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Conscious and unconscious vision

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Publication date
2009

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Citation for published version (APA):

Fahrenfort, J. J. (2009). *Conscious and unconscious vision*.

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References

- Angelucci, A., Levitt, J. B., Walton, E. J. S., Hupe, J. M., Bullier, J., & Lund, J. S. (2002). Circuits for local and global signal integration in primary visual cortex. *Journal of Neuroscience*, *22*(19), 8633-8646.
- Atkinson, J., & Braddick, O. J. (1989). Where and what in visual-search. *Perception*, *18*(2), 181-189.
- Bachmann, T., Luiga, I., & Poder, E. (2005). Variations in backward masking with different masking stimuli: II. The effects of spatially quantised masks in the light of local contour interaction, interchannel inhibition, perceptual retouch, and substitution theories. *Perception*, *34*(2), 139-153.
- Bar, M., Kassam, K. S., Ghuman, A. S., Boshyan, J., Schmid, A. M., Dale, A. M., et al. (2006). Top-down facilitation of visual recognition. *Proceedings of the National Academy of Sciences of the United States of America*, *103*(2), 449-454.
- Bar, M., Tootell, R. B. H., Schacter, D. L., Greve, D. N., Fischl, B., Mendola, J. D., et al. (2001). Cortical mechanisms specific to explicit visual object recognition. *Neuron*, *29*(2), 529-535.
- Beck, D. M., Rees, G., Frith, C. D., & Lavie, N. (2001). Neural correlates of change detection and change blindness. *Nature Neuroscience*, *4*(6), 645-650.
- Becker, M. W., & Anstis, S. (2004). Metacontrast masking is specific to luminance polarity. *Vision Research*, *44*(21), 2537-2543.
- Benjamini, Y., & Hochberg, Y. (1995). Controlling the False Discovery Rate - a practical and powerful approach to multiple testing. *Journal of the Royal Statistical Society Series B-Methodological*, *57*(1), 289-300.
- Boehler, C. N., Schoenfeld, M. A., Heinze, H. J., & Hopf, J. M. (2008). Rapid recurrent processing: gates awareness in primary visual cortex. *Proceedings of the National Academy of Sciences of the United States of America*, *105*(25), 8742-8747.

- Boyer, J. L., Harrison, S., & Ro, T. (2005). Unconscious processing of orientation and color without primary visual cortex. *Proceedings of the National Academy of Sciences of the United States of America*, 102(46), 16875-16879.
- Brefczynski, J. A., & DeYoe, E. A. (1999). A physiological correlate of the 'spotlight' of visual attention. *Nature Neuroscience*, 2(4), 370-374.
- Breitmeyer, B. G. (1984). *Visual masking: An integrative approach*. Oxfordshire/New York: Oxford/Clarendon Press/Oxford University Press.
- Breitmeyer, B. G., & Ogmen, H. (2000). Recent models and findings in visual backward masking: A comparison, review, and update. *Perception & Psychophysics*, 62(8), 1572-1595.
- Breitmeyer, B. G., Ro, T., & Ogmen, H. (2004). A comparison of masking by visual and transcranial magnetic stimulation: implications for the study of conscious and unconscious visual processing. *Consciousness and Cognition*, 13(4), 829-843.
- Brewer, A. A., Liu, J. J., Wade, A. R., & Wandell, B. A. (2005). Visual field maps and stimulus selectivity in human ventral occipital cortex. *Nature Neuroscience*, 8(8), 1102-1109.
- Bridgeman, B. (1980). Temporal response characteristics of cells in monkey striate cortex measured with metacontrast masking and brightness discrimination. *Brain Research*, 196(2), 347-364.
- Buschman, T. J., & Miller, E. K. (2007). Top-down versus bottom-up control of attention in the prefrontal and posterior parietal cortices. *Science*, 315(5820), 1860-1862.
- Caputo, G., & Casco, C. (1999). A visual evoked potential correlate of global figure-ground segmentation. *Vision Research*, 39(9), 1597-1610.
- Cavanaugh, J. R., Bair, W., & Movshon, J. A. (2002). Nature and interaction of signals from the receptive field center and surround in macaque V1 neurons. *Journal of Neurophysiology*, 88(5), 2530-2546.
- Chalmers, D. J. (1995). Facing up to the problem of consciousness. *Journal of Consciousness Studies*, 2, 200-219.
- Clark, R. E., Broadbent, N. J., Zola, S. M., & Squire, L. R. (2002). Anterograde amnesia and temporally graded retrograde amnesia for a nonspatial memory task after lesions of

