Function in the Nervous Systems of Invertebrates*, Freeman, San Francisco and London.
- Burkhardt, D. 1962, 'Spectral sensitivity and other response characteristics of single visual cells in the arthropod eye', *Symposium of the Society of Experimental Biology*, vol. 16, pp. 86–109.
- Burkhardt, D. and Streck, P. 1965, 'Das Sehfeld einzelner Sehzellen—eine Richtigstellung', *Zeitschrift für vergleichende Physiologie*, vol. 51, pp. 151–2.
- Burt, E. T. and Catton, W. T. 1962, 'A diffraction theory of insect vision. Part I. An experimental study of visual acuity in certain insects', *Proceedings of the Royal Society of London*, vol. 157, pp. 53–82.
- Burt, E. T. and Catton, W. T. 1969, 'Resolution of the locust eye measured by rotation of radial striped patterns', *Proceedings of the Royal Society of London*, vol. 173, pp. 513–29.
- Butel-Repen, H. von, 1900, *Sind die Bienen Reflexmaschinen*, Verlag Arthur Georgi, Leipzig.
- Butler, R. 1971, 'The identification and mapping of spectral cell types in the retina of *Periplaneta americana*', *Zeitschrift für vergleichende Physiologie*, vol. 72, pp. 67–80.
- Cajal, S. R. y, 1909, 'Nota sobre la estructura de la retina de la mosca (*Mosca vomitoria*)', *Trabajos del Laboratorio de Investigaciones Biológicas del Universidad, Madrid*, vol. 16, pp. 109–39.
- Cajal, S. R. y, and Sanchez, S. D. 1915, 'Contribución al conocimiento de los centros nerviosos de los insectos. Parte I. Retina y los centros opticos', *Trabajos del Laboratorio de Investigaciones Biológicas del Universidad, Madrid*, vol. 13, pp. 1–168.
- Campan, R. and Lehrer, M. 2002, 'Discrimination of closed shapes by two species of bee, *Apis mellifera* and *Megachile rotundata*', *Journal of Experimental Biology*, vol. 205, pp. 559–72.
- Campion, G. G. and Elliot Smith, G. 1934, *The Neural Basis of Thought*, Kegan Paul, London.
- Carthy, J. D. 1958, *An Introduction to the Behaviour of Invertebrates*, Allen & Unwin, London.
- Cartwright, B. A. and Collett, T. S. 1979, 'How honey-bees know their distance from a near-by visual landmark', *Journal of Experimental Biology*, vol. 82, pp. 367–72.

- Cartwright, B. A. and Collett, T. S. 1983, 'Landmark learning in bees; experiments and models', *Journal of Comparative Physiology*, vol. 151, pp. 521–43.
- Cartright, B. A. and Collett, T. S. 1987, 'Landmark maps for honeybees', *Biological Cybernetics*, vol. 57, pp. 85–93.
- Catton, W. T. 1998, 'A test of the visual acuity of the locust eye', *Journal of Insect Physiology*, vol. 44, pp. 1145–8.
- Catton, W. T. 1999, 'The effect of target orientation on the visual acuity and the spatial frequency response of the locust eye', *Journal of Insect Physiology*, vol. 45, pp. 191–200.
- Chen, L., Zhang, S. W. and Srinivasan, M. 2003, 'Global perception in small brains: topological pattern recognition in honey bees', *Proceedings of the National Academy of Science of the USA*, vol. 100, pp. 6884–9.
- Cheng, K., Collett, T. S. and Wehner, R. 1986, 'Honeybees learn the colours of landmarks', *Journal of Comparative Physiology*, vol. 159, pp. 69–73.
- Cheng, K., Collett, T. S., Pickhard, A. and Wehner, R. 1987, 'The use of visual landmarks by honeybees; bees weight landmarks according to their distance from the goal', *Journal of Comparative Physiology*, vol. 161, pp. 469–75.
- Chittka, L. and Menzel, R. 1992, 'The evolutionary adaptation of flower colours and the insect pollinators' colour vision', *Journal of Comparative Physiology*, vol. 171, pp. 171–81.
- Chittka, L., Dyer, A. G., Bock, F. and Dornhaus, A. 2003, 'Bees trade off foraging speed for accuracy', *Nature*, vol. 424, pp. 388.
- Collett, M., Harland, D. and Collett, T. S. 2002, 'The use of landmarks and panoramic context in the performance of local vectors by navigating bees', *Journal of Experimental Biology*, vol. 205, pp. 807–14.
- Collett, T. S. 1971, 'Visual neurons for tracking moving targets', *Nature*, vol. 232, pp. 127–30.
- Collett, T. S. 1992, 'Landmark learning and guidance in insects', *Philosophical Transactions of the Royal Society of London*, vol. 337, pp. 295–303.
- Collett, T. S. 1993, 'Route following and the retrieval of memories in insects', *Comparative Physiology and Biochemistry*, vol. 104A, pp. 709–16.
- Collett, T. S. and Baron, J. 1994, 'Biological compasses and the coordinate frame of landmark memories in honeybees', *Nature*, vol. 368, pp. 137–40.
- Collett, T. S. and Kelber, A. 1988, 'The retrieval of visuospatial memories by honeybees', *Journal of Comparative Physiology*, vol. 163, pp. 145–50.

- Collett, T. S. and King, A. J. 1975, 'Vision during flight', in G. A. Horridge (ed.), *The Compound Eye and Vision of Insects*, Oxford University Press, Oxford, pp. 437–66.
- Collett, T. S. and Land, M. F. 1975a, 'Visual control of flight behaviour in the hoverfly *Syrirta pipiens* L.', *Journal of Comparative Physiology*, vol. 99, pp. 1–66.
- Collett, T. S. and Land, M. F. 1975b, 'Visual spatial memory in a hoverfly', *Journal of Comparative Physiology*, vol. 99, pp. 59–84.
- Collett, T. S. and Land, M. F. 1978, 'How hoverflies compute interception courses', *Journal of Comparative Physiology*, vol. 125, pp. 191–204.
- Collett, T. S. and Lehrer, M. 1993, 'Looking and learning: a spatial pattern in the orientation flight of the wasp *Vespa vulgaris*', *Proceedings of the Royal Society of London*, vol. 252, pp. 129–34.
- Collett, T. S. and Patterson, C. J. 1991, 'Relative motion parallax and target localization in the locust', *Journal of Comparative Physiology*, vol. 169, pp. 615–21.
- Collett, T. S. and Rees, J. A. 1997, 'View-based navigation in Hymenoptera: multiple strategies of landmark guidance in the approach to a feeder', *Journal of Comparative Physiology*, vol. 181, pp. 47–58.
- Collett, T. S. and Zeil, J. 1998, 'Places and landmarks: an arthropod perspective', in S. Healy (ed.), *Spatial Representation in Animals*, Clarendon Press, Oxford, pp. 18–53.
- Collett, T. S., Dillmann, E., Giger, A. and Wehner, R. 1992, 'Visual landmarks and route following in desert ants', *Journal of Comparative Physiology*, vol. 170, pp. 435–42.
- Collett, T. S., Fry, S. N. and Wehner, R. 1993, 'Sequence learning by honeybees', *Journal of Comparative Physiology*, vol. 172, pp. 693–706.
- Crozier, W. J. 1928–37 [numerous papers with colleagues in the *Journal of General Physiology*].
- Cruse, H. 1972, 'Versuch einer quantitativen Beschreibung des Formensehens der Honigbiene', *Kybernetik*, vol. 11, pp. 185–200.
- Dafni, A., Lehrer, M. and Kevan, P. G. 1999, 'Spatial flower parameters and insect spatial vision', *Biological Reviews*, vol. 72, pp. 239–82.
- Dahmen, H. 1991, 'Eye specialization in waterstriders: an adaptation to life in a flat world', *Journal of Comparative Physiology*, vol. 169, pp. 623–32.
- David, C. T. 1979a, 'Height control by free-flying *Drosophila*', *Physiological Entomology*, vol. 4, pp. 209–16.

- David, C. T. 1979b, 'Optomotor control of speed and height by free-flying *Drosophila*', *Journal of Experimental Biology*, vol. 82, pp. 389–92.
- David, C. T. 1982, 'Compensation for height in the control of ground speed by *Drosophila* in a new "Barber's Pole" wind tunnel', *Journal of Comparative Physiology*, vol. 147, pp. 485–93.
- David, C. T. 1986, 'Mechanisms of directional flight in wind', in T. Payne, M. Birch and J. S. Kennedy (eds), *Mechanisms in Insect Olfaction*, Oxford University Press, Oxford, pp. 53–69.
- De Souza, J., Hertel, H., Ventura, D. F. and Menzel, R. 1992, 'Response properties of stained monopolar cells in the honeybee lamina', *Journal of Comparative Physiology*, vol. 170, pp. 267–74.
- de Vries, H. 1956, 'Physical aspects of sense organs', *Progress in Biophysics*, vol. 6, pp. 208–64.
- Dietrich, W. 1909, 'Die Facettenaugen der Dipteren', *Zeitschrift für Zoologie*, vol. 92, pp. 465–539.
- Dill, M. and Heisenberg, M. 1995, 'Visual pattern memory without shape recognition', *Philosophical Transactions of the Royal Society of London*, vol. 349, pp. 143–52.
- Dill, M., Wolf, R. and Heisenberg, M. 1993, 'Visual pattern recognition in *Drosophila* involves retinotopic matching', *Nature*, vol. 365, pp. 751–3.
- Douglass, J. K. and Strausfeld, N. J. 1995–96, 'Visual motion detection circuits in flies', *Journal of Neuroscience*, vol. 15, pp. 5596–605; vol. 16, pp. 4551–62.
- Douglass, J. K. and Strausfeld, N. J. 2005, 'Sign-conserving amacrine neurons in the fly's external plexiform layer', *Visual Neuroscience*, vol. 22, pp. 345–58.
- Doujak, F. E. 1984, 'Electrophysiological measurement of photoreceptor membrane dichroism and polarization sensitivity in a Grapsid crab', *Journal of Comparative Physiology*, vol. 154, pp. 597–605.
- Doujak, F. E. 1985, 'Can a shore crab see a star?', *Journal of Experimental Biology*, vol. 166, pp. 385–93.
- Dubs, A., Laughlin, S. B. and Srinivasan, M. V. 1981, 'Single photon signals in fly photoreceptors and first-order interneurons at behavioural threshold', *Journal of Physiology*, vol. 317, pp. 317–34.
- Dyer, A. G. and Gould, J. L. 1981a, 'Honey bee navigation', *American Scientist*, vol. 71, pp. 587–97.
- Dyer, A. G. and Gould, J. L. 1981b, 'Honey bee orientation: a backup system for cloudy days', *Science*, vol. 214, pp. 1041–2.

- Dyer, A. G., Neumeyer, C. and Chittka, L. 2005, 'Honeybee (*Apis mellifera*) vision can discriminate between and recognise images of human faces', *Journal of Experimental Biology*, vol. 208, pp. 4709–14.
- Eccles, J. C. 1957, *The Physiology of Nerve Cells*, Johns Hopkins Press, Baltimore.
- Efler, D. and Ronacher, B. 2000, 'Evidence against a retinotopic-template matching in honeybees' pattern recognition', *Vision Research*, vol. 40, pp. 3391–403.
- Egelhaaf, M. 1985, 'On the neuronal basis of figure-ground discrimination by relative movement in the visual system of the fly. II. Figure-detection cells: a new class of visual interneurons', *Biological Cybernetics*, vol. 52, pp. 195–209.
- Egelhaaf, M. 1987, 'Dynamic properties of two control systems underlying visually guided turning in house flies', *Journal of Comparative Physiology*, vol. 161, pp. 777–83.
- Egelhaaf, M. and Borst, A. 1993, 'Movement detection in arthropods', in F. A. Miles and J. Wallman (eds), *Visual Motion and Its Role in the Stabilization of Gaze*, Elsevier, Amsterdam, pp. 53–77.
- Erickson, R. P. 1982, 'The across-fiber pattern theory: an organizing principle for molar neural function', *Contributions in Sensory Physiology*, vol. 6, pp. 79–110.
- Ernst, R. and Heisenberg, M. 1999, 'The memory template in *Drosophila* pattern vision at the flight stimulator', *Vision Research*, vol. 39, pp. 3920–33.
- Esch, H. E. and Burns, J. E. 1995, 'Distance estimation by foraging honeybees', *Journal of Experimental Biology*, vol. 199, pp. 155–62.
- Exner, S. 1875, 'Über das Sehen von Bewegungen und die Theorie des zusammengesetzten Auges', *Sitzungsberichte Akademische Wissenschaft Wien, Abteilung III*, vol. 72, pp. 156–70.
- Exner, S. 1891 [1988], *Die Physiologie der facettirten Augen von Krebsen und Insecten*, Franz Deuticke, Leipsig [Translated by R. C. Hardie as *The Physiology of the Compound Eyes of Insects and Crustaceans*, Springer-Verlag, Berlin].
- Exner, S. 1894, *Entwurf zu einer physiologischen Erklärung der psychischen Erscheinungen*, Franz Deuticke, Leipsig.
- Fabre, J. H. 1879 [the experiments on navigation are published in the volume of *Souvenirs Entomologiques* for 1879].
- Field, D. J. 1987, 'Relations between the statistics of natural images and the response properties of cortical cells', *Journal of the Optical Society of America*, vol. 4, pp. 2379–94.
- Fisher, R. A. 1935, *The Design of Experiments*, Oliver and Boyd, London.

