Bibliography

Accot, J. and Zhai., S. (1997). Beyond Fitts' law: Models for trajectory-based HCI tasks. *Proceedings of CHI '97,* ACM, 295–302.

Ahlberg, C. and Shneiderman, B.N. (1994). Visual information seeking using the FilmFinder. *Proceedings of CHI '94, Conference Companion,* 433.

Ahlberg, C., Williamson, C., and Shneiderman, B. (1992). Dynamic queries for information exploration. *Proceedings of CHI '92,* ACM, 619–626.

Alexander, C. (1964). *Notes on the Synthesis of Form.* Harvard University Press, Cambridge, MA.

Amaya, K., Bruderlin, A., and Calvert, T. (1996). Emotion from motion. *Proceedings of Graphics Interface '96,* 222–229.

Anderson, J.R., Matessa, M., and Lebiere, C. (1997). ACT-R: A theory of higher-level cognition and its relation to visual attention. *Human-Computer Interaction* 12: 439–462.

Anderson, J.R. and Milson, R. (1989). Human memory: An adaptive perspective. *Psychological Review* 96(4): 703–719.

Anderson, S.J., Mullen, K.T., and Hess, R.F. (1991). Human peripheral spatial resolution for achromatic and chromatic stimuli: Limits imposed by optical and retinal factors. *Journal of Physiology* 442: 47–64.

Anstis, S.M. (1974). A chart demonstrating variations in acuity with retinal position. *Vision Research* 14: 589–592.

Anstis, S.M. and Cavanaugh, P. (1983). A minimum motion technique for judging equiluminance in color vision. In *Physiology and Psychophysics*, ed. J.D. Mollon and L.T. Sharpe, 156–166. Academic Press, London.

Arditi, A. (1987). Binocular vision. In *Handbook of Perception and Human Performance,* ed. K.R. Boff, L. Kaufman, and J.P. Thomas, 23–41. Wiley, New York.

Aretz, A.J. (1991). The design of electronic map displays. *Human Factors* 33(1): 85–101.

Armstrong, D.F., Stokoe, W.C., and Wilcox, S.E. (1994). Signs of the origin of syntax. *Current Anthropology* 35(4): 349–368.

Arsenault, R. and Ware, C. (1994, in press). The importance of stereo, eye coupled perspective and touch for eye-hand coordination. In *Presence: Teleoperators and Virtual Environments.* MIT Press, Cambridge.

Arthur, K.W., Booth, K.S., and Ware, C. (1993). Evaluating task performance for fish-tank virtual worlds. *ACM Transactions on Information Systems* 11(3): 239–265.

Baddeley, A.D. and Hitch, G.J. (1974). Working memory. In *The Psychology of Learning and Motivation: Advances in Research and Theory*, ed. G.H. Bower, 647–667. Erlbaum, Hillsdale, NJ.

Baddeley, A.D. and Logie, R.H. (1999). Working memory: The multiple-component model. In *Models of Working Memory*, ed. A. Miyake and P. Shah, 28–61. Cambridge University Press, Cambridge.

Badler, N.I., Manoocherhri, K.H., and Baraff, D. (1986). Multi-dimensional interface techniques and articulated figure positioning by multiple constraints. *Proceedings Workshop on Interactive 3D Graphics,* ACM, October, 151–169.

Baecker, R.M. (1981). *Sorting out Sorting.* Presented at ACM SIGGRAPH Conference, Dallas, TX, 1981. Film and video versions available from Morgan Kaufmann, San Francisco.

Baecker, R.M. and Small, I. (1990). Animation at the Interface. In *The Art of Human-Computer Interface Design*, ed. B. Laurel, 251–267. Addison-Wesley, Reading, MA.

Baecker, R.M., Small, I., and Mander, R. (1991). Bringing icons to life. *Proceedings CHI '91,* ACM, 1–12.

Balakrishnan, R. and MacKenzie, I.S. (1997). Performance differences in the fingers, wrist and forearm in computer input control. *CHI '97 Proceedings,* ACM, 303–310.