- hippocampus and subiculum. *Journal of Neuroscience*, 22(11), 4663-4669.
- Dehaene, S., Changeux, J. P., Naccache, L., Sackur, J., & Sergent, C. (2006). Conscious, preconscious, and subliminal processing: a testable taxonomy. *Trends in Cognitive Sciences*, 10(5), 204-211.
- Dehaene, S., Naccache, L., Cohen, L., Le Bihan, D., Mangin, J. F., Poline, J. B., et al. (2001). Cerebral mechanisms of word masking and unconscious repetition priming. *Nature Neuroscience*, 4(7), 752 - 758.
- Dehaene, S., Naccache, L., Le Clec'H, G., Koechlin, E., Mueller, M., Dehaene Lambertz, G., et al. (1998). Imaging unconscious semantic priming. *Nature*, 395(6702), 597-600.
- Dehaene, S., Sergent, C., & Changeux, J. P. (2003). A neuronal network model linking subjective reports and objective physiological data during conscious perception. *Proceedings of the National Academy of Sciences of the United States of America*, 100(14), 8520-8525.
- Desimone, R., & Duncan, J. (1995). Neural mechanisms of selective visual-attention. *Annual Review of Neuroscience*, 18, 193-222.
- Di Lollo, V., Enns, J. T., & Rensink, R. A. (2000). Competition for consciousness among visual events: The psychophysics of reentrant visual processes. *Journal of Experimental Psychology-General*, 129(4), 481-507.
- Donchin, E., & Coles, M. G. H. (1988). Is the P300 component a manifestation of context updating? *Behavioral and Brain Sciences*, 11(3), 357-374.
- Eimer, M., & Schlaghecken, F. (1998). Effects of masked stimuli on motor activation: Behavioral and electrophysiological evidence. *Journal of Experimental Psychology-Human Perception and Performance*, 24(6), 1737-1747.
- Enns, J. T. (2004). Object substitution and its relation to other forms of visual masking. *Vision Research*, 44(12), 1321-1331.
- Enns, J. T., & Di Lollo, V. (2000). What's new in visual masking? *Trends in Cognitive Sciences*, 4(9), 345-352.
- Epstein, R., & Kanwisher, N. (1998). A cortical representation of the local visual environment. *Nature*, 392(6676), 598-601.

- Fahrenfort, J. J., Scholte, H. S., & Lamme, V. A. F. (2007). Masking disrupts reentrant processing in human visual cortex. *Journal of Cognitive Neuroscience*, *19*(9), 1488-1497.
- Fahrenfort, J. J., Scholte, H. S., & Lamme, V. A. F. (2008). The spatiotemporal profile of cortical processing leading up to visual perception. *Journal of Vision*, *8*(1), -.
- Fang, F., & He, S. (2005). Cortical responses to invisible objects in the human dorsal and ventral pathways. *Nature Neuroscience*, *8*(10), 1380-1385.
- Felleman, D. J., & Van Essen, D. C. (1991). Distributed hierarchical processing in the primate cerebral cortex. *Cerebral Cortex*, *1*(1), 1-47.
- Foxe, J. J., & Simpson, G. V. (2002). Flow of activation from V1 to frontal cortex in humans - A framework for defining "early" visual processing. [Article]. *Experimental Brain Research*, *142*(1), 139-150.
- Francis, G. (1997). Cortical dynamics of lateral inhibition: Metacontrast masking. *Psychological Review*, *104*(3), 572-594.
- Gandhi, S. P., Heeger, D. J., & Boynton, G. M. (1999). Spatial attention affects brain activity in human primary visual cortex. *Proceedings of the National Academy of Sciences of the United States of America*, *96*(6), 3314-3319.
- Genovese, C. R., Lazar, N. A., & Nichols, T. (2002). Thresholding of statistical maps in functional neuroimaging using the false discovery rate. *Neuroimage*, *15*(4), 870-878.
- Glover, G. H. (1999). Deconvolution of impulse response in event-related BOLD fMRI. *Neuroimage*, *9*(4), 416-429.
- Gratton, G., Coles, M. G., & Donchin, E. (1983). A new method for off-line removal of ocular artifact. *Electroencephalography and Clinical Neurophysiology*, *55*(4), 468-484.
- Greenwald, A. G., Klinger, M. R., & Liu, T. J. (1989). Unconscious processing of dichoptically masked words. *Memory & Cognition*, *17*(1), 35-47.
- Grill-Spector, K. (2003). The neural basis of object perception. *Current Opinion in Neurobiology*, *13*(2), 159-166.
- Grill-Spector, K., & Kanwisher, N. (2005). Visual recognition - As soon as you know it is there, you know what it is. *Psychological Science*, *16*(2), 152-160.