- Forel, A. 1908, *The Senses of Insects*, Translated by M. Yearsley, Methuen, London.
- Fraenkel, G. S. and Gunn, D. O. 1940, *The Orientation of Animals*, Oxford University Press, Oxford.
- Free, J. B. 1970, 'Effect of flower shapes and nectar guides on the behaviour of foraging honeybees', *Behaviour*, vol. 37, pp. 269–85.
- Friedlaender, M. 1931, 'Zur Bedeutung des Fluglochs im optischen Feld der Biene bei senkrechter Dressuranordnung', *Zeitschrift für vergleichende Physiologie*, vol. 15, pp. 193–260.
- Frisch, K. von, 1914, 'Der Farbensinn und Formensinn der Bienen', *Zoologisches Jahrbucher, Physiologie*, vol. 35, pp. 1–188.
- Frisch, K. von, 1947, 'The dances of the honey bee', *Bulletin of Animal Behaviour*, vol. 5, pp. 1–32.
- Frisch, K. von, 1957, *A Biologist Remembers*, Gombrich, Lisbeth.
- Frisch, K. von, 1965 [1967], *Tanzsprache und Orientierung des Bienen*, Springer, Berlin [translated into English as *The Dance Language and Orientation of Bees*, Harvard University Press, Cambridge, Mass.].
- Frisch, K. von, 1971, *Bees, Their Vision, Chemical Senses, and Language*, Cornell University Press, Ithaca, NY.
- Frisch, K. von, Lindauer, M. and Daumer, K. 1960, 'Über die Wahrnehmung polarisierten Lichtes durch das Bienenauge', *Experientia*, vol. 16, pp. 289–301.
- Fry, S. N. and Wehner, R. 2002, 'Honeybees store landmarks in an egocentric frame of reference', *Journal of Comparative Physiology*, vol. 187, pp. 1009–16.
- Gallistel, C. R. and King, A. P. 2009, *Memory and the Computational Brain: Why cognitive science will transform neuroscience*, Wiley/Blackwell, New York.
- Gavel, L. von, 1939, 'Die kritische Streifenbreite als Mass für die Sehschärfe bei *Drosophila melanogaster*', *Zeitschrift für vergleichende Physiologie*, vol. 27, pp. 80–135.
- Geiger, K., Kratzsch, D. and Menzel, R. 1995, 'Target-directed orientation in displaced honeybees', *Ethology*, vol. 101, pp. 335–45.
- Gibson, J. J. 1950, *The Perception of the Visual World*, Houghton Mifflin, Boston.
- Gibson, J. J. 1979, *The Ecological Approach to Visual Perception*, Houghton Mifflin, Boston.
- Giger, A. D. 1996, PhD thesis, The Australian National University, Canberra.

- Giger, A. D. and Srinivasan, M. V. 1995, 'Pattern recognition in honeybees: eidetic imagery and orientation discrimination', *Journal of Comparative Physiology*, vol. 176, pp. 791–5.
- Giger, A. D. and Srinivasan, M. V. 1996, 'Pattern recognition in honeybees: chromatic properties of orientation analysis', *Journal of Comparative Physiology*, vol. 178, pp. 763–9.
- Giger, A. D. and Srinivasan, M. V. 1997, 'Honeybee vision: analysis of orientation and colour in the lateral, dorsal and ventral fields of view', *Journal of Experimental Biology*, vol. 200, pp. 1271–80.
- Giulio, L. 1963, 'Elektroretinographische Beweisführung dichroitischer Eigenschaften des Komplexauges bei Zweiflüglern', *Journal of Comparative Physiology*, vol. 46, pp. 491–5.
- Giurfa, M. 2003, 'Cognitive neuroethology: dissecting non-elemental learning in a honeybee brain', *Current Opinion in Neurobiology*, vol. 13, pp. 726–35.
- Giurfa, M. 2007, 'Behavioral and neural analysis of associative learning in the honeybee: a taste from the magic well', *Journal of Comparative Physiology*, vol. 193, pp. 801–24.
- Giurfa, M. and Lehrer, M. 2001, 'Honeybee vision and floral displays: from detection to close-up recognition', in L. Chittka and J. D. Thomson (eds), *Cognitive Ecology of Pollination*, Cambridge University Press, Cambridge, pp. 61–82.
- Giurfa, M. and Menzel, R. 1997, 'Insect visual perception: complex abilities of simple nervous systems', *Current Opinion in Neurobiology*, vol. 7, pp. 505–13.
- Giurfa, M. and Vorobyev, M. 1998, 'The angular range of achromatic target detection by honey bees', *Journal of Comparative Physiology*, vol. 183, pp. 101–10.
- Giurfa, M., Hammer, M., Stach, S., Stollhoff, N., Müller-Deisig, N. and Mizyrycki, C. 1999, 'Pattern learning by honeybees, conditioning procedure and recognition strategy', *Animal Behaviour*, vol. 57, pp. 315–24.
- Giurfa, M., Schubert, M., Reisenman, C., Gerber, B. and Lachnit, H. 2003, 'The effect of cumulative experience on the use of elemental and configural visual discrimination strategies in honeybees', *Behavior and Brain Research*, vol. 145, pp. 161–9.
- Giurfa, M., Vorobyev, P., Brandt, R., Posner, B. and Menzel, R. 1997, 'Discrimination of coloured stimuli by honeybees, alternative use of achromatic and chromatic signals', *Journal of Comparative Physiology*, vol. 180, pp. 235–43.

- Giurfa, M., Vorobyev, P., Kevan, P. and Menzel, R. 1996, 'Detection of coloured stimuli by honeybees: the role of chromatic and achromatic contrast', *Journal of Comparative Physiology*, vol. 178, pp. 699–709.
- Giurfa, M., Zhang, S. W., Jenett, A., Menzel, R. and Srinivasan, M. V. 2001, 'The concepts of "sameness" and "difference" in an insect', *Nature*, vol. 410, pp. 930–3.
- Goldsmith, T. H. and Bernard, G. D. 1974, 'The visual system of insects', in M. Rockstein (ed.), *The Physiology of Insects. Volume 2*, Academic Press, New York, pp. 165–272.
- Goodman, L. J. 1960, 'The landing responses in insects. I. The landing response of the fly *Lucilia sericata* and other Calliphoridae', *Journal of Experimental Biology*, vol. 37, pp. 854–78.
- Goodman, L. J. and Fischer, R. C. (eds) 1991, *The Behaviour and Psychology of Bees*, CAB International, Wallingford, Oxford.
- Goodman, L. J., Ibbotson M. R. and Bidwell, N. J. 1991, 'Spatial, temporal and directional properties of motion-sensitive visual neurons in the honeybee', in L. J. Goodman and R. C. Fisher (eds), *The Behaviour and Physiology of Bees*, CAB International, Wallingford, Oxford, pp. 203–26.
- Götz, K. G. 1965, 'Die optischen Übertragungseigenschaften der Komplexaugen von *Drosophila*', *Kybernetik*, vol. 2, pp. 215–21.
- Götz, K. G. and Buchner E. 1978, 'Evidence for one-way movement detection in the visual system of *Drosophila*', *Biological Cybernetics*, vol. 31, pp. 243–8.
- Götz, K. G., Hengstenberg, B. and Biesinger, R. 1979, 'Optomotor control of wing beat and body posture in *Drosophila*', *Biological Cybernetics*, vol. 35, pp. 101–12.
- Gould, J. L. 1976, 'The honey bee dance–language controversy', *Quarterly Review of Biology*, vol. 51, pp. 211–44.
- Gould, J. L. 1982, *Ethology: The mechanisms and evolution of behaviour*, Norton, New York.
- Gould, J. L. 1984, 'Natural history of honey bee learning', in P. Marler and H. S. Terrace (eds), *The Biology of Learning*, Springer, Berlin, pp. 149–80.
- Gould, J. L. 1985, 'How bees remember flower shapes', *Science*, vol. 227, pp. 1492–4.
- Gould, J. L. 1986, 'Pattern learning by honeybees', *Animal Behaviour*, vol. 34, pp. 991–7.
- Gould, J. L. 1987, 'Landmark learning by honey bees', *Animal Behaviour*, vol. 35, pp. 26–34.

- Gould, J. L. and Gould, C. G. 1988, *The Honey Bee*, Scientific American Library, Freeman, New York.
- Gray, J. and Lissmann, H. W. 1946, 'The coordination of limb movements in the amphibia', *Journal of Experimental Biology*, vol. 23, pp. 133–42.
- Gregory, R. L. 1981, *Mind in Science*, Penguin Books, London.
- Grenacher, H. 1879, *Untersuchungen über das Sehorgan der Arthropoden, insbesondere der Spinnen, Insecten und Crustaceen*, Vandenhoeck and Ruprecht, Göttingen.
- Gross, H. J., Pahl, M., Si, A., Zhu, H., Tautz, J. et al. 2009, 'Number-based visual generalisation in the honeybee', *PLoS ONE*, vol. 4, no. 1.
- Guerten, R. H., Nordström, K., Sprayberry, J. D. H., Bolzon, D. M. and O'Carroll, D. C. 2007, 'Neural mechanisms underlying target detection in a dragonfly centrifugal neuron', *Journal of Experimental Biology*, vol. 210, pp. 3277–84.
- Hardie, R. C. 1985, 'Functional organisation of the fly retina', in D. Ottoson (ed.), *Progress in Sensory Physiology 5*, Springer, Berlin, pp. 1–79.
- Hardie, R. C. 1986, 'The photoreceptor array of the dipteran retina', *Trends in Neurosciences*, vol. 9, pp. 419–23.
- Hardie, R. C. 1987, 'Is histamine a neurotransmitter in insect photoreceptors?', *Journal of Comparative Physiology*, vol. 161, pp. 201–13.
- Hardie, R. C. 1988a, 'The use of local ionophoresis to identify neurotransmitter candidates in the housefly *Musca domestica*', *Journal of Physiology*, vol. 396, p. 7.
- Hardie, R. C. 1988b, 'Neurotransmitters in compound eyes', in D. G. Stavenga and R. C. Hardie (eds), *Facets of Vision*, Springer, Berlin.
- Hassenstein, B. 1951, 'Ommatidienraster und afferente Bewegungsintegration', *Zeitschrift für vergleichende Physiologie*, vol. 33, pp. 301–26.
- Hassenstein, B. and Reichardt, W. 1956, 'Systemtheoretische analyse der Zeit-, Reihenfolgen- und Vorzeichenbewertung bei der Bewegungsperzeption des Rüsselkäfers *Chlorophanus*', *Zeitschrift für Naturforschung*, vol. 31c, pp. 629–33.
- Hateren, J. H. van, 1989, 'Photoreceptor optics, theory and practice', in D. G. Stavenga and R. C. Hardie (eds), *Facets of Vision*, Springer, Berlin, pp. 74–89.
- Hateren, J. H. van, 1992, 'Theoretical predictions of spatiotemporal receptive fields of fly LMCs, and experimental validation', *Journal of Comparative Physiology*, vol. 171, pp. 157–70.