Ballesteros, S. (1989). Some determinants of perceived structure: Effects of stimulus and tasks. In *Object Perception: Structure and Process*, ed. B.E. Shepp and S. Ballesteros, 235–266. Lawrence Erlbaum Associates, Hillsdale, NJ.

Bar, M. and Biederman, I. (1998). Subliminal visual priming. *Psychological Science* 9: 464–469.

Barfield, W., Hendrix, C., Bjorneseth, O., Kaczmarek, K.A., and Lotens, W. (1995). Comparison of human sensory capabilities with technical specifications of virtual environment equipment. *Presence* 4(4): 329–356.

Barlow, H. (1972). Single units and sensation: A neuron doctrine for perceptual psychology? *Perception* 1: 371–394.

Bartram, D.J. (1980). Comprehending spatial information: The relative efficiencies of different methods for presenting information about bus routes. *Journal of Applied Psychology* 65: 103–110.

Bartram, L. (1998). Perceptual and interpretative properties of motion for information visualization. *Proceedings of the Workshop on New Paradigms in Information Visualization and Manipulation,* ACM, 3–7.

Bartram, L., Ho, A., Dill, J., and Henigman, F. (1995). The continuous zoom: A constrained fisheye technique for viewing and navigating large information spaces. *Proceedings of UIST '95,* ACM, 207–215.

Bartram, L., Ovans, R., Dill, J., Dyck, M., Ho, A., and Harens, W.S. (1994). Contextual assistance in user interfaces to complex, time-critical systems: The intelligent zoom. *Graphics Interface '94,* 216–224.

Bartram, L. and Ware, C. (2002). Filtering and brushing with motion. *Information Visualization* 1(1): 66–79.

Bartram, L., Ware, C., and Calvert, T. (2003). Moticons: Detection, distraction and task. *International Journal of Human-Computer Studies* 58(5): 515–545.

Bassili, J.N. (1978). Facial motion in the perception of faces and of emotional expressions. *Journal of Experimental Psychology: Human Perception and Performance* 4: 373–379.

Bassili, J.N. (1979). Emotion recognition. *Journal of Personality and Social Psychology* 37: 2049–2058.

Baudisch, P., Good, N., and Stewart, P. (2001). Focus plus context screens: Combining display technology with visualization techniques. *Proceedings of UIST '01,* 31–34, Orlando.

Bauer, B., Jolicoeur, P., and Cowan, W.B. (1996). Distractor heterogeneity versus linear separability in colour visual search. *Perception* 25: 1281–1294.

Beardsley, T. (1997). The machinery of thought. *Scientific American,* August, 78–83.

Beck, J. (1966). Effect of orientation and of shape similarity on perceptual grouping. *Perception and Psychophysics* 1: 300–302.

Beck, J. and Ivry, R. (1988). On the role of figural organization in perceptual transparency. *Perception and Psychophysics* 44: 585–594.

Becker, R.A. and Cleaveland, W.S. (1987). Brushing scatterplots. *Technometrics* 29(2): 127–142.

Bederson, B. and Hollan, J. (1994). Pad++: A zooming graphical interface for exploring alternate interface physics. *Proceedings of UIST '94,* ACM, 17–36.

Bellugi, U. and Klima, E.S. (1976). Two faces of sign: Iconic and abstract. *Annals of the New York Academy of Sciences* 280: 514–538.

Benedikt, M. (1991). Cyberspace: Some proposals. In *Cyberspace: First Steps,* 119–224. MIT Press, Cambridge, MA.

Bennett, A. and Rabbetts, R.B. (1989). *Clinical Visual Optics,* 2d ed., 31. Butterworth Heinemann, Oxford.

Berlin, B. and Kay, P. (1969). *Basic Color Terms: Their Universality and Evolution.* University of California Press, Berkeley.

Berry, R.N. (1948). Quantitative relations among vernier, real depth and stereoscopic depth acuities. *Journal of Experimental Psychology* 38: 708–721.

Bertin, J. (1977). *Graphics and Graphic Information Processing.* de Gruyter Press, Berlin.

Bertin, J. (1983). *Semiology of Graphics* (W.J. Berg, trans.). University of Wisconsin Press, Madison.

Bichot, N.P. and Schall, J.D. (1999). Effects of similarity and history on neural mechanisms of visual selection. *Nature Neuroscience* 2(6): 549–554.