- Grill-Spector, K., Kourtzi, Z., & Kanwisher, N. (2001). The lateral occipital complex and its role in object recognition. *Vision Research*, *41*(10-11), 1409-1422.
- Gross, C. G., Rocha-Miranda, C. E., & Bender, D. B. (1972). Visual properties of neurons in inferotemporal cortex of the Macaque. *Journal of Neurophysiology*, *35*(1), 96-111.
- Hartline, H. K. (1949). Inhibition of activity of visual receptors by illuminating nearby retinal areas in the Limulus eye. *Federation Proceedings*, *8*(7), 69.
- Haxby, J. V., Gobbini, M. I., Furey, M. L., Ishai, A., Schouten, J. L., & Pietrini, P. (2001). Distributed and overlapping representations of faces and objects in ventral temporal cortex. *Science*, *293*(5539), 2425-2430.
- Haynes, J. D., Driver, J., & Rees, G. (2005). Visibility reflects dynamic changes of effective connectivity between V1 and fusiform cortex. *Neuron*, *46*(5), 811-821.
- Heilman, K. M., & Abell, T. V. D. (1980). Right hemisphere dominance for attention: The mechanism underlying hemispheric asymmetries of inattention (neglect). *Neurology*, *30*(3), 327-.
- Heinrich, S. P., Andrés, M., & Bach, M. (2007). Attention and visual texture segregation. *Journal of Vision*, *7*(6), 1-10.
- Hillyard, S. A., Hink, R. F., Schwent, V. L., & Picton, T. W. (1973). Electrical signs of selective attention in the human brain. *Science*, *182*(108), 177-180.
- Hochstein, S., & Ahissar, M. (2002). View from the top: Hierarchies and reverse hierarchies in the visual system. *Neuron*, *36*(5), 791-804.
- Hubel, D. H., & Wiesel, T. N. (1962). Receptive fields, binocular interaction and functional architecture in the cat's visual cortex. *Journal of Physiology*, *160*, 106-154.
- Hubel, D. H., & Wiesel, T. N. (1968). Receptive fields and functional architecture of monkey striate cortex. *Journal of Physiology*, *195*(1), 215-243.
- Hupe, J. M., James, A. C., Payne, B. R., Lomber, S. G., Girard, P., & Bullier, J. (1998). Cortical feedback improves discrimination between figure and background by V1, V2 and V3 neurons. [10.1038/29537]. *Nature*, *394*(6695), 784-787.

- Jolij, J., Scholte, H. S., Van Gaal, S., & Lamme, V. A. F. (in press). The brain decides late: long latency visual evoked potentials reflect perceptual decisions. *Journal of Cognitive Neuroscience*.
- Kanwisher, N., McDermott, J., & Chun, M. M. (1997). The fusiform face area: A module in human extrastriate cortex specialized for face perception. *Journal of Neuroscience*, *17*(11), 4302-4311.
- Kastner, S., Pinsk, M. A., De Weerd, P., Desimone, R., & Ungerleider, L. G. (1999). Increased activity in human visual cortex during directed attention in the absence of visual stimulation. *Neuron*, *22*(4), 751-761.
- Kastner, S., & Ungerleider, L. G. (2000). Mechanisms of visual attention in the human cortex. *Annual Review of Neuroscience*, *23*, 315-341.
- Knierim, J. J., & Van Essen, D. C. (1992). Neuronal responses to static texture patterns in area-V1 of the alert macaque monkey. *Journal of Neurophysiology*, *67*(4), 961-980.
- Koivisto, M., Revonsuo, A., & Lehtonen, M. (2006). Independence of visual awareness from the scope of attention: An electrophysiological study. *Cerebral Cortex*, *16*(3), 415-424.
- Koivisto, M., Revonsuo, A., & Salminen, N. (2005). Independence of visual awareness from attention at early processing stages. *Neuroreport*, *16*(8), 817-821.
- Kok, A. (2001). On the utility of P3 amplitude as a measure of processing capacity. *Psychophysiology*, *38*(3), 557-577.
- Kolb, F. C., & Braun, J. (1995). Blindsight in normal observers. *Nature*, *377*(6547), 336-338.
- Konen, C. S., & Kastner, S. (2008). Two hierarchically organized neural systems for object information in human visual cortex. *Nature Neuroscience*, *11*(2), 224-231.
- Kouider, S., Eger, E., Dolan, R., & Henson, R. N. (2008). Activity in face-responsive brain regions is modulated by invisible, attended faces: evidence from masked priming. *Cerebral Cortex*, *19*(1), 13-23.
- Kovacs, G., Vogels, R., & Orban, G. A. (1995). Cortical correlate of pattern backward-masking. *Proceedings of the National Academy of Sciences of the United States of America*, *92*(12), 5587-5591.
- Kovacs, I., Pappathomas, T. V., Yang, M., & Feher, A. (1996). When the brain changes its mind: Interocular grouping during