- Hateren, J. H. van, Srinivasan, M. V. and Wait, P. B. 1990, 'Pattern recognition in bees: orientation discrimination', *Journal of Comparative Physiology*, vol. 167, pp. 649–54.
- Hausen, K. 1982, 'Motion-sensitive interneurons in the optomotor system of the fly. I–II', *Biological Cybernetics*, vol. 45, pp. 143–56; and vol. 46, pp. 67–79.
- Hausen, K. 1984, 'The lobula-complex of the fly: structure, function and significance in visual behavior', in M. A. Ali (ed.), *Photoreception and Vision in Invertebrates*, Plenum, New York, pp. 523–59.
- Hausen, K. and Egelhaaf, M. 1989, 'Neural mechanisms of visual course control in insects', in D. G. Stavenga and R. C. Hardie (eds), *Facets of Vision*, Springer, Berlin, pp. 391–424.
- Hebb, D. O. 1949, *The Organization of Behavior*, Wiley, New York.
- Hecht, S. and Wald, G. 1934, 'The visual acuity and intensity discrimination of *Drosophila*', *Journal of General Physiology*, vol. 17, pp. 517–47.
- Hecht, S. and Wolf, E. 1929, 'The visual acuity of the honeybee', *Journal of General Physiology*, vol. 12, pp. 727–60.
- Heinze, S. and Homberg, U. 2007, 'Map-like representation of celestial E-vector orientations in the brain of an insect', *Science*, vol. 315, pp. 995–7.
- Heisenberg, M. 1995, 'Pattern recognition in insects', *Current Opinion in Neurobiology*, vol. 5, pp. 475–81.
- Heisenberg, M. and Wolf, R. 1984, *Vision in Drosophila: Genetics of microbehavior*, Springer, Berlin.
- Heisenberg, M. and Wolf, R. 1988, 'Reafferent control of optomotor yaw torque in *Drosophila melanogaster*', *Journal of Comparative Physiology*, vol. 163, pp. 373–88.
- Heisenberg, M. and Wolf, R. 1990, 'Visual control of straight flight in *Drosophila melanogaster*', *Journal of Comparative Physiology*, vol. 167, pp. 269–83.
- Heisenberg, M. and Wolf, R. 1992, 'The sensory motor link in motion-dependent flight control of flies', in J. Wallman and F. A. Miles (ed.), *Visual Motion and Its Role in the Stabilization of Gaze*, Elsevier, Amsterdam.
- Helversen, O. von, 1972, 'Zur spektralen Unterscheidempfindlichkeit der Honigbiene', *Journal of Comparative Physiology*, vol. 80, pp. 439–72.
- Hempel de Ibarra, N. and Giurfa, M. 2003, 'Discrimination of closed coloured shapes by honeybees requires only contrast to the long wavelength receptor type', *Animal Behaviour*, vol. 66, pp. 903–10.

- Hengstenberg, R. 1982, 'Common visual response properties of giant vertical cells in the lobula plate of the blowfly *Calliphora*', *Journal of Comparative Physiology*, vol. 149, pp. 179–93.
- Hensler, K. and Rowell, C. H. F. 1990, 'Control of optomotor responses by descending deviation detector neurons in intact flying locusts', *Journal of Experimental Biology*, vol. 149, pp. 191–205.
- Hertel, H. 1980, 'Chromatic properties of identified interneurons in the optic lobes of the bee', *Journal of Comparative Physiology*, vol. 137, pp. 215–31.
- Hertel, H. and Maronde, U. 1987a, 'Processing of visual information in the honeybee brain', in R. Menzel and A. Mercer (eds), *Neurobiology and Behaviour in Honeybees*, Springer, Berlin, pp. 141–57.
- Hertel, H. and Maronde, U. 1987b, 'Processing of visual information in the centrally projecting visual interneurons in the honeybee brain', *Journal of Experimental Biology*, vol. 133, pp. 301–15.
- Hertel, H., Schäfer, S. and Maronde, U. 1987, 'The physiology and morphology of visual commissures in the honeybee brain', *Journal of Experimental Biology*, vol. 133, pp. 283–300.
- Hertz, M. 1929–31, 'Die Organisation des optischen Feldes bei der Biene', *Zeitschrift für vergleichende Physiologie*, vol. 8, pp. 693–748; vol. 11, pp. 107–45; vol. 14, pp. 629–74.
- Hertz, M. 1933, 'Über figurale Intensität und Qualitäten in der optische Wahrnehmung der Biene', *Biologische Zentralblatte*, vol. 53, pp. 10–40.
- Hertz, M. 1934, 'Die Untersuchungen über den Formensinn der Honigbiene', *Naturwissenschaften*, vol. 23, pp. 618–24.
- Hinde, R. A. 1990, 'Nikolaas Tinbergen', *Biographical Memoirs of the Fellows of the Royal Society*, vol. 36, pp. 549–65.
- Hinton, G. E., McClelland, J. L. and Rumelhart, D. E. 1986, 'Distributed representations', in D. E. Rumelhart and J. L. McClelland (eds), *Parallel Distributed Processing*, MIT Press, Cambridge, Mass., pp. 77–109.
- Holmes, W., Pumphrey, R. J. and Young, J. Z. 1941, 'The structure and conduction velocity of the medullated nerve fibres of prawns', *Journal of Experimental Biology*, vol. 18, pp. 50–4.
- Holst, E. von, and Mittelstaedt, H. 1950, 'Das Reafferenzprinzip. Wechselwirkungen zwischen Zentralnervensystem und Peripherie', *Naturwiss*, vol. 37, pp. 464–76.
- Hooke, R. 1665, *Micrographia or Some Physiological Descriptions of Minute Bodies Made by Magnifying Glasses*, J. Martyn and J. Allestry, London.

- Horridge, G. A. 1962, 'Learning of leg position by the ventral nerve cord in headless insects', *Proceedings of the Royal Society of London*, vol. 157, pp. 33–52.
- Horridge, G. A. 1966a, 'Perception of edges versus areas by the crab *Carcinus*', *Journal of Experimental Biology*, vol. 44, pp. 247–54.
- Horridge, G. A. 1966b, 'The retina of the locust', in C. G. Bernhard (ed.), *The Functional Organization of the Compound Eye*, Pergamon Press, Oxford, pp. 513–42.
- Horridge, G. A. 1968, *Interneurons: Their origin, action, specificity, growth and plasticity*, Freeman and Co., London and San Francisco.
- Horridge, G. A. (ed.) 1975, *The Compound Eye and Vision of Insects*, Oxford University Press, Oxford.
- Horridge, G. A. 1977a, 'The compound eye of insects', *Scientific American*, vol. 237, pp. 108–20.
- Horridge, G. A. 1977b, 'Insects which turn and look', *Endeavour*, [new series], vol. 1, pp. 7–17.
- Horridge, G. A. 1978, 'The separation of visual axes in apposition compound eyes', *Philosophical Transactions of the Royal Society of London*, vol. 285, pp. 1–59.
- Horridge, G. A. 1980, 'Apposition eyes of large diurnal insects as organs adapted to seeing', *Proceedings of the Royal Society of London*, vol. 207, pp. 287–309.
- Horridge, G. A. 1987, 'The evolution of visual processing and the construction of seeing systems', *Proceedings of the Royal Society of London*, vol. 220, pp. 279–92.
- Horridge, G. A. 1994, 'Bee vision of pattern and 3D', *Bioessays*, vol. 16, pp. 877–84.
- Horridge, G. A. 1996a, 'Vision of the honeybee *Apis mellifera* for patterns with two pairs of equal orthogonal bars', *Journal of Insect Physiology*, vol. 42, pp. 131–8.
- Horridge, G. A. 1996b, 'The relation between pattern and landmark vision of the honeybee (*Apis mellifera*)', *Journal of Insect Physiology*, vol. 42, pp. 373–81.
- Horridge, G. A. 1996c, 'Pattern vision of the honeybee (*Apis mellifera*): the significance of the angle subtended by the target', *Journal of Insect Physiology*, vol. 42, pp. 693–703.
- Horridge, G. A. 1996d, 'The honeybee (*Apis mellifera*) detects bilateral symmetry and discriminates its axis', *Journal of Insect Physiology*, vol. 42, pp. 755–64.

- HorrIDGE, G. A. 1997a, 'Pattern discrimination by the honeybee, disruption as a cue', *Journal of Comparative Physiology*, vol. 181, pp. 267–77.
- HorrIDGE, G. A. 1997b, 'Vision of the honeybee *Apis mellifera* for patterns with one pair of equal orthogonal bars', *Journal of Insect Physiology*, vol. 43, pp. 741–8.
- HorrIDGE, G. A. 1997c, 'Spatial and non-spatial coding of patterns by the honeybee', in M. V. Srinivasan and S. Venkatesh (eds), *From Living Eyes to Seeing Machines*, Oxford University Press, Oxford, pp. 52–79.
- HorrIDGE, G. A. 1998a, 'Spatial coincidence of cues in visual learning by the honeybee', *Journal of Insect Physiology*, vol. 44, pp. 343–50.
- HorrIDGE, G. A. 1998b, 'Pattern vision by the honeybee (*Apis mellifera*): training on two pairs of patterns alternately', *Journal of Insect Physiology*, vol. 45, pp. 349–55.
- HorrIDGE, G. A. 1999a, 'Two-dimensional pattern discrimination by the honeybee', *Physiological Entomology*, vol. 24, pp. 1–17.
- HorrIDGE, G. A. 1999b, 'Pattern vision by the honeybee (*Apis mellifera*) is colour blind for radial/tangential cues', *Journal of Insect Physiology*, vol. 184, pp. 413–22.
- HorrIDGE, G. A. 1999c, 'Pattern vision of the honeybee (*Apis mellifera*). The effect of pattern on the discrimination of location', *Journal of Comparative Physiology*, vol. 185, pp. 105–13.
- HorrIDGE, G. A. 2000a, 'Pattern vision of the honeybee (*Apis mellifera*). What is an oriented edge?', *Journal of Comparative Physiology*, vol. 186, pp. 521–34.
- HorrIDGE, G. A. 2000b, 'Seven experiments on pattern vision of the honeybee, with a model', *Vision Research*, vol. 40, pp. 2589–603.
- HorrIDGE, G. A. 2000c, 'Visual discrimination of radial cues by the honeybee (*Apis mellifera*)', *Journal of Insect Physiology*, vol. 46, pp. 629–45.
- HorrIDGE, G. A. 2000d, 'Pattern vision of the honeybee (*Apis mellifera*): the discrimination of location by the blue and green receptors', *Neurobiology of Learning and Memory*, vol. 74, pp. 1–16.
- HorrIDGE, G. A. 2003a, 'Discrimination of single bars by the honeybee (*Apis mellifera*)', *Vision Research*, vol. 43, pp. 1257–71.
- HorrIDGE, G. A. 2003b, 'The visual system of the honeybee (*Apis mellifera*): the maximum length of the orientation detector', *Journal of Insect Physiology*, vol. 49, pp. 621–8.
- HorrIDGE, G. A. 2003c, 'Visual resolution of gratings by the compound eye of the bee (*Apis mellifera*)', *Journal of Experimental Biology*, vol. 206, pp. 2105–10.

- Horridge, G. A. 2003d, 'Visual discrimination by the honeybee (*Apis mellifera*): the position of the common centre as the cue', *Physiological Entomology*, vol. 28, pp. 132–43.
- Horridge, G. A. 2003e, 'The effect of complexity on the discrimination of oriented bars by the honeybee (*Apis mellifera*)', *Journal of Comparative Physiology*, vol. 189, pp. 703–14.
- Horridge, G. A. 2003f, 'Visual resolution of the orientation cue by the honeybee (*Apis mellifera*)', *Journal of Insect Physiology*, vol. 49, pp. 1145–52.
- Horridge, G. A. 2005a, 'The spatial resolutions of the apposition compound eye and its neurosensory feature detectors: observation versus theory', *Journal of Insect Physiology*, vol. 51, pp. 243–66.
- Horridge, G. A. 2005b, 'What the honeybee sees: a review of the recognition system of *Apis mellifera*', *Physiological Entomology*, vol. 30, pp. 2–13.
- Horridge, G. A. 2006a, 'Visual discrimination of spokes, sectors, and circles by the honeybee (*Apis mellifera*)', *Journal of Insect Physiology*, vol. 52, pp. 984–1003.
- Horridge, G. A. 2006b, 'Some labels that are recognized on landmarks by the honeybee (*Apis mellifera*)', *Journal of Insect Physiology*, vol. 52, pp. 1254–71.
- Horridge, G. A. 2006c, 'Visual processing of pattern', in E. Warrant and D.-E. Nilsson (eds), *Invertebrate Vision*, Cambridge University Press, Cambridge, pp. 494–525.
- Horridge, G. A. 2007, 'The preferences of the honeybee (*Apis mellifera*) for different visual cues during the learning process', *Journal of Insect Physiology*, vol. 53, pp. 877–89.
- Horridge, G. A. 2009a, 'Generalization in visual recognition by the honeybee (*Apis mellifera*). A review and explanation', *Journal of Insect Physiology*, vol. 55, pp. 499–511.
- Horridge, G. A. 2009b, 'What does the honeybee see?', in O. Lazareva, T. Shimizu and E. Wasserman (eds), *How Animals See the World*, Oxford University Press, Oxford.
- Horridge, G. A. 2009c, 'What does an insect see?', *Journal of Experimental Biology*, vol. 212, pp. 2721–2729.
- Horridge, G. A. and Marčelja, L. 1992, 'On the existence of "fast" and "slow" directionally sensitive motion detector neurons in insects', *Proceedings of the Royal Society of London*, vol. 248, pp. 47–54.
- Horridge, G. A. and Meinertzhagen, I. A. 1970, 'The exact neural projection of the visual fields upon the first and second ganglia of the insect eye', *Zeitschrift für vergleichende Physiologie*, vol. 66, pp. 369–78.