Bickerton, D. (1990). *Language and Species*. University of Chicago Press, Chicago.

Biederman, I. (1987). Recognition-by-components: A theory of human image understanding. *Psychological Review* 94(2): 115–117.

Biederman, I. and Cooper, E. (1992). Size invariance in visual object priming. *Journal of Experimental Psychology: Human Perception and Performance* 18: 121–133.

Bier, E.A., Stone, M.C., Pier, K., Buxton, W., and DeRose, T.D. (1993). Tool glasses and magic lenses: The see-through interface. *Proceedings SIGGRAPH '93*, ACM, 73–80.

Bieusheuvel, S. (1947). Psychological tests and their application to non-European peoples. In *Yearbook of Education*, ed. G.B. Jeffrey, 185–207. University of London Press, London.

Bingham, G.P., Bradley, A., Bailey, M., and Vinner, R. (2001). Accommodation, occlusion, and disparity matching are used to guide reaching: A comparison of actual versus virtual environments. *Journal of Experimental Psychology: Human Perception and Performance* 27(6): 1314–1334.

Blake, R. and Holopigan, K. (1985). Orientation selectivity in cats and humans assessed by masking. *Vision Research* 23(1): 1459–1467.

Booher, H.R. (1975). Comprehensibility of pictorial information and printed word in proceduralized instructions. *Human Factors* 17(3): 266–277.

Boritz, J. and Booth, K.S. (1998). A study of interactive 6 DOF docking in a computerised virtual environment. *Proceedings of the IEEE Virtual Reality Annual International Symposium,* 139–146, Atlanta, GA.

Bovik, A.C., Clark, M., and Geisler, W.S. (1990). Multichannel texture analysis using localized spatial filters. *IEEE Transactions on Pattern Analysis and Machine Intelligence* 12: 55–73.

Bower, G.H., Karlin, M.B., and Dueck, A. (1975). Comprehension and memory for pictures. *Memory and Cognition* 3(2): 216–220.

Bradshaw, M.F., Parton, A.D., and Glennister, A. (2000). The task-dependent use of binocular disparity and motion parallax information. *Vision Research* 4: 3725–3734.

Bray, T. (1996). Measuring the Web. *Computer Networks and ISDN Systems* 28: 993–1005.

Bremmer, F., Schlack, A., Duhamel, J.R., Graf, W., and Fink, G.R. (2001). Spaced coding in primate posterior parietal cortex. *Neuroimage* 14: S46–S51.

Brewer. C.A. (1996a). Guidelines for selecting colors for diverging schemes on maps, *Cartographic Journal* 33(2): 79–86.

Brewer, C.A. (1996b). Prediction of simultaneous contrast between map colors with Hunt's model of color appearance, *Color Research and Application* 21(3): 221–235.

Bridgeman, B. (1991). Separate visual representations for perception and visually guided behavior. In *Pictorial Communications in Virtual and Real Environments*, ed. S.R. Ellis, 316–327. Taylor and Francis, London.

Brooks, F.P. (1988). Grasping reality through illusion: Interactive graphics serving science. *Proceedings of CHI '88*, ACM, 1–11.

Bruce, V. and Morgan, M.J. (1975). Violations of symmetry and repetition in visual principles. *Perception* 4: 239–249.

Bruce, V. and Young, A. (1986). Understanding face recognition. *British Journal of Psychology* 77: 305–327.

Bruce, V. and Young, A. (1998). *In the Eye of the Beholder: The Science of Face Perception.* Oxford University Press, Oxford.

Bruno, N. and Cutting, J.E. (1988). Minimodality and the perception of layout. *Journal of Experimental Psychology: General* 117: 161–170.

Bull, P. (1990). What does gesture add to the spoken word? In *Images and Understanding,* ed. H. Barlow, C. Blakemore, and M. Weston-Smith, 108–121. Cambridge University Press, Cambridge.

Burr, D.C. and Ross, J. (1982). Contrast sensitivity at high velocities. *Vision Research* 22(4): 479–558.

Bushnell, I.W.R., Sai, F., and Mullin, J.T. (1989). Neonatal recognition of the mother's face. *British Journal of Developmental Psychology* 7: 3–15.