- binocular rivalry. *Proceedings of the National Academy of Sciences of the United States of America*, 93(26), 15508-15511.
- Kranczioch, C., Debener, S., & Engel, A. K. (2003). Event-related potential correlates of the attentional blink phenomenon. *Cognitive Brain Research*, 17(1), 177-187.
- Kranczioch, C., Debener, S., Schwarzbach, J., Goebel, R., & Engel, A. K. (2005). Neural correlates of conscious perception in the attentional blink. *Neuroimage*, 24(3), 704-714.
- Lamme, V. A. F. (1995). The neurophysiology of figure ground segregation in primary visual-cortex. *Journal of Neuroscience*, 15(2), 1605-1615.
- Lamme, V. A. F. (2001). Blindsight: the role of feedforward and feedback corticocortical connections. *Acta Psychologica*, 107(1-3), 209-228.
- Lamme, V. A. F. (2003). Why visual attention and awareness are different. *Trends in Cognitive Sciences*, 7(1), 12-18.
- Lamme, V. A. F. (2004). Separate neural definitions of visual consciousness and visual attention; a case for phenomenal awareness. *Neural Networks*, 17(5-6), 861-872.
- Lamme, V. A. F. (2006). Towards a true neural stance on consciousness. *Trends in Cognitive Sciences*, 10(11), 494-501.
- Lamme, V. A. F., Rodriguez-Rodriguez, V., & Spekreijse, H. (1999). Separate processing dynamics for texture elements, boundaries and surfaces in primary visual cortex of the macaque monkey. *Cerebral Cortex*, 9(4), 406-413.
- Lamme, V. A. F., & Roelfsema, P. R. (2000). The distinct modes of vision offered by feedforward and recurrent processing. *Trends in Neurosciences*, 23(11), 571-579.
- Lamme, V. A. F., Super, H., Landman, R., Roelfsema, P. R., & Spekreijse, H. (2000). The role of primary visual cortex (V1) in visual awareness. *Vision Research*, 40(10-12), 1507-1521.
- Lamme, V. A. F., Super, H., & Spekreijse, H. (1998). Feedforward, horizontal, and feedback processing in the visual cortex. *Current Opinion in Neurobiology*, 8(4), 529-535.
- Lamme, V. A. F., Van Dijk, B. W., & Spekreijse, H. (1992). Texture segregation is processed by primary visual cortex in man and monkey. Evidence from VEP experiments. *Vision Research*, 32(5), 797-807.