- HorrIDGE, G. A. and Zhang, S. W. 1995, 'Pattern vision of bees, flower-like patterns with no predominant orientation', *Journal of Insect Physiology*, vol. 41, pp. 681–8.
- HorrIDGE, G. A., Duniec, J. and Marčelja, L. 1981, 'A 24-hour cycle in single locust and mantid photoreceptors', *Journal of Experimental Biology*, vol. 91, pp. 307–22.
- HorrIDGE, G. A., Marčelja, L., Jahnke, R. and McIntyre, P. 1983, 'Daily changes in the compound eye of a beetle (*Macrogyrus*)', *Proceedings of the Royal Society of London*, vol. 217, pp. 265–85.
- HorrIDGE, G. A., Mimura, K. and Hardie, R. C. 1976, 'Fly photoreceptors III. Angular sensitivity as a function of wavelength and the limits of resolution', *Proceedings of the Royal Society of London*, vol. 194, pp. 151–77.
- HorrIDGE, G. A., Scholes, J. H., Shaw, S. and Tunstall, J. 1965, 'Extracellular recordings from single neurons in the optic lobe and brain of the locust', in J. E. Treherne and J. S. C. Beament (eds), *The Physiology of the Insect Central Nervous System*, Academic Press, London, pp. 165–202.
- HorrIDGE, G. A., Zhang, S. W. and Lehrer, M. 1992, 'Bees can combine range and visual angle to estimate absolute size', *Philosophical Transactions of the Royal Society of London*, vol. 337, pp. 49–57.
- HorrIDGE, G. A., Zhang, S. W. and O'Carroll, D. 1992, 'Insect perception of illusory contours', *Philosophical Transactions of the Royal Society of London*, vol. 337, pp. 59–64.
- HorrIDGE, G. A., Zhang, S. W. and Srinivasan, M. V. 1992, 'Pattern recognition in honeybees: local and global analysis', *Proceedings of the Royal Society of London*, vol. 248, pp. 55–61.
- Howard, J. and Snyder, A. W. 1983, 'Transduction as a limitation on compound eye function and design', *Proceedings of the Royal Society of London*, vol. 217, pp. 287–307.
- Hubel, D. H. and Wiesel, T. N. 1959, 'Receptive fields of single neurons in the cat's striate cortex', *Journal of Physiology*, vol. 148, pp. 574–91.
- Ibbotson, M. R. 1991a, 'Wide-field motion-sensitive neurons tuned to horizontal movement in the honeybee, *Apis mellifera*', *Journal of Comparative Physiology*, vol. 168, pp. 91–102.
- Ibbotson, M. R. 1991b, 'A motion-sensitive visual descending neuron in *Apis mellifera* monitoring translatory flow-fields in the horizontal plane', *Journal of Experimental Biology*, vol. 157, pp. 1–5.

- Ibbotson, M. R., Maddess, T. and Dubois, R. 1991, 'A system of insect neurons sensitive to horizontal and vertical image motion connects the medulla and midbrain', *Journal of Comparative Physiology*, vol. 169, pp. 355–67.
- Ichikawa, T. 1990, 'Spectral sensitivities of elementary colour-coded neurons in butterfly larva', *Journal of Neurophysiology*, vol. 64, pp. 1861–72.
- Ichikawa, T. 1991, 'Integration of colour signals in the medulla of the swallowtail butterfly larva', *Journal of Experimental Biology*, vol. 155, pp. 127–45.
- Ichikawa, T. and Tateda, H. 1980, 'Cellular patterns and spectral sensitivity of larval ocelli in the swallowtail butterfly *Papilio*', *Journal of Comparative Physiology*, vol. 139, pp. 41–7.
- Ichikawa, T. and Tateda, H. 1982a, 'Receptive field of the stemmata in the swallowtail butterfly *Papilio*', *Journal of Comparative Physiology*, vol. 146, pp. 191–9.
- Ichikawa, T. and Tateda, H. 1982b, 'Distribution of color receptors in the larval eyes of four species of *Lepidoptera*', *Journal of Comparative Physiology*, vol. 149, pp. 317–24.
- Jacobs-Jessens, U. F. 1959, 'Zur Orientierung der Hummeln und einiger anderer Hymenopteren', *Zeitschrift für vergleichende Physiologie*, vol. 41, pp. 597–641.
- James, A. C. 1992, 'Non-linear operator network models of processing in the fly lamina', in R. B. Pinter and B. Nabet (eds), *Nonlinear Vision*, CRC Press, Boca Raton, pp. 39–73.
- James, A. C. and Osorio, D. 1996, 'Characterization of columnar neurons and visual signal processing in the medulla of the locust optic lobe by system identification techniques', *Journal of Comparative Physiology*, vol. 178, pp. 183–99.
- Jander, R. 1964, 'Die Detektortheorie optischer Auslösemechanismen von Insekten', *Zeitschrift für Tierpsychologie*, vol. 21, pp. 302–7.
- Jander, R. and Volk-Heinrichs, I. 1980, 'Das strauschspezifische visuel Perceptorsystem der Stabheuschrecke (*Carausius morosus*)', *Zeitschrift für vergleichende Physiologie*, vol. 70, pp. 425–77.
- Jander, R. and Voss, C. 1963, 'Die Bedeutung von Streifenmustern für das Formensehen der Roten Waldameise (*Formica rufa* L.)', *Zeitschrift für Tierpsychologie*, vol. 20, pp. 1–9.
- Jander, R., Fabritius, M. and Fabritius, M. 1970, 'Die Bedeutung von gliederung und Kantenrichtung für die visuelle Formunterscheidung der Wespe *Dolichovespula saxonica* am Flugloch', *Zeitschrift für Tierpsychologie*, vol. 27, pp. 881–93.

- Jander, U. and Jander, R. 2002, 'Allometry and resolution of bee eyes (Apoidea)', *Arthropod Structure and Development*, vol. 30, pp. 179–93.
- Järvilehto, M. 1985, 'The eye, vision and perception', in G. A. Kerkut and L. I. Gilbert (eds), *Comprehensive Insect Physiology, Biochemistry and Pharmacology. Volume 6. Nervous System, Sensory*, Pergamon Press, Oxford, pp. 355–429.
- Jawłowski, H. 1958, 'Nerve tracts in bee (*Apis mellifera*) running from the sight and antennal organs to the brain', *Annales of the Université, M. Curie-Sklodowska C*, vol. 12, pp. 307–23.
- Jennings, H. S. 1905, *The Behaviour of the Lower Organisms*, Columbia University Press, New York.
- Jones, C. E. and Buchmann, S. L. 1974, 'Ultraviolet floral patterns as functional orientation cues in hymenopterous pollination systems', *Animal Behaviour*, vol. 22, pp. 481–5.
- Kennedy, J. S. 1940, 'The visual responses of flying mosquitoes', *Proceedings of the Zoological Society of London*, vol. 109, pp. 221–42.
- Kenyon, F. C. 1986, 'The brain of the bee. A preliminary contribution to the morphology of the nervous system of the Arthropoda', *Journal of Comparative Neurology*, vol. 6, pp. 133–210.
- Kien, J. 1975, 'Motion detectors in locusts and grasshoppers', in G. A. Horridge (ed.), *The Compound Eye and Vision of Insects*, Oxford University Press, Oxford, pp. 410–22.
- Kirschfeld, K. 1966, 'Discrete and graded receptor potentials in the compound eye of the fly (*Musca*)', in C. G. Bernhard (ed.), *The Functional Organization of the Compound Eye*, Pergamon Press, Oxford, pp. 291–308.
- Kirschfeld, K. 1967, 'Die projektion der optischen Umwelt auf das Raster der Rhabdomeren im Komplexauge von *Musca*', *Experimental Brain Research*, vol. 3, pp. 248–70.
- Kirschfeld, K. 1972, 'The visual system of *Musca*. Studies on optics, structure and function', in R. Wehner (ed.), *Information Processing in the Visual System of Arthropods*, Springer, Berlin, pp. 63–74.
- Kirschfeld, K. 1976, 'The resolution of lens and compound eyes', in F. Zettler and R. Weiler (eds), *Neural Principles in Vision*, Springer, Berlin, pp. 354–70.
- Kirschfeld, K. and Franceschini, N. 1969, 'Ein Mechanismus zur Steuerung des Lichtflusses in den Rhabdomeren des Komplexauges von *Musca*', *Kybernetik*, vol. 6, pp. 13–22.

- Kirschfeld, K. and Lutz, B. 1974, 'Lateral inhibition in the compound eye of the fly, *Musca*', *Zeitschrift für Naturforschung*, vol. 29c, pp. 95–6.
- Koehler, W. 1925, *The Mentality of Apes*, Kegan Paul, London and New York.
- Koffka, K. 1924, *The Growth of the Mind*, Translated by R. M. Ogden, Kegan Paul, London.
- Koffka, K. 1935, *Principles of Gestalt Psychology*, Kegan Paul, London.
- Kolb, G. and Autrum, H. 1972, 'Die Feinstruktur im Auge der Biene bei Hell- und Dunkeladaptation', *Journal of Comparative Physiology*, vol. 77, pp. 113–25.
- Kuffler, S. 1953, 'Discharge patterns and functional organization of mammalian retina', *Journal of Neurophysiology*, vol. 16, pp. 37–68.
- Kühn, A. 1919, *Die Orientierung der Tiere im Raum*, Fischer, Jena.
- Kuhn, T. S. 1970, *The Structure of Scientific Revolutions*, University of Chicago Press, Chicago.
- Kuiper, J. W. 1962, 'The optics of the compound eye', *Symposium of the Society for Experimental Biology*, vol. 16, pp. 58–71.
- Kuiper, J. W. 1966, 'On the image formation in a single ommatidium of the compound eye in Diptera', in C. G. Bernhard (ed.), *The Functional Organization of the Compound Eye*, Pergamon Press, Oxford, pp. 35–50.
- Kunze, P. 1961, 'Untersuchungen des Bewegungssehens fixiert fliegender Bienen', *Zeitschrift für vergleichende Physiologie*, vol. 44, pp. 656–84.
- Labhart, T. 1980, 'Specialized photoreceptors at the dorsal rim of the honey bee's compound eye: polarization and angular sensitivity', *Journal of Comparative Physiology*, vol. 141, pp. 19–30.
- Labhart, T. 1988, 'Polarization-opponent interneurons in the insect visual system', *Nature*, vol. 331, pp. 435–7.
- Land, M. F. 1975, 'Head movements and fly vision', in G. A. Horridge (ed.), *The Compound Eye and Vision of Insects*, Oxford University Press, Oxford, pp. 469–89.
- Land, M. F. 1989, 'Variations in the structure and design of compound eyes', in D. G. Stavenga and R. C. Hardie (eds), *Facets of Vision*, Springer, Berlin, pp. 90–111.
- Land, M. F. 1997a, 'Visual acuity in insects', *Annual Review of Entomology*, vol. 42, pp. 147–77.
- Land, M. F. 1997b, 'The resolution of insect compound eyes', *Israel Journal of Plant Sciences*, vol. 45, pp. 79–91.

- Land, M. F. and Collett, T. S. 1974, 'Chasing behaviour of houseflies (*Fannia canicularis*)', *Journal of Comparative Physiology*, vol. 89, pp. 331–57.
- Land, M. F. and Eckert, H. 1985, 'Maps of the acute zones of fly eyes', *Journal of Comparative Physiology*, vol. 156, pp. 525–38.
- Lashley, K. S. 1938, 'Conditional reactions in the rat', *Journal of Psychology*, vol. 6, pp. 311–24.
- Laughlin, S. B. 1975, 'The function of the lamina ganglionaris', in G. A. Horridge (ed.), *The Compound Eye and Vision of Insects*, Clarendon Press, Oxford.
- Laughlin, S. B. 1981, 'A simple coding procedure enhances a neuron's information capacity', *Zeitschrift für Naturforschung*, vol. 36c, pp. 910–12.
- Laughlin, S. B. 1989, 'Coding efficiency and design in visual processing', in D. G. Stavenga and R. C. Hardie (eds), *Facets of Vision*, Springer, Berlin, pp. 213–34.
- Laughlin, S. B. 1994, 'Matching coding, circuits, cells and molecules to signals. General principles of retinal design in the fly's eye', *Progress in Retinal and Eye Research*, vol. 13, pp. 165–96.
- Laughlin, S. B. and Hardie, R. C. 1978, 'Common strategies for light adaptation in the peripheral visual systems of fly and dragonfly', *Journal of Comparative Physiology*, vol. 128, pp. 319–40.
- Laughlin, S. B. and Horridge, G. A. 1972, 'Angular sensitivity of the retinula cells of dark-adapted worker bee', *Zeitschrift für vergleichende Physiologie*, vol. 74, pp. 329–35.
- Laughlin, S. B. and Weckström, M. 1993, 'Fast and slow photoreceptors—a comparative study of the functional diversity of coding and conductances in the Diptera', *Journal of Comparative Physiology*, vol. 172, pp. 593–609.
- Laughlin, S. B., Howard, J. and Blakeslee, B. 1987, 'Synaptic limitations to contrast coding in the retina of the blowfly *Calliphora*', *Proceedings of the Royal Society of London*, vol. 231, pp. 437–67.
- Lehrer, M. 1990, 'How bees use peripheral eye regions to localize a frontally positioned target', *Journal of Comparative Physiology*, vol. 167, pp. 173–85.
- Lehrer, M. 1993, 'Why do bees turn back and look?', *Journal of Comparative Physiology*, vol. 172, pp. 544–63.
- Lehrer, M. and Bischof, S. 1995, 'Detection of model flowers by honeybees: the role of chromatic and achromatic contrast', *Naturwissenschaften*, vol. 82, pp. 145–7.