Buxton, W. and Myers, B. (1986). A study in two-handed input. *Proceedings of CHI '86,* ACM, 321–326.

Cabral, B. and Leedom, L.C. (1993). Imaging vector fields using line integral convolution. *SIGGRAPH '93,* ACM, 263–272.

Caelli, T. and Bevan, P. (1983). Probing the spatial frequency spectrum for orientation sensitivity with stochastic textures. *Vision Research* 23(1): 39–45.

Caelli, T., Brettel, H., Rentschler, I., and Hilz, R. (1983). Discrimination thresholds in the two-dimensional spatial frequency domain. *Vision Research* 23(2): 129–133.

Caelli, T., Manning, M., and Finlay, D. (1993). A general correspondence approach to apparent motion. *Perception* 22: 185–192.

Caelli, T. and Moraglia G. (1985). On the detection of Gabor signals and discrimination of Gabor textures. *Vision Research* 25(5): 671–684.

Callaghan, T.C. (1989). Interference and dominance in texture segmentation: Hue, geometric form and line orientation. *Perception and Psychophysics* 46(4): 299–311.

Campbell, F.W. and Green, D.G. (1965). Monocular versus binocular visual acuity. *Nature* 208: 191–192.

Card, S.K., Moran, T.P., and Newell, A. (1983). *The Psychology of Human-Computer Interaction.* Lawrence Erlbaum Associates, Hillsdale, NJ.

Card, S.K. and Nation, D. (2002). Degree-of-interest trees: A component of an attention-reactive user interface. *Proceedings of Advanced Visual Interfaces,* 231–245, Trento, Italy.

Card, S.K., Pirolli, P., and Mackinlay, J.D. (1994). The cost-of-knowledge characteristic function: Display evaluation of direct-walk dynamic information visualizations. *CHI '94,* ACM, 238–244.

Card, S.K., Robertson, G.G., and York, W. (1996). The WebBook and the Web Forager: An information workspace for the World Wide Web. *SIGCHI '96 Proceedings,* ACM, 111–117.

Carroll, J.M. and Kellogg, W.A. (1989). Artifact as theory-nexus: Hermeneutics meets theory-based design. *Proceedings of SIGCHI '89.* ACM, 7–14.

Casey, S. (1993). *Set Phasers on Stun and Other True Tales of Design, Technology and Human Error.* Aegean Publishing, Santa Barbara, CA.

Cataliotti, J. and Gilchrist, A.L. (1995). Local and global processes in lightness perception. *Perception and Psychophysics* 57(2): 125–135.

Chambers, J.M., Cleveland, W.S., Kleiner, B., and Tukey, P.A. (1983). *Graphical Methods for Data Analysis.* Wadsworth, Belmont, CA.

Chandler, P. and Sweller, J. (1991). Cognitive load theory and the format of instruction. *Cognition and Instruction* 8: 293–332.

Charbonnell, J.R., Ware, J.L., and Senders, J.W. (1968). A queuing model of visual sampling: Experimental validation. *IEEE Transactions on Man-Machine Systems,* MMS-9, 82–87.

Chau, A.W. and Yeh, Y.Y. (1995). Segregation by color and stereoscopic depth in three-dimensional visual space. *Perception and Psychophysics* 57(7): 1032–1044.

Chen, P.P.S. (1976). The entity-relationship model—toward a unified view of data. *ACM Transactions on Database Systems* 1: 1–22.

Chernoff, H. (1973). Using faces to represent points in *k*-dimensional space. *Journal of the American Statistical Association* 68: 361–368.

Chomsky, N. (1965). *Aspects of the Theory of Syntax.* MIT Press, Cambridge, MA.

CIE subcommittee E-1.3.1. (1971.) *Recommendations on Uniform Color Spaces.* Commission Internationale de l'Éclariage (CIE), Supplement #2 to CIE Publication #15, Paris.

Cleveland, W.S. and McGill, R.A. (1983). A color-caused optical illusion on a statistical graph. *American Statistician* 37(2): 101–105.