- Lamme, V. A. F., Van Dijk, B. W., & Spekreijse, H. (1993). Contour from motion processing occurs in primary visual cortex. *Nature*, 363(6429), 541-543.
- Lamme, V. A. F., Zipser, K., & Spekreijse, H. (1998). Figure-ground activity in primary visual cortex is suppressed by anesthesia. *Proceedings of the National Academy of Sciences of the United States of America*, 95(6), 3263-3268.
- Lamme, V. A. F., Zipser, K., & Spekreijse, H. (2002). Masking interrupts figure-ground signals in V1. *Journal of Cognitive Neuroscience*, 14(7), 1044-1053.
- LaRock, E. (2007). Disambiguation, binding, and the unity of visual consciousness. *Theory & Psychology*, 17(6), 747-777.
- Lee, S. H., Blake, R., & Heeger, D. J. (2005). Traveling waves of activity in primary visual cortex during binocular rivalry. *Nature Neuroscience*, 8(1), 22-23.
- Liu, J., Harris, A., & Kanwisher, N. (2002). Stages of processing in face perception: an MEG study. [10.1038/nn909]. *Nature Neuroscience*, 5(9), 910-916.
- Logothetis, N. K., Pauls, J., Augath, M., Trinath, T., & Oeltermann, A. (2001). Neurophysiological investigation of the basis of the fMRI signal. *Nature*, 412(6843), 150-157.
- Luck, S. J., Chelazzi, L., Hillyard, S. A., & Desimone, R. (1997). Neural mechanisms of spatial selective attention in areas V1, V2, and V4 of macaque visual cortex. *Journal of Neurophysiology*, 77(1), 24-42.
- Luck, S. J., Girelli, M., McDermott, M. T., & Ford, M. A. (1997). Bridging the gap between monkey neurophysiology and human perception: An ambiguity resolution theory of visual selective attention. *Cognitive Psychology*, 33(1), 64-87.
- Luck, S. J., Vogel, E. K., & Shapiro, K. L. (1996). Word meanings can be accessed but not reported during the attentional blink. *Nature*, 383(6601), 616-618.
- Lumer, E. D., & Rees, G. (1999). Covariation of activity in visual and prefrontal cortex associated with subjective visual perception. *Proceedings of the National Academy of Sciences of the United States of America*, 96(4), 1669-1673.
- Mack, M. L., Gauthier, I., Sadr, J., & Palmeri, T. J. (2008). Object, detection and basic-level categorization: Sometimes

- you know it is there before you know what it is. *Psychonomic Bulletin & Review*, 15(1), 28-35.
- Macknik, S. L., & Livingstone, M. S. (1998). Neuronal correlates of visibility and invisibility in the primate visual system. *Nature Neuroscience*, 1(2), 144-149.
- Macknik, S. L., & Martinez-Conde, S. (2004). Dichoptic visual masking reveals that early binocular neurons exhibit weak interocular suppression: Implications for binocular vision and visual awareness. *Journal of Cognitive Neuroscience*, 16(6), 1049-1059.
- Malach, R., Reppas, J. B., Benson, R. R., Kwong, K. K., Jiang, H., Kennedy, W. A., et al. (1995). Object-related activity revealed by functional magnetic-resonance-imaging in human occipital cortex. *Proceedings of the National Academy of Sciences of the United States of America*, 92(18), 8135-8139.
- Marcus, D. S., & Van Essen, D. C. (2002). Scene segmentation and attention in primate cortical areas V1 and V2. *Journal of Neurophysiology*, 88(5), 2648-2658.
- Marois, R., Yi, D. J., & Chun, M. M. (2004). The neural fate of consciously perceived and missed events in the attentional blink. *Neuron*, 41(3), 465-472.
- Marr, D. (1982). *Vision: A computational investigation into the human representation and processing of visual information*. San Francisco: W.H. Freeman.
- Martinez, A., Anllo-Vento, L., Sereno, M. I., Frank, L. R., Buxton, R. B., Dubowitz, D. J., et al. (1999). Involvement of striate and extrastriate visual cortical areas in spatial attention. *Nature Neuroscience*, 2(4), 364-369.
- McCormick, P. A. (1997). Orienting attention without awareness. *Journal of Experimental Psychology-Human Perception and Performance*, 23(1), 168-180.
- Mesulam, M. M. (1999). Spatial attention and neglect: parietal, frontal and cingulate contributions to the mental representation and attentional targeting of salient extrapersonal events. *Philosophical Transactions of the Royal Society of London Series B-Biological Sciences*, 354(1387), 1325-1346.
- Miller, B. T., & D'Esposito, M. (2005). Searching for "the top" in top-down control. *Neuron*, 48(4), 535-538.