- Lehrer, M. and Campan, R. 2004, 'Shape discrimination by wasps (*Paravespula germanica*) at the food source: generalization among various types of contrast', *Journal of Comparative Physiology*, vol. 190, pp. 651–63.
- Lehrer, M. and Campan, R. 2006, 'Generalization of convex shapes by bees: what are shapes made of?', *Journal of Experimental Biology*, vol. 208, pp. 3233–3247.
- Lehrer, M. and Srinivasan, M. V. 1992, 'Freely flying bees discriminate between stationary and moving objects: performance and possible mechanisms', *Journal of Comparative Physiology*, vol. 171, pp. 457–67.
- Lehrer, M. and Srinivasan, M. V. 1993, 'Object detection by honeybees: why do they land on edges?', *Journal of Comparative Physiology*, vol. 173, pp. 23–32.
- Lehrer, M., Horridge, G. A., Zhang, S. W. and Gadagkar, R. 1995, 'Shape vision in bees' innate preference for flower-like patterns', *Philosophical Transactions of the Royal Society of London*, vol. 347, pp. 123–37.
- Lehrer, M., Srinivasan, M. V. and Zhang, S. W. 1990, 'Visual edge detection in the honeybee, and its chromatic properties', *Proceedings of the Royal Society of London*, vol. 238, pp. 321–30.
- Lehrer, M., Srinivasan, M. V., Zhang, S. W. and Horridge, G. A. 1988, 'Motion cues provide the bee's visual world with a third dimension', *Nature*, vol. 332, pp. 356–7.
- Lehrer, M., Wehner, R. and Srinivasan, M. V. 1985, 'Visual scanning behaviour in honeybees', *Journal of Comparative Physiology*, vol. 157, pp. 405–15.
- Lehrer, M., Wunderli, M. and Srinivasan, M. V. 1993, 'Perception of heterochromatic flicker by honeybees: a behavioural study', *Journal of Comparative Physiology*, vol. 172, pp. 1–6.
- Lehrman, D. S. 1953, 'A critique of Konrad Lorenz's theory of instinctive behaviour', *Quarterly Review of Biology*, vol. 28, pp. 337–63.
- Lehrman, D. S. 1970, 'Semantic and conceptual issues in the nature–nurture problem', in L. R. Aronson, E. Tobach, D. S. Lehrman and J. S. Rosenblatt (eds), *Development and Evolution of Behavior: Essays in memory of T. C. Schneirla*, Freeman, San Francisco, pp. 17–52.
- Lettvin, J. Y., Maturana, H. R., McCulloch, W. S. and Pitts, W. H. 1959, 'What the frog's eye tells the frog's brain', *Proceedings of the Institute of Radio Engineers*, vol. 47, pp. 1940–51.
- Lillywhite, P. G. 1977, 'Single photon signals and transduction in an insect eye', *Journal of Comparative Physiology*, vol. 122, pp. 189–200.

- Lillywhite, P. G. and Dvorak, D. R. 1981, 'Responses to single photons in a fly optomotor neuron', *Vision Research*, vol. 21, pp. 279–90.
- Lindauer, M. 1978, *Communication Among Social Bees*, Harvard University Press, Cambridge, Mass.
- Lindauer, M. and Martin, P. 1968, 'Die Schwereorientierung der Bienen unter dem Einfluss des Erdmagnetfeldes', *Zeitschrift für vergleichende Physiologie*, vol. 60, pp. 219–43.
- Lubbock, J. 1865, *Prehistoric Times*, Williams and Norgate, London.
- Lubbock, J. 1871, *The Origin of Civilisation and the Primitive Condition of Man*, Longmans/Green, London.
- Lubbock, J. 1881 [1898], *Ants, Bees and Wasps*, 13th edn, Kegan Paul, London.
- McCann, G. D. and Dill, J. C. 1969, 'Fundamental properties of intensity, form and motion perception in the visual nervous system of *Calliphora phaenicia* and *Musca domestica*', *Journal of General Physiology*, vol. 53, pp. 385–413.
- Maddess, T. 1986, 'After-image-like effects in the motion-sensitive neuron H1', *Proceedings of the Royal Society of London*, vol. 228, pp. 433–59.
- Maddess, T. and Laughlin, S. B. 1985, 'Adaptation of the motion-sensitive neuron H1 is generated locally and governed by contrast frequency', *Proceedings of the Royal Society of London*, vol. 225, pp. 251–75.
- Maldonado, H. 1970, 'The deimatic reaction in the praying mantis *Stagmatoptera biocellata*', *Zeitschrift für vergleichender Physiologie*, vol. 68, pp. 60–71.
- Mallock, A. 1894, 'Insect sight and the defining power of composite eyes', *Proceedings of the Royal Society of London*, vol. 55, pp. 85–90.
- Maronde, U. 1991, 'Common projection areas of antennae and visual pathways in the honeybee brain, *Apis mellifera*', *Journal of Comparative Physiology*, vol. 309, pp. 328–40.
- Marr, D. 1982, *Vision*, Freeman, San Francisco.
- Maturana, R., Lettvin, J., Pitts, W. and McCulloch, W. 1960, 'Anatomy and physiology of vision in the frog (*Rana pipiens*)', *Journal of General Physiology*, vol. 43, pp. 129–75.
- Mazokhin-Porshnyakov, G. A. 1969, *Insect Vision*, Plenum Press, New York.
- Meinertzhagen, I. A. 1976, 'The organisation of perpendicular fibre pathways in the insect optic lobe', *Philosophical Transactions of the Royal Society of London*, vol. 274, pp. 555–94.

- Meinertzhagen, I. A. and Sorra, K. E. 1976, 'Synaptic organization in the fly's optic lamina: few cells, many synapses and divergent microcircuits', *Progress in Brain Research*, vol. 131, pp. 53–69.
- Menzel, R. 1979, 'Spectral sensitivity and colour vision in invertebrates', in H. Autrum (ed.), *Handbook of Sensory Physiology. Volume VII. Part 6A. Invertebrate Visual Centres and Behaviour*, Springer, Berlin, pp. 503–80.
- Menzel, R. 2008, 'Insect minds for human minds', in A. S. Benjamin, J. S. de Belle and T. A. Polk (eds), *Human Learning*, Elsevier, London, pp. 271–85.
- Menzel, R. 2009, 'Working memory in bees, also in flies?', *Journal of Neurogenetics*, vol. 8, pp. 1–8.
- Menzel, R. and Giurfa, M. 2006, 'Dimensions of cognition in an insect: the honeybee', *Behavioral and Cognitive Neuroscience Reviews*, vol. 5, pp. 24–40.
- Menzel, R. and Greggers, U. 1992, 'Temporal dynamics and foraging behaviour in honeybees', in T. Billen (ed.), *Biology and Evolution of Social Insects*, Leuven University Press, Leuven, Belgium, pp. 303–18.
- Menzel, R. and Mercer, A. (eds) 1987, *Neurobiology and Behavior of Honeybees*, Springer, Berlin.
- Menzel, R., Chyittka, L., Eichmüller, S., Geiger, K., Peitsch, D. and Knoll, P. 1990, 'Dominance of celestial cues over landmarks disproves map-like orientation in honey bees', *Zeitschrift für Naturforschung*, vol. 45c, pp. 723–6.
- Menzel, R., Greggers, U., Smith, A., Berger, S., Brandt, R., Brunke, S., Bundrock, G., Huelse, S., Pluempe, T., Schaupp, F., Schuettler, E., Stach, S., Stind, J., Stollhoff, N. and Watzl, S. 2005, 'Honeybees navigate according to a map-like spatial memory', *Proceedings of the National Academy of Sciences of the USA*, vol. 102, pp. 3040–5.
- Meyer, H. W. 1971, 'Visuelle Schlüsselreize für die Aulösung der Beutefanghandlung beim Bachwasserläufer *Velia capria* (Hemiptera, Heteroptera)', *Zeitschrift für vergleichende Physiologie*, vol. 72, pp. 260–342.
- Meyer, H. W. 1974, 'Geometrie und funktionelle Spezialisierung des optischen Abtastrasters beim Bachwasserläufer (*Velia capria*)', *Journal of Comparative Physiology*, vol. 92, pp. 85–103.
- Mill, J. S. 1843, *A System of Logic, Ratiocinative and Inductive, Being a Connected View of the Principal Evidence, and the Methods of Scientific Investigation*, 2 vols, John W. Parker, London.
- Mill, J. S. 1873, *Autobiography*, Penguin Classics, United States.

- Mobbs, P. G. 1982, 'The brain of the honeybee *Apis mellifera* I. The connections and spatial organization of the mushroom bodies', *Philosophical Transactions of the Royal Society of London*, vol. 298, pp. 309–54.
- Møller, A. P. 1995, 'Bumblebee preference for symmetrical flowers', *Proceedings of the National Academy of Science of the USA*, vol. 92, pp. 2288–92.
- Mollon, J. D. 1997, 'On the basis of velocity clues alone': some perceptual themes, 1946–1996', *Quarterly Journal of Experimental Psychology*, vol. 50, pp. 859–78.
- Morgan, C. L. 1890, *Animal Life and Intelligence*, Edward Arnold, London.
- Müller, J. 1826, *Zur vergleichende Physiologie des Gesichtssinnes*, Cnobloch, Leipsig.
- Naka, K. 1961, 'Recording of retinal action potentials from single cells in the insect compound eye', *Journal of General Physiology*, vol. 44, pp. 571–84.
- Naka, K. and Eguchi, E. 1962, 'Spike potentials recorded from the insect photoreceptor', *Journal of General Physiology*, vol. 45, pp. 663–80.
- Nelson, R. C. and Aloimonos, J. 1988, 'Finding motion parameters from spherical motion fields (or the advantages of having eyes in the back of your head)', *Biological Cybernetics*, vol. 58, pp. 261–73.
- Neumann, J. von, 1958, *The Computer and the Brain*, Yale University Press, Newhaven, Conn.
- Nilsson, D. E. 1989, 'Optics and evolution of the compound eye', in D. G. Stavenga and R. C. Hardie (eds), *Facets of Vision*, Springer, Berlin, pp. 30–73.
- Nordström, K. and O'Carroll, D. C. 2006, 'Small object detection neurons in female hoverflies', *Proceedings of the Royal Society of London*, vol. 273, pp. 1211–16.
- Nordström, K., Barnett, P. D. and O'Carroll, D. C. 2006, 'Insect detection of small targets moving in visual clutter', *PloS Biology*, vol. 4, no. 3.
- Northrop, R. B. 1975, 'Information processing in the insect compound eye', in G. A. Horridge (ed.), *The Compound Eye and Vision of Insects*, Oxford University Press, Oxford, pp. 378–409.
- Olberg, R. M. 1981, 'Object and self-movement detectors in the ventral nerve cord of the dragonfly', *Journal of Comparative Physiology*, vol. 141, pp. 327–34.
- Olberg, R. M. 1986, 'Identified target-selective visual interneurons descending from the dragonfly brain', *Journal of Comparative Physiology*, vol. 159, pp. 827–40.