Cockburn, A. and McKenzie, B. (2001). 3D or not 3D? Evaluating the effect of the third dimension in a document management system. *Proceedings of SIGCHI '99,* ACM, 434–441.

Cohen, M.F. and Greenberg, D.P. (1985). The hemi-cube: A radiosity solution for complex environments. *SIGGRAPH '85,* ACM, 31–40.

Colby, C.L. (1998). Action-oriented spatial reference frames in cortex. *Neuron* 20: 15–24.

Cole, J. (1995). *Pride and a Daily Marathon.* MIT Press, Cambridge, MA.

Colle, H.A. and Reid, G.B. (1998). The room effect: Metric spatial knowledge of local and separated regions. *Presence* 7(2): 116–128.

Collins, A.M. and Loftus, E.F. (1975). A spreading activation theory of semantic processing. *Psychological Review* 82: 407–428.

Coltheart, V. (1999). *Fleeting Memories: Cognition of Brief Visual Stimuli.* MIT Press, Cambridge, MA.

Coren, S. and Ward, L.M. (1989). *Sensation and Perception,* 3d ed. Harcourt Brace Jovanovich, New York.

Cornsweet, T.N. (1970). *Visual Perception,* Academic Press, New York.

Cowan, W.B. (1983). An inexpensive scheme for calibration of a colour monitor in terms of CIE standard coordinates. *SIGGRAPH '83 Proceedings,* ACM, 315–322.

Craik, F. and Lockhart, R. (1972). Levels of processing: A framework for memory research. *Journal of Verbal Learning and Behavior* 11: 671–684.

Cross, A.R., Armstrong, R.L., Gobrecht, C., Paton, M., and Ware, C. (1997). Three-dimensional imaging of the Belousov-Zhabotinsky reaction using magnetic resonance. *Magnetic Resonance Imaging* 15(6): 719–728.

Cruz-Neira, C., Sandin, D.J., DeFanti, T.A., Kenyon, R.V., and Hart, J.C. (1992). The CAVE: Audio visual experience automatic virtual environment. *Communications of the ACM* 35(6): 65–72.

Cutrell, E.B., Czerwinski, M., and Horvitz, E. (2000). Effects of instant messaging interruptions on computing tasks. *Proceedings of the CHI 2000 Conference on Human Factors in Computing Systems, Extended Abstracts,* 99–100. ACM Press, New York.

Cutting, J.E. (1986). *Perception with an Eye for Motion.* MIT Press, Cambridge, MA.

Cutting, J.E. (1991). On the efficacy of cinema, or what the visual systems did not evolve to do: Visual enhancements in pick-and-place tasks. In *Pictorial Communication in Virtual and Real Environments*, ed. S.R. Ellis, 486–495. Taylor and Francis, London.

Cutting, J.E., Springer, K., Braren, P.A., and Johnson, S.H. (1992). Wayfinding on foot from information in retinal, not optical flow. *Journal of Experimental Psychology: General* 121: 41–72.

Cypher, A. and Smyth, D. (1995). KidSim: End user programming of simulations. *CHI '95 Proceedings,* ACM, 27–34.

Czerwinski, M., van Dantzich, M., Robertson, G.G., and Hoffman, H. (1999). The contribution of thumbnail image, mouse-over text and spatial location memory to Web page retrieval in 3D. *Proceedings of Interact '99,* Edinburgh, Scotland, 163–170.

Darken, R.P., Allard, T., and Achille, L.B. (1998). Spatial orientation and wayfinding in large-scale virtual spaces: An introduction. *Presence* 7(2): 101–107.

Darken, R.P. and Banker, W.P. (1998). Navigating in natural environments: A virtual environment training transfer study. *Proceedings of VRAIS '98,* 12–19.

Darken, R.P. and Sibert, J.L. (1996). Wayfinding strategies and behaviors in large virtual worlds, *CHI '96, Proceedings,* 142–149.

Daugman, J.G. (1984). Spatial visual channels in the Fourier plane. *Vision Research* 24: 891–910.

Daugman, J.G. (1985). Uncertainty relation for resolution in space, spatial frequency, and orientation optimized by two-dimensional visual cortical filters. *Journal of the Optical Society of America* A/2: 1160–1169.