- Milner, A. D., & Goodale, M. A. (1995). *The visual brain in action*. Oxford University Press, Oxford.
- Moutoussis, K., & Zeki, S. (2002). The relationship between cortical activation and perception investigated with invisible stimuli. *Proceedings of the National Academy of Sciences of the United States of America*, *99*(14), 9527-9532.
- Mulckhuysen, M., Talsma, D., & Theeuwes, J. (2007). Grabbing attention without knowing: Automatic capture of attention by subliminal spatial cues. *Visual Cognition*, *15*(7), 779-788.
- Müller, N. G., & Kleinschmidt, A. (2004). The attentional 'spotlight's' penumbra: center-surround modulation in striate cortex. *Neuroreport*, *15*(6), 977-980.
- Murray, S. O., Boyaci, H., & Kersten, D. (2006). The representation of perceived angular size in human primary visual cortex. [10.1038/nn1641]. *Nature Neuroscience*, *9*(3), 429-434.
- Naccache, L., Gaillard, R., Adam, C., Hasboun, D., Clemenceau, S., Baulac, M., et al. (2005). A direct intracranial record of emotions evoked by subliminal words. *Proceedings of the National Academy of Sciences of the United States of America*, *102*(21), 7713-7717.
- Nakayama, K., Ziji, J. H., & Shinsuke, S. (1995). Visual surface representation: A critical link between lower-level and higher-level vision. In D. N. Osherson, L. R. Gleitman & S. M. Kosslyn (Eds.), *An Invitation to Cognitive Science* (pp. 1-70). Cambridge: MIT Press.
- Nieuwenhuis, S., Aston-Jones, G., & Cohen, J. D. (2005). Decision making, the p3, and the locus coeruleus-norepinephrine system. *Psychological Bulletin*, *131*(4), 510-532.
- Nunez, P., & Srinivasan, R. (2006). *Electric fields of the brain*. Oxford: Oxford University Press.
- Ogmen, H., Breitmeyer, B. G., & Melvin, R. (2003). The what and where in visual masking. *Vision Research*, *43*(12), 1337-1350.
- Oram, M. W., & Perrett, D. I. (1992). Time course of neural responses discriminating different views of the face and head. *Journal of Neurophysiology*, *68*(1), 70-84.
- Pascual-Leone, A., & Walsh, V. (2001). Fast backprojections from the motion to the primary visual area necessary for visual awareness. *Science*, *292*(5516), 510-512.

- Perrin, F., Pernier, J., Bertrand, O., & Echallier, J. F. (1989). Spherical splines for scalp potential and current-density mapping. *Electroencephalography and Clinical Neurophysiology*, 72(2), 184-187.
- Peterson, M. A., & Gibson, B. S. (1993). Shape-recognition inputs to figure ground organization in 3-dimensional displays. *Cognitive Psychology*, 25(3), 383-429.
- Peterson, M. A., & Gibson, B. S. (1994). Must figure-ground organization precede object recognition - an assumption in peril. *Psychological Science*, 5(5), 253-259.
- Philiastides, M. G., Ratcliff, R., & Sajda, P. (2006). Neural representation of task difficulty and decision making during perceptual categorization: A timing diagram. *Journal of Neuroscience*, 26(35), 8965-8975.
- Philiastides, M. G., & Sajda, P. (2006). Temporal characterization of the neural correlates of perceptual decision making in the human brain. *Cerebral Cortex*, 16(4), 509-518.
- Pins, D., & ffytche, D. (2003). The neural correlates of conscious vision. *Cerebral Cortex*, 13(5), 461-474.
- Rao, R. P. N., & Ballard, D. H. (1999). Predictive coding in the visual cortex: a functional interpretation of some extra-classical receptive-field effects. [10.1038/4580]. *Nature Neuroscience*, 2(1), 79-87.
- Ro, T., Breitmeyer, B., Burton, P., Singhal, N. S., & Lane, D. (2003). Feedback contributions to visual awareness in human occipital cortex. *Current Biology*, 13(12), 1038-1041.
- Rodriguez, E., George, N., Lachaux, J. P., Martinerie, J., Renault, B., & Varela, F. J. (1999). Perception's shadow: long-distance synchronization of human brain activity. *Nature*, 397(6718), 430-433.
- Roelfsema, P. R. (2006). Cortical algorithms for perceptual grouping. *Annual Review of Neuroscience*, 29, 203-227.
- Roelfsema, P. R., Lamme, V. A. F., & Spekreijse, H. (1998). Object-based attention in the primary visual cortex of the macaque monkey. *Nature*, 395(6700), 376-381.
- Roelfsema, P. R., Lamme, V. A. F., & Spekreijse, H. (2000). The implementation of visual routines. *Vision Research*, 40(10-12), 1385-1411.