- Osborne, J. L., Williams, I. H., Carreck, N. L., Poppy, G. M., Riley, J. R., Smith, A. D., Reynolds, D. R. and Edwards A. S. 1996, 'Harmonic radar: a new technique for investigating bumblebee and honey bee foraging flight', *VII International Symposium on Pollination. ISHS Acta Horticulturae*, vol. 43.
- Osorio, D. 1986, 'Directionally selective cells in the locust medulla', *Journal of Comparative Physiology*, vol. 159, pp. 841–7.
- Osorio, D. 1987a, 'Temporal and spectral properties of sustaining cells in the medulla of the locust', *Journal of Comparative Physiology*, vol. 161, pp. 441–8.
- Osorio, D. 1987b, 'The temporal properties of non-linear transient cells in the locust medulla', *Journal of Comparative Physiology*, vol. 161, pp. 431–40.
- Osorio, D., Snyder, A. W. and Srinivasan, M. V. 1987, 'Bi-partitioning and boundary detection in natural scenes', *Spatial Vision*, vol. 2, pp. 191–8.
- Palka, J. 1965, 'Diffraction and visual acuity of insects', *Science*, vol. 149, pp. 551–3.
- Palka, J. and Pinter, R. B. 1975, 'Theoretical and experimental analysis of visual acuity in insects', in G. A. Horridge (ed.), *The Compound Eye and Vision of Insects*, Oxford University Press, Oxford, pp. 321–37.
- Paulk, A. C., Dacks, A. M. and Gronenberg, W. 2009, 'Color processing in the medulla of the bumblebee (*Apidae: Bombus impatiens*)', *Journal of Comparative Neurology*, vol. 513, pp. 441–56.
- Pick, B. and Buchner, E. 1979, 'Visual movement detection under light- and dark-adaptation in the fly, *Musca domestica*', *Journal of Comparative Physiology*, vol. 134, pp. 45–54.
- Pièron, H. 1904, 'Du rôle de sens musculaire dans l'orientation des fourmis', *Bulletin de l'Institute générale de Psychologie*, vol. 45, pp. 221–9.
- Pinter, R. B. 1979, 'Inhibition and excitation in the locust DCMD receptive field: spatial frequency, temporal and spatial characteristics', *Journal of Experimental Biology*, vol. 80, pp. 191–216.
- Plateau, F. 1885–99, 'Comment les fleurs attirent les insectes. Recherches expérimentales', *Bulletin Academie, Société royale belge*, vol. 30, pp. 466–88, [see papers listed by Forel (1908:142)].
- Poggio, T. and Reichardt, W. 1976, 'Visual control of orientation in the fly. Part II. Towards the underlying neural interactions', *Quarterly Review of Biophysics*, vol. 9, pp. 377–438.
- Poggio, T. and Reichardt, W. 1981, 'Visual fixation and tracking in flies. Mathematical properties of simple control systems', *Biological Cybernetics*, vol. 40, pp. 101–12.

- Popper, K. R. 1935 [1959], *Logik der Forschung*, Springer, Vienna [Translated as *The Logic of Scientific Discovery*, Hutchinson, London].
- Popper, K. 1972, *Objective Knowledge: An evolutionary approach*, Oxford University Press, Oxford.
- Praagh, J. P. van, Ribí, W., Wehrhahn, C. and Wittmann, D. 1980, 'Drone bees fixate the queen with the dorsal front part of their compound eyes', *Journal of Comparative Physiology*, vol. 162, pp. 159–72.
- Preiss, R. 1987, 'Motion parallax and figural properties of depth control and flight speed in an insect', *Biological Cybernetics*, vol. 57, pp. 1–9.
- Preiss, R. 1992, 'Set point of retinal velocity of ground images in the control of swarming flight of desert locusts', *Journal of Comparative Physiology*, vol. 171, pp. 251–6.
- Preiss, R. and Kramer, E. 1984, 'Control of flight speed by minimization of the apparent ground pattern movement', in D. Varjú and H. U. Schnitzler (eds), *Localization and Orientation in Biology and Engineering*, Springer, Berlin, pp. 140–2.
- Pringle, J. W. S. 1938, 'Proprioception in insects. I–III', *Journal of Experimental Biology*, vol. 15, pp. 101–31, 467–73.
- Pumphrey, R. J. and Young, J. Z. 1938, 'The rates of conduction of nerve fibres of various diameters in cephalopods', *Journal of Experimental Biology*, vol. 15, pp. 453–66.
- Pumphrey, R. J., Schmit, O. H. and Young, J. Z. 1940, 'Correlation of local excitability with local physiological response in the giant axon of the squid (*Loligo*)', *Journal of Physiology*, vol. 98, pp. 47–72.
- Pyza, E. and Meinertzhagen, I. A. 2003, 'The regulation of circadian rhythms in the fly's visual system', *Neuropeptides*, vol. 37, pp. 227–89.
- Rabaud, E. 1928, *How Animals Find Their Way About*, Translated by H. Myers, Kegan Paul, London.
- Reichardt, W. 1961, 'Autocorrelation: a principle for evaluation of sensory information by the central nervous system', in W. A. Rosenblith (ed.), *Principles of Sensory Communication*, Wiley, New York, pp. 303–17.
- Reichardt, W. 1962, 'Nervous integration in the facet eye', *Journal of Biophysics*, vol. 2, pp. 121–43.
- Reichardt, W. (ed.) 1969, *Processing of Optical Data by Organisms and by Machines*, Academic Press, New York.

- Reichardt, W. 1970, 'The insect eye as a model for analysis of uptake, transduction and processing of optical data in the nervous system', in F. O. Schmitt (ed.), *The Neurosciences: Second study program*, Rockefeller University Press, New York, pp. 494–511.
- Reichardt, W. 1986, 'Processing of optical information by the visual system of the fly', *Vision Research*, vol. 26, pp. 113–26.
- Reichardt, W. 1987a, 'Computation of optical motion by movement detectors', *Biophysics and Chemistry*, vol. 26, pp. 263–78.
- Reichardt, W. 1987b, 'Evaluation of optical motion information by movement detectors', *Journal of Comparative Physiology*, vol. 161, pp. 533–47.
- Reichardt, W. and Poggio, T. 1976, 'Visual control of orientation behavior in the fly. Part I. A quantitative analysis', *Quarterly Review of Biophysics*, vol. 9, pp. 311–75.
- Reichardt, W. and Poggio, T. 1979, 'Figure-ground discrimination by relative movement in the visual system of the fly. Part I. Experimental results', *Biological Cybernetics*, vol. 35, pp. 81–100.
- Reichardt, W., Poggio, T. and Hausen, K. 1983, 'Figure-ground discrimination by relative movement in the visual system of the fly. Part II. Towards the neural circuitry', *Biological Cybernetics*, vol. 46 (Supplement), pp. 1–30.
- Reichert, H. and Rowell, C. H. F. 1986, 'Neuronal circuits controlling flight in the locust: how sensory information is processed for motor control', *Trends in Neurosciences*, vol. 9, pp. 281–3.
- Ribi, W. 1975–79, 'The first optic ganglion of the bee. I–III', *Cell and Tissue Research*, vol. 165, pp. 103–11; vol. 171, pp. 359–73; vol. 200, pp. 345–57.
- Rind, F. C. 1990, 'A directionally selective motion-detecting neuron in the brain of the locust: physiological and morphological characterization', *Journal of Experimental Biology*, vol. 149, pp. 1–19.
- Robert, D. and Rowell, C. H. F. 1992, 'Locust flight steering', *Journal of Comparative Physiology*, vol. 171, pp. 41–51.
- Romanes, G. J. 1885, 'Homing faculty of Hymenoptera', *Nature*, vol. 32, p. 630.
- Ronacher, B. 1979, 'Äquivalenz zwischen Größen- und Helligkeitsunterschieden im Rahmen der visuellen Wahrnehmung der Honigbiene', *Biological Cybernetics*, vol. 32, pp. 63–75.
- Ronacher, B. and Duft, U. 1996, 'An image matching mechanism describes a generalization task in honeybees', *Journal of Comparative Physiology*, vol. 178, pp. 803–12.

- Rose, A. 1973, *Vision, Human and Electronic*, Plenum Press, New York and London.
- Rossel, S. 1979, 'Regional differences in photoreceptor performance in the eye of the praying mantis', *Journal of Comparative Physiology*, vol. 131, pp. 95–112.
- Rossel, S. and Wehner, R. 1987, 'The bee's E-vector compass', in R. Menzel and A. Mercer (eds), *Neurobiology and Behavior of the Honeybee*, Springer, Berlin, pp. 76–93.
- Rowell, C. H. F. 1971, 'The orthopteran descending movement-detector (DMD) neurons: a characterization and review', *Zeitschrift für vergleichende Physiologie*, vol. 73, pp. 167–94.
- Rowell, C. H. F. and Reichert, H. 1991, 'Mesothoracic interneurons involved in flight steering in the locust', *Tissue and Cell*, vol. 23, pp. 75–139.
- Rowell, C. H. F., O'Shea, M. and Williams, J. L. D. 1977, 'The neuronal basis of a sensory analyser; the acridid movement detector system. I. The preference for small-field stimuli', *Journal of Experimental Biology*, vol. 68, pp. 157–85.
- Rummelhart, D. E. and McClelland, J. L. (eds) 1986, *Parallel Distributed Processing*, MIT Press, Cambridge, Mass.
- Ryback, J. and Menzel, R. 1993, 'Anatomy of the mushroom bodies in the honeybee brain: the neuronal connections of the alpha lobe', *Journal of Comparative Neurology*, vol. 334, pp. 444–65.
- Sandeman, D. C., Kien, J. and Erber, J. 1975, 'Optokinetic eye movements in the crab, *Carcinus maenas*. II. Responses of optokinetic interneurons', *Journal of Comparative Physiology*, vol. 101, pp. 259–74.
- Sanders J. S. (ed.) 1996, *Selected Papers on Natural and Artificial Compound Eye Sensors*, SPIE Optical Engineering Press, Bellingham, Washington, DC.
- Santschi, F. 1911, 'Observations et remarques critiques sur le mécanisme de l'orientation chez les fourmis', *Revue Suisse de Zoologie*, vol. 19, pp. 303–38.
- Santschi, F. 1923, *Memoires de la Societe Vaudoise des Sciences Naturelles*, vol. 137.
- Schnetter, B. 1968, 'Visuelle Formunterscheidung der Honigbiene im Bereich von Vier- und Sechs-strahlsternen', *Zeitschrift für vergleichende Physiologie*, vol. 59, pp. 90–109.
- Schnetter, B. 1972, 'Experiments on pattern discrimination in honey bees', in R. Wehner (ed.), *Information Processing in the Visual Systems of Arthropods*, Springer, Berlin, pp. 195–200.
- Scholes, J. H. 1964, 'Discrete subthreshold potentials from the dimly-lit insect eye', *Nature*, vol. 202, pp. 572–3.

- Scholes, J. 1965, 'Discontinuity of the excitation process in locust visual cells', *Cold Spring Harbor Symposium on Quantitative Biology*, vol. 30, pp. 517–27.
- Schwind, R. 1984, 'Evidence for true polarization vision based on a two-channel analyzer system in the eye of the water bug *Notonecta glauca*', *Journal of Comparative Physiology*, vol. 154, pp. 53–7.
- Seidl, R. 1982, Die Sehfelder und Ommatidien Divergenzwinkel von Arbeiterin, Königin und Drohne der Honigbiene (*Apis mellifera*), PhD thesis, Technische Hochschule, Darmstadt.
- Seidl, R. and Kaiser, W. 1981, 'Visual field size, binocular domain and ommatidial array of the compound eyes in worker honey bees', *Journal of Comparative Physiology*, vol. 143, pp. 17–26.
- Shaw, S. R. 1968, 'Organisation of the locust retina', *Symposia of the Zoological Society of London*, vol. 23, pp. 135–63.
- Shaw, S. R. 1984, 'Early visual processing in insects', *Journal of Experimental Biology*, vol. 112, pp. 225–51.
- Shaw, S. R. 1989, 'The retina-lamina pathway in insects, particularly Diptera, viewed from an evolutionary perspective', in D. G. Stavenga and R. C. Hardie (eds), *Facets of Vision*, Springer, Berlin, pp. 186–212.
- Shepherd, P. R. B. 1966, 'Optokinetic memory and the perception of movement by the crab, *Carcinus*', in C. G. Bernhard (ed.), *The Functional Organization of the Compound Eye*, Pergamon Press, Oxford, pp. 543–57.
- Sherrington, C. S. 1906, *The Integrative Action of the Nervous System*, Yale University Press, New Haven, Conn.
- Smakman, J. G. J., van Hateren, J. H. and Stavenga, D. G. 1984, 'Angular sensitivity of blowfly photoreceptors, intracellular measurements and wave-optical predictions', *Journal of Comparative Physiology*, vol. 155, pp. 239–47.
- Snyder, A. W. 1973, 'Structure and function of the fused rhabdom', *Journal of Comparative Physiology*, vol. 87, pp. 99–135.
- Snyder, A. W. 1975, 'Optical properties of invertebrate photoreceptors', in G. A. Horridge (ed.), *The Compound Eye and Vision of Insects*, Oxford University Press, Oxford, pp. 179–235.
- Snyder, A. W. 1979, 'The physics of vision in compound eyes', in H. Autrum (ed.), *Handbook of Sensory Physiology. Volume VII. Part 6A. Vision in Invertebrates*, Springer, Berlin, pp. 255–314.
- Snyder, A. W. and Menzel, R. (eds) 1975, *Photoreceptor Optics*, Springer, Berlin.