Davies, D.R. and Parasuraman, R. (1980). *The Psychology of Vigilance.* Academic Press, London.

Deering, M. (1992). High-resolution virtual reality. In *Proceedings of SIGGRAPH '92. Computer Graphics* 26(2): 195–202.

Dehaene, S. (1997). *The Number Sense: How the Mind Creates Mathematics.* Oxford University Press, Oxford.

Deregowski, J.B. (1968). Picture recognition in subjects from a relatively pictureless environment. *African Social Research* 5: 356–364.

Deuchar, M. (1990). Are the signs of language arbitrary? In *Images and Understanding,* ed. H. Barlow, C. Blakemore, and M. Weston Smith, 168–179. Cambridge University Press, Cambridge.

De Bruijn, O., Spence, R., and Tong, C.H. (2000). Rapid serial visual presentation: A space-time trade-off in information presentation. *Proceedings, Advance Visual Interfaces (AVI '2000),* Palermo, Italy, 189–192. ACM Press: New York.

De Valois, R.L. and De Valois, K.K. (1975). Neural coding of color. In *Handbook of Perception*, ed. E.C. Carterette and M.P. Friedman, vol. 5, *Seeing*, ch. 5, 117–166. Academic Press, New York.

Di Battista, G., Eades, P., Tamassia, R., and Tollis, I.G. (1998). *Graph Drawing: Algorithms for the Visualization of Graphs.* Prentice Hall, Upper Saddle River, NJ.

Dickinson, S., Christensen, H., Tsotsos, J., and Olofsson, G. (1997), Active object recognition integrating attention and viewpoint control. *Computer Vision and Image Understanding* 6(3): 239–260.

Distler, C., Boussaoud, D., Desmone, R., and Ungerleider, L.G. (1993). Cortical connections of inferior temporal area REO in Macaque monkeys. *Journal of Comparative Neurology* 334: 125–150.

DiZio, P. and Lackner, J.R. (1992). Spatial orientation, adaptation and motion sickness in real and virtual environments. *Presence* 1(3): 319–328.

Donoho, A.W., Donoho, D.L., and Gasko, M. (1988). MacSpin: Dynamic graphics on a desktop computer. *IEEE Computer Graphics and Applications,* July, 51–58.

Dosher, B.A., Sperling, G., and Wurst, S.A. (1986). Trade-offs between stereopsis and proximity luminance covariance as determinants of perceived 3D structure. *Vision Research* 26(6): 973–990.

Douglas, S. and Kirkpatrick, T. (1996). Do color models really make a difference? *ACM CHI '96 Proceedings,* 399–405.

Drasdo, N. (1977). The neural representation of visual space. *Nature* 266: 554–556.

Drasic, D. and Milgram, P. (1991). Positioning accuracy of a virtual stereoscopic pointer in a real stereoscopic video world. *SPIE vol. 1457—Stereoscopic Displays and Applications II,* 58–69.

Driver, J., McLeod, P., and Dienes, Z. (1992). Motion coherence and conjunction search. *Perception and Psychophysics* 51(1): 79–85.

Drucker, S.M. and Zeltzer, D. (1995). CamDroid: A system for implementing intelligent camera control. *Proceedings of the 1995 Symposium on Interactive 3D Graphics,* 139–144.

Drury, C.G. and Clement, N.R. (1978). The effect of area, density, and number of background characters on visual search. *Human Factors* 20: 597–603.

Duda, R. and Hart, P.E. (1973). *Pattern Classification and Scene Analysis.* Wiley, New York.

Duncan, J. and Humphreys, G. (1989) Visual search and stimulus similarity. *Psychological Review* 96: 433–458.

Durgin, F.H., Proffitt, D.R., Olson, T.J., and Reinke, K.S. (1995). Comparing depth from motion with depth from binocular disparity. *Journal of Experimental Psychology: Human Perception and Performance* 21(3): 679–699.

Dwyer, F.M. (1967). The effect of varying the amount of realistic detail in visual illustrations. *Journal of Experimental Education* 36: 34–42.

D'Zmura, M., Lennie, P., and Tiana, C. (1997). Color search and visual field segregation. *Perception and Psychophysics* 59