- Roelfsema, P. R., Lamme, V. A. F., Spekreijse, H., & Bosch, H. (2002). Figure-ground segregation in a recurrent network architecture. *Journal of Cognitive Neuroscience*, 14(4), 525-537.
- Roelfsema, P. R., Tolboom, M., & Khayat, P. S. (2007). Different processing phases for features, figures, and selective attention in the primary visual cortex. *Neuron*, 56(5), 785-792.
- Rolls, E. T., & Tovee, M. J. (1994). Processing speed in the cerebral-cortex and the neurophysiology of visual masking. *Proceedings of the Royal Society of London Series B-Biological Sciences*, 257(1348), 9-15.
- Rubin, E. (1958). *Figure and ground*. New York: Van Nostrand.
- Scholte, H. S., Witteveen, S. C., Spekreijse, H., & Lamme, V. A. F. (2006). The influence of inattention on the neural correlates of scene segmentation. *Brain Research*, 1076(1), 106-115.
- Schultz, W. (2001). Reward signaling by dopamine neurons. *Neuroscientist*, 7(4), 293-302.
- Schwarzlose, R. F., Swisher, J. D., Dang, S. B., & Kanwisher, N. (2008). The distribution of category and location information across object-selective regions in human visual cortex. *Proceedings of the National Academy of Sciences of the United States of America*, 105(11), 4447-4452.
- Sereno, M. I., Dale, A. M., Reppas, J. B., Kwong, K. K., Belliveau, J. W., Brady, T. J., et al. (1995). Borders of multiple visual areas in humans revealed by functional magnetic resonance imaging. *Science*, 268(5212), 889-893.
- Sergent, C., Baillet, S., & Dehaene, S. (2005). Timing of the brain events underlying access to consciousness during the attentional blink. *Nature Neuroscience*, 8(10), 1391-1400.
- Serre, T., Oliva, A., & Poggio, T. (2007). A feedforward architecture accounts for rapid categorization. *Proceedings of the National Academy of Sciences of the United States of America*, 104(15), 6424-6429.
- Shear, J. (1999). *Explaining consciousness: The hard problem*. MIT Press, 1999.
- Silvanto, J., Cowey, A., Lavie, N., & Walsh, V. (2005). Striate cortex (V1) activity gates awareness of motion. *Nature Neuroscience*, 8(2), 143-144.

- Sirotin, Y. B., & Das, A. (2009). Anticipatory haemodynamic signals in sensory cortex not predicted by local neuronal activity. *Nature*, *457*(7228), 475-U476.
- Skiera, G., Petersen, D., Skalej, M., & Fahle, M. (2000). Correlates of figure-ground segregation in fMRI. *Vision Research*, *40*(15), 2047-2056.
- Slotnick, S. D., Schwarzbach, J., & Yantis, S. (2003). Attentional inhibition of visual processing in human striate and extrastriate cortex. *Neuroimage*, *19*(4), 1602-1611.
- Smith, A. T., Singh, K. D., & Greenlee, M. W. (2000). Attentional suppression of activity in the human visual cortex. *Neuroreport*, *11*(2), 271-277.
- Smith, A. T., Singh, K. D., Williams, A. L., & Greenlee, M. W. (2001). Estimating receptive field size from fMRI data in human striate and extrastriate visual cortex. *Cerebral Cortex*, *11*(12), 1182-1190.
- Smith, A. T., Williams, A. L., & Singh, K. D. (2004). Negative BOLD in the visual cortex: Evidence against blood stealing. *Human Brain Mapping*, *21*(4), 213-220.
- Smith, M. L., Gosselin, F., & Schyns, P. G. (2004). Receptive fields for flexible face categorizations. *Psychological Science*, *15*(11), 753-761.
- Spratling, M. W., & Johnson, M. H. (2004). A feedback model of visual attention. *Journal of Cognitive Neuroscience*, *16*(2), 219-237.
- Stern, C. E., Corkin, S., Gonzalez, R. G., Guimaraes, A. R., Baker, J. R., Jennings, P. J., et al. (1996). The hippocampal formation participates in novel picture encoding: Evidence from functional magnetic resonance imaging. *Proceedings of the National Academy of Sciences of the United States of America*, *93*(16), 8660-8665.
- Super, H., Spekreijse, H., & Lamme, V. A. F. (2001). Two distinct modes of sensory processing observed in monkey primary visual cortex (V1). *Nature Neuroscience*, *4*(3), 304-310.
- Super, H., van der Togt, C., Spekreijse, H., & Lamme, V. A. F. (2003). Internal state of monkey primary visual cortex (V1) predicts figure-ground perception. *Journal of Neuroscience*, *23*(8), 3407-3414.