- Snyder, A. W., Stavenga, D. G. and Laughlin, S. B. 1977, 'Spatial information capacity of compound eyes', *Journal of Comparative Physiology*, vol. 116, pp. 183–207.
- Sobel, E. C. 1990, 'The locust's use of motion parallax to measure distance', *Journal of Comparative Physiology*, vol. 167, pp. 579–88.
- Sobey, P., Sasaki, S., Nagle, M., Toriu, T. and Srinivasan, M. V. 1992, 'A hardware system for computing image velocity in real time', *Proceedings SPIE, Boston*, vol. 1823, pp. 334–41.
- Spaethe, J. and Chittka, L. 2003, 'Inter-individual variation of eye optics and single object resolution in bumblebees', *Journal of Experimental Biology*, vol. 206, pp. 3447–53.
- Srinivasan, M. V. 1983, 'The impulse response of a movement-detecting neuron and its interpretation', *Vision Research*, vol. 23, pp. 659–63.
- Srinivasan, M. V. 1985, 'Shouldn't directional movement detection necessarily be "colour-blind"?', *Vision Research*, vol. 25, pp. 997–1000.
- Srinivasan, M. V. 1992, 'How insects exploit optic flow: behavioural experiments and neural models', *Philosophical Transactions of the Royal Society of London*, vol. 337, pp. 253–9.
- Srinivasan, M. V. 1994, 'Pattern recognition in the honeybee: recent progress', *Journal of Insect Physiology*, vol. 40, pp. 183–94.
- Srinivasan, M. V. 2006, 'Small brains, smart computations: vision and navigation in honeybees, and applications to robotics', *International Congress Series, Elsevier*, vol. 1291, pp. 30–7.
- Srinivasan, M. V. and Bernard, G. D. 1977, 'The pursuit response of the housefly and its interaction with the optomotor response', *Journal of Comparative Physiology*, vol. 115, pp. 101–17.
- Srinivasan, M. V. and Dvorak, D. R. 1980, 'Spatial processing of visual information in the movement detecting pathway of the fly', *Journal of Comparative Physiology*, vol. 140, pp. 1–23.
- Srinivasan, M. V. and Lehrer, M. 1984a, 'Temporal acuity of honeybee vision: behavioural studies using moving stimuli', *Journal of Comparative Physiology*, vol. 155, pp. 297–312.
- Srinivasan, M. V. and Lehrer, M. 1984b, 'Temporal acuity of honeybee vision: behavioural studies using flickering stimuli', *Physiological Entomology*, vol. 9, pp. 447–57.
- Srinivasan, M. V. and Lehrer, M. 1988, 'Spatial acuity of honeybee vision, and its spectral properties', *Journal of Comparative Physiology*, vol. 162, pp. 159–72.

- Srinivasan, M. V. and Venkatesh, S. (eds) 1997, *From Living Eyes to Seeing Machines*, Oxford University Press, New York.
- Srinivasan, M. V., Laughlin, S. B. and Dubs, A. 1982, 'Predictive coding: a fresh view of inhibition in the retina', *Proceedings of the Royal Society of London*, vol. 216, pp. 427–59.
- Srinivasan, M. V., Lehrer, M. and Horridge, G. A. 1990, 'Visual figure-ground discrimination in the honeybee: the role of motion parallax at boundaries', *Proceedings of the Royal Society of London*, vol. 238, pp. 331–50.
- Srinivasan, M. V., Lehrer, M., Kirchner, W. H. and Zhang, S. W. 1991, 'Range perception through apparent image speed in freely flying honeybees', *Visual Neurosciences*, vol. 6, pp. 519–35.
- Srinivasan, M. V., Lehrer, M., Zhang, S. W. and Horridge, G. A. 1989, 'How honeybees measure their distance from objects of unknown size', *Journal of Comparative Physiology*, vol. 165, pp. 605–13.
- Srinivasan, M. V., Zhang, S. W. and Bidwell, N. J. 1997, 'Visually mediated odometry in honeybees', *Journal of Experimental Biology*, vol. 200, pp. 2513–22.
- Srinivasan, M. V., Zhang, S. W. and Chahl, J. S. 2001, 'Landing strategies in honeybees, and possible applications to autonomous airborne vehicles', *Biological Bulletin*, vol. 200, pp. 216–21.
- Srinivasan, M. V., Zhang, S. W. and Chandrashekhara, K. 1993, 'Evidence for two distinct movement-detecting mechanisms in insect vision', *Naturwissenschaften*, vol. 80, pp. 38–41.
- Srinivasan, M. V., Zhang, S. W. and Rolfe, B. 1993, 'Is pattern vision in insects mediated by "cortical" processing?', *Nature*, vol. 362, pp. 539–40.
- Srinivasan, M. V., Zhang, S. W. and Witney, K. 1994, 'Visual discrimination of pattern orientation by honeybees', *Philosophical Transactions of the Royal Society of London*, vol. 343, pp. 199–210.
- Srinivasan, M. V., Zhang, S. W. and Zhu, H. 1998, 'Honeybees link sights to smells', *Nature*, vol. 396, pp. 637–8.
- Srinivasan, M. V., Zhang, S. W., Altwein, A. and Tautz, J. 2000, 'Honeybee navigation: nature and calibration of the "odometer"', *Science*, vol. 287, pp. 851–3.
- Srinivasan, M. V., Zhang, S. W., Lehrer, M. and Collett, T. S. 1996, 'Honeybee navigation en route to the goal, visual flight control and odometry', *Journal of Experimental Biology*, vol. 199, pp. 237–44.

- Stach, S. and Giurfa, M. 2005, 'The influence of training length on generalization of visual feature assemblies in honeybees', *Behavioural Brain Research*, vol. 161, pp. 8–17.
- Stach, S., Benard, J. and Giurfa, M. 2004, 'Local feature assembling in visual pattern recognition and generalization in honeybees', *Nature*, vol. 429, pp. 758–61.
- Stange, G. 1981, 'The ocellar component of flight equilibrium control in dragonflies', *Journal of Comparative Physiology*, vol. 141, pp. 335–47.
- Stange, G., Stowe, S., Chahl, J. S. and Massaro, A. 2002, 'Anisotropic imaging in the dragonfly median ocellus: a matched filter for horizon detection', *Journal of Comparative Physiology*, vol. 188, pp. 455–67.
- Stavenga, D. G. 1979, 'Pseudopupils of compound eyes', in H. Autrum (ed.), *Invertebrate Photoreceptors. Handbook of Sensory Physiology. VII/6A*, Springer, Berlin, pp. 357–439.
- Stavenga, D. G. 2003, 'Angular and spectral sensitivity of fly photoreceptors. Parts I, II, III', *Journal of Comparative Physiology*, vol. 189, pp. 1–17; vol. 189, pp. 189–202; vol. 190, pp. 115–29.
- Stavenga, D. G. and Hardie, R. C. (eds) 1989, *Facets of Vision*, Springer, Berlin.
- Strausfeld, N. J. 1976, *Atlas of an Insect Brain*, Springer, Berlin.
- Strausfeld, N. J. 1989, 'Beneath the compound eye. Neuroanatomical analysis and physiological correlates in the study of insect vision', in D. G. Stavenga and R. C. Hardie (eds), *Facets of Vision*, Springer, Berlin, pp. 317–59.
- Strausfeld, N. J. 2002, 'Organization of the honey bee mushroom body: representation of the calyx within the vertical and gamma lobes', *Journal of Comparative Neurology*, vol. 450, pp. 4–33.
- Strausfeld, N. J. and Lee, J. K. 1991, 'Neuronal basis for parallel visual processing in the fly', *Visual Neuroscience*, vol. 7, pp. 13–33.
- Strausfeld, N. J. and Seyan, H. S. 1985, 'Convergence of visual, haltere and prosternal inputs at neck motor neurons of *Calliphora erythrocephala*', *Cell and Tissue Research*, vol. 240, pp. 601–15.
- Strausfeld, N., Douglass, J. K., Campbell, H. and Higgins, C. M. 2006, 'Parallel processing in the optic lobes of flies and the occurrence of motion computing circuits', in E. Warrant and D.-E. Nilsson (eds), *Invertebrate Vision*, Cambridge University Press, Cambridge, pp. 349–98.
- Tatler, B., O'Carroll, D. C. and Laughlin, S. B. 2000, 'Temperature and the temporal resolving power of fly photoreceptors', *Journal of Comparative Physiology*, vol. 186, pp. 399–407.

- Tautz, J., Rohrseitz, K. and Sandeman, D. C. 1996, 'One-strided waggle dance in bees', *Nature*, vol. 382, p. 32.
- Tautz, J., Zhang, S. W., Spaethe, J., Brockman, A., Si, A. and Srinivasan, M. V. 2004, 'Honeybee odometry: performance in varying natural terrain', *PloS Biology*, vol. 2, pp. 915–23.
- Thorpe, W. H. 1956 [1963], *Learning and Instinct in Animals*, 2nd edn, Methuen, London.
- Thorson, J. 1966a, 'Small-signals analysis of a visual reflex in locust', *Kybernetik*, vol. 3, pp. 54–66.
- Thorson, J. 1966b, 'Small-signal analysis of a visual reflex in locust. I. Input parameters', *Kybernetik*, vol. 3, pp. 41–53.
- Tinbergen, N. and Kruyt, W. 1938, 'Über die Orientierung des Bienenwolfes (*Philanthus triangulum* Fabr.). III. Die Bevorzugung bestimmter Wegmarken', *Zeitschrift für vergleichende Physiologie*, vol. 25, pp. 292–334.
- Tunstall, J. and Horridge, G. A. 1967, 'Electrophysiological investigation of the optics of the locust retina', *Zeitschrift für vergleichende Physiologie*, vol. 55, pp. 167–82.
- Turner, C. H. 1911, 'Experiments on pattern vision of the honeybee', *Biological Bulletin, Woods Hole*, vol. 21, pp. 249–64.
- Tye, M. 1997, 'The problem of simple minds: is there anything it is like to be a honey bee?', *Philosophical Studies*, vol. 88, pp. 289–317.
- Uexkull, J. von, 1908, *Umwelt und Innenwelt*, J. Springer, Berlin.
- Vallet, A. M. and Coles, J. A. 1993, 'The perception of small objects by the drone honeybee', *Journal of Comparative Physiology*, vol. 172, pp. 183–8.
- Varjú, D. 1959, 'Anwendung der Systemtheorie auf Experimente am Rüsselkäfer *Chlorophanus viridis*', *Zeitschrift für Naturforschung*, vol. 14b, pp. 724–6.
- Varjú, D. and Schnitzler, H. U. (eds) 1984, *Localization and Orientation in Biology and Engineering*, Springer, Berlin.
- Verlaine, L. 1927, 'L'instinct et l'intelligence chez les Hyménoptères. VII L'abstraction', *Annales de la Societe Royale Zoologique de Belgique*, vol. 55, pp. 58–88.
- Victor, J. D. and Shapley, R. M. 1980, 'A method of non-linear analysis in the frequency domain', *Biophysical Journal*, vol. 29, pp. 459–84.
- Vigier, P. 1907, 'Sur les terminations photoréceptrices dans les yeux composés des Muscides', *Comptes Rendues, Academie des Sciences, Paris*, vol. 63, pp. 532–36.

- Vigier, P. 1909, 'Mécanisme de la synthèse des impressions lumineuses recueillies par les yeux composés des Diptères', *Comptes Rendues, Academie des Sciences, Paris*, vol. 65, pp. 1221–3.
- Vladusich, T., Hemmi, J. M. and Zeil, J. 2006, 'Honeybee odometry and scent guidance', *Journal of Experimental Biology*, vol. 209, pp. 1367–75.
- Vladusich, T., Hemmi, J. M., Srinivasan, M. V. and Zeil, J. 2005, 'Interactions of visual odometry and landmark guidance during food search in honeybees', *Journal of Experimental Biology*, vol. 208, pp. 4123–35.
- Vorobyev, M. and Osorio, D. 1998, 'Receptor noise as a determinant of colour thresholds', *Proceedings of the Royal Society of London*, vol. 265, pp. 351–8.
- Vorobyev, M., Brandt, R., Peitsch, D., Laughlin, S. B. and Menzel, R. 2001, 'Colour thresholds and receptor noise, behaviour and physiology compared', *Vision Research*, vol. 41, pp. 639–53.
- Voss, C. 1967, 'Das Formensehen der Roten Waldameise *Formica rufa*', *Zeitschrift für vergleichende Physiologie*, vol. 55, pp. 225–54.
- Walcott, B. 1975, 'Anatomical changes during light adaptation in insect compound eyes', in G. A. Horridge (ed.), *The Compound Eye and Vision of Insects*, Oxford University Press, Oxford, pp. 20–33.
- Wallace, D. F. 2008, 'It all gets quite tricky', *Harpers Magazine*, 317, 31.
- Wallace, G. K. 1959, 'Visual scanning in the desert locust *Schistocerca gregaria* Forskal', *Journal of Experimental Biology*, vol. 36, pp. 512–25.
- Warrant, E. and Nillson, D.-E. (eds) 2006, *Invertebrate Vision*, Cambridge University Press, Cambridge.
- Warrant, E., Kelber, A., Gislén, A., Greiner, B., Ribi, W. and Wcislo, T. 2004, 'Nocturnal vision and landmark orientation in a tropical halictid bee', *Current Biology*, vol. 14, pp. 1309–18.
- Warrant, E., Porombka, T. and Kirchner, W. 1996, 'Neural image enhancement allows honeybees to see at night', *Proceedings of the Royal Society of London*, vol. 263, pp. 1521–6.
- Wehner, R. 1967, 'Pattern recognition in bees', *Nature*, vol. 215, pp. 1244–8.
- Wehner, R. 1968, 'Die Bedeutung der Streifenbreite für die optische Winkelmessung der Biene (*Apis mellifica*)', *Zeitschrift für vergleichende Physiologie*, vol. 58, pp. 322–43.
- Wehner, R. 1969, 'Die Mechanismus der optischen Winkelmessung bei der Biene (*Apis mellifera*)', *Zoologische Anzeiger*, vol. 33 (Supplement), pp. 586–92.

- Wehner, R. 1971, 'The generalization of directional visual stimuli in the honeybee, *Apis mellifera*', *Journal of Insect Physiology*, vol. 17, pp. 1579–91.
- Wehner, R. 1972a, 'Dorsoventral asymmetry in the visual field of the bee, *Apis mellifica*', *Journal of Comparative Physiology*, vol. 77, pp. 256–77.
- Wehner, R. 1972b, 'Pattern modulation and pattern detection in the visual systems of Hymenoptera', in R. Wehner (ed.), *Information Processing in the Visual Systems of Arthropods*, Springer, Berlin, pp. 183–94.
- Wehner, R. (ed.) 1972c, *Information Processing in the Visual Systems of Arthropods*, Springer, Berlin.
- Wehner, R. 1975, 'Pattern recognition', in G. A. Horridge (ed.), *The Compound Eye and Vision of Insects*, Oxford University Press, Oxford, pp. 75–114.
- Wehner, R. 1981, 'Spatial vision in arthropods', in H. Autrum (ed.), *Handbook of Sensory Physiology. Volume VII/6C. Vision in Invertebrates*, Springer-Verlag, Berlin, pp. 287–616.
- Wehner, R. 1987, "'Matched filters": neural models of the external world', *Journal of Comparative Physiology*, vol. 161, pp. 511–31.
- Wehner, R. 1989, 'The hymenopteran skylight compass: matched filtering and parallel coding', *Journal of Experimental Biology*, vol. 146, pp. 63–85.
- Wehner, R. and Lindauer, M. 1966a, 'Zur Physiologie des Formensehens bei der Honigbiene. I Winkelunterscheidung an vertikal orientierten Streifenmustern', *Zeitschrift für vergleichende Physiologie*, vol. 52, pp. 290–324.
- Wehner, R. and Lindauer, M. 1966b, 'Die optische Orientierung der Honigbiene (*Apis mellifica*) nach der Winkelrichtung frontal gebotener Streifenmuster', *Zoologische Anzeiger*, vol. 30 (Supplement), pp. 239–46.
- Wehner, R. and Menzel, R. 1990, 'Do insects have cognitive maps?', *Annual Review of Neurosciences*, vol. 13, pp. 403–14.
- Wehner, R. and Müller, M. 1985, 'Does interocular transfer occur in visual navigation by ants?', *Nature*, vol. 315, pp. 228–9.
- Wehner, R. and Rossel, S. 1985, 'The bee's celestial compass—a case study in behavioural neurobiology', *Fortschritt für Zoologie*, vol. 31, pp. 11–53.
- Wehner, R. and Srinivasan, M. V. 1984, 'The world as the insect sees it', in T. Lewis (ed.), *Insect Communication*, Academic Press, New York, pp. 29–47.
- Wehner, R., Bleuler, S., Nievergelt, C. and Shah, D. 1990, 'Bees navigate by using vectors and routes rather than maps', *Naturwissenschaften*, vol. 77, pp. 479–82.

- Wehrhahn, C. 1985, 'Visual guidance of flies during flight', in G. A. Kerkut and L. I. Gilbert (eds), *Comprehensive Insect Physiology, Biochemistry and Pharmacology. Volume 6. Nervous System, Sensory*, Pergamon Press, Oxford, pp. 673–84.
- Weiss, K. 1953, 'Versuche mit Bienen und Vespen in farbigenlabryrinthen', *Zeitschrift für Tierpsychologie*, vol. 10, pp. 29–44.
- Wells, P. H. and Wenner, A. M. 1973, 'Do honey bees have a language?', *Nature*, vol. 241, pp. 171–5.
- Wenner, A. M. 1967, 'Honey bees: do they use the distance information contained in their dance maneuver?', *Science*, vol. 155, pp. 847–9.
- Wenner, A. M. [see Munz, T. 2005, 'The bee battles: Karl von Frisch, Adrian Wenner and the honey bee dance language controversy', *Journal of the History of Biology*, vol. 38, pp. 535–70].
- Wenner, A. M. and Wells, P. H. 1990, *Anatomy of a Controversy: The question of a 'language' among bees*, Columbia University Press, New York.
- Wertheimer, M. 1912, 'Experimentelle Studien über das Sehen von Bewegung', *Zeitschrift für Psychologie und Physiologie der Sinnesorgane*, vol. 61, pp. 161–265.
- Wertheimer, M. 1924 [1938], *Über Gestalttheorie* [an address before the Kant Society, Berlin, 7 December 1924, Translated by Willis D. Ellis, published in his *Source Book of Gestalt Psychology*, Harcourt, Brace and Co. New York. Reprinted in 1997 by Gestalt Journal Press, New York].
- Westaway, F. W. 1937, *Scientific Method*, Revised 5th edn, Blackie, London.
- Whewell, W. 1837, *History of the Inductive Sciences*, Parker, London.
- Whewell, W. 1840, *The Philosophy of the Inductive Sciences, Founded Upon Their History*, Parker, London.
- Whewell, W. 1858, *Novum Organon Renovatum*, Parker, London.
- Whitaker, D., Bradley, A., Barrett, B. T. and McGraw, P. V. 2002, 'Isolation of stimulus characteristics contributing to Weber's law for position', *Vision Research*, vol. 42, pp. 1137–48.
- Wiechert, E. 1938, 'Zur Frage der Koordinaten des subjectiven Sehraumes der Biene', *Zeitschrift für vergleichende Physiologie*, vol. 25, pp. 455–93.
- Wiersma, C. A. G. 1958, 'On the functional connections of single units in the central nervous system of the crayfish *Procambarus clarkii* Girard', *Journal of Comparative Neurology*, vol. 110, pp. 421–71.

- Wiersma, C. A. G. 1966, 'Integration in the visual pathway of crustacea', *Symposia of the Society of Experimental Biology*, vol. 20, pp. 151–78.
- Wigglesworth, V. B. [1965], *The Principles of Insect Physiology*, Revised 6th edn, Methuen, London.
- Wilson, M. 1975, 'Angular sensitivity of light and dark adapted locust retinula cells', *Journal of Comparative Physiology*, vol. 97, pp. 323–8.
- Winsor, F. 1958 [2001], *The Space Child's Mother Goose*, Simon Schuster, New York [Reprinted by Purple House Press].
- Wolf, E. 1931, 'Sehschärfepfung an Bienen im Freilandversuch', *Zeitschrift für vergleichende Physiologie*, vol. 14, pp. 746–62.
- Wolf, E. 1933, 'The visual intensity discrimination of the honeybee', *Journal of General Physiology*, vol. 16, pp. 407–22.
- Wolf, E. 1935, 'An analysis of the visual capacity of the bee's eye', *Cold Spring Harbor Symposium on Quantitative Biology*, vol. 3, pp. 255–60.
- Wolf, E. and Zerrahn-Wolf, G. 1935, 'The dark adaptation of the eye of the honeybee', *Journal of General Physiology*, vol. 19, pp. 229–37.
- Wolf, E. and Zerrahn-Wolf, G. 1936, 'Flicker and the reactions of bees to flowers', *Journal of General Physiology*, vol. 20, pp. 511–18.
- Wolf, R. and Heisenberg, M. 1986, 'Visual orientation in motion-blind flies is an operant behaviour', *Nature*, vol. 323, pp. 154–6.
- Wolf, R. and Heisenberg, M. 1990, 'Visual control of straight flight in *Drosophila melanogaster*', *Journal of Comparative Physiology*, vol. 167, pp. 269–83.
- Wolf, R. and Heisenberg, M. 1991, 'Basic organization of operant behaviour as revealed in *Drosophila* flight orientation', *Journal of Comparative Physiology*, vol. 169, pp. 699–705.
- Wolf, R., Wittig, T., Li, L., Wustmann, G., Eyding, D. and Heisenberg, M. 1998, '*Drosophila* mushroom bodies are dispensable for visual, tactile, and motor learning', *Learning and Memory*, vol. 5, pp. 166–78.
- Yang, E.-C. and Maddess, T. 1997, 'Orientation-sensitive neurons in the brain of the honey bee (*Apis mellifera*)', *Journal of Insect Physiology*, vol. 43, pp. 329–36.
- Yang, E.-C. and Osorio, D. 1996, 'Spectral responses and chromatic processing in the dragonfly lamina', *Journal of Comparative Physiology*, vol. 178, pp. 543–50.

- Yang, E.-C., Lin, H.-C. and Yung, Y.-S. 2004, 'Patterns of chromatic information processing in the lobula of the honeybee', *Journal of Insect Physiology*, vol. 50, pp. 913–25.
- Young, J. Z. 1939, 'Fused neurons and synaptic contacts in the giant nerve fibres of cephalopods', *Philosophical Transactions of the Royal Society of London*, vol. 229, pp. 465–503.
- Zawarzin, A. 1913, 'Histologische Studien über Insekten IV. Die optischen Ganglien der *Aeschna* Larven', *Zeitschrift für wissenschaftlich Zoologie*, vol. 108, pp. 175–257.
- Zeil, J. 1993, 'Orientation flights of solitary wasps (*Cerceris*; Sphecidae; Hymenoptera). Parts I and II', *Journal of Comparative Physiology*, vol. 172, pp. 189–205, 207–22.
- Zeil, J., Nalbach, G. and Nalbach, H. O. 1989, 'Spatial vision in a flat world: optical and neural adaptations in arthropods', in R. N. Singh and N. Strausfeld (eds), *Neurobiology of Sensory Systems*, Plenum, New York, pp. 123–36.
- Zerrahn, G. 1933, 'Formdressur und Formunterscheidung bei der Honigbiene', *Zeitschrift für vergleichende Physiologie*, vol. 20, pp. 117–50.
- Zettler, F. and Weiler, R. 1976, *Neural Principles in Vision*, Springer, Berlin.
- Zhang, S. W. and Horridge, G. 1992, 'Pattern recognition in bees, size of regions in spatial layout', *Transactions of the Royal Society of London*, vol. 337, pp. 65–71.
- Zhang, S. W. and Srinivasan, M. V. 1994a, 'Prior experience enhances pattern discrimination in insect vision', *Nature*, vol. 368, pp. 330–2.
- Zhang, S. W. and Srinivasan, M. V. 1994b, 'Pattern recognition in honeybees: analysis of orientation', *Philosophical Transactions of the Royal Society of London*, vol. 346, pp. 399–406.
- Zhang, S. W. and Srinivasan, M. V. 2004, 'Exploration of cognitive capacity in honeybees: higher functions emerge from a small brain', in F. R. Prete (ed.), *Complex Worlds From Simpler Nervous Systems*, MIT Press, Cambridge, Mass., pp. 41–74.
- Zhang, S. W., Lehrer, M. and Srinivasan, M. V. 1998, 'Eye-specific route learning and interocular transfer in walking honeybees', *Journal of Comparative Physiology*, vol. 182, pp. 745–54.
- Zhang, S. W., Srinivasan, M. V. and Collett, T. 1995, 'Convergent processing in honeybee vision: multiple channels for the recognition of shape', *Proceedings of the National Academy of Sciences of the USA*, vol. 92, pp. 3029–31.

- Zhang, S. W., Srinivasan, M. V. and Horridge, G. A. 1992, 'Pattern recognition in honeybees: local and global analysis', *Proceedings of the Royal Society of London*, vol. 248, pp. 55–61.
- Zhang, S. W., Wang, X., Liu, Z. and Srinivasan, M. V. 1990, 'Visual tracking of moving targets by freely flying honeybees', *Visual Neuroscience*, vol. 4, pp. 379–86.