- Thompson, K. G., & Schall, J. D. (1999). The detection of visual signals by macaque frontal eye field during masking. *Nature Neuroscience*, 2(3), 283-288.
- Thorpe, S., Fize, D., & Marlot, C. (1996). Speed of processing in the human visual system. *Nature*, 381(6582), 520-522.
- Tong, F., Nakayama, K., Vaughan, J. T., & Kanwisher, N. (1998). Binocular rivalry and visual awareness in human extrastriate cortex. *Neuron*, 21(4), 753-759.
- Tootell, R. B. H., Hadjikhani, N., Hall, E. K., Marrett, S., Vanduffel, W., Vaughan, J. T., et al. (1998). The retinotopy of visual spatial attention. *Neuron*, 21(6), 1409-1422.
- Treisman, A. M., & Gelade, G. (1980). Feature-integration theory of attention. *Cognitive Psychology*, 12(1), 97-136.
- Trotter, Y. (1995). Cortical representation of visual three-dimensional space. *Perception*, 24(3), 287-298.
- Ungerleider, L. G., & Mishkin, M. (1982). Two cortical visual systems. In D. J. Ingle, M. A. Goodale & R. J. W. Mansfield (Eds.), *Analysis of visual behavior* (pp. 549-586): Cambridge, MA: The MIT Press.
- VanRullen, R., & Koch, C. (2003). Visual selective behavior can be triggered by a feed-forward process. *Journal of Cognitive Neuroscience*, 15(2), 209-217.
- Vigneau, M., Beaucousin, V., Herve, P. Y., Duffau, H., Crivello, F., Houde, O., et al. (2006). Meta-analyzing left hemisphere language areas: Phonology, semantics, and sentence processing. *NeuroImage*, 30(4), 1414-1432.
- Vorberg, D., Mattler, U., Heinecke, A., Schmidt, T., & Schwarzbach, J. (2003). Different time courses for visual perception and action priming. *Proceedings of the National Academy of Sciences of the United States of America*, 100(10), 6275-6280.
- Wandell, B. A. (1999). Computational neuroimaging of human visual cortex. *Annual Review of Neuroscience*, 22, 145-+.
- Wandell, B. A., Brewer, A. A., & Dougherty, R. F. (2005). Visual field map clusters in human cortex. *Philosophical Transactions of the Royal Society B-Biological Sciences*, 360(1456), 693-707.
- Weidner, R., Shah, N. J., & Fink, G. R. (2006). The neural basis of perceptual hypothesis generation and testing. *Journal of Cognitive Neuroscience*, 18(2), 258-266.

- Weiskrantz, L., Barbur, J. L., & Sahraie, A. (1995). Parameters affecting conscious versus unconscious visual-discrimination with damage to the visual-cortex (V1). *Proceedings of the National Academy of Sciences of the United States of America*, *92*(13), 6122-6126.
- Weiskrantz, L., Warrington, E. K., Sanders, M. D., & Marshall, J. (1974). Visual capacity in the hemianopic field following a restricted occipital ablation. *Brain*, *97*(1), 709-728.
- Wickens, T. D. (2002). *Elementary signal detection theory*. Oxford ; New York: Oxford University Press.
- Wilenius-Emet, M., Revonsuo, A., & Ojanen, V. (2004). An electrophysiological correlate of human visual awareness. *Neuroscience Letters*, *354*(1), 38-41.
- Wilke, M., Logothetis, N. K., & Leopold, D. A. (2003). Generalized flash suppression of salient visual targets. *Neuron*, *39*(6), 1043-1052.
- Woodman, G. F., & Luck, S. J. (2003). Dissociations among attention, perception, and awareness during object-substitution masking. *Psychological Science*, *14*(6), 605-611.
- Yoshor, D., Bosking, W. H., Ghose, G. M., & Maunsell, J. H. (2007). Receptive fields in human visual cortex mapped with surface electrodes. *Cerebral Cortex*, *17*(10), 2293-2302.
- Zhang, W. W., & Luck, S. J. (2009). Feature-based attention modulates feedforward visual processing. *Nature Neuroscience*, *12*(1), 24-25.
- Zipser, K., Lamme, V. A. F., & Schiller, P. H. (1996). Contextual modulation in primary visual cortex. *Journal of Neuroscience*, *16*(22), 7376-7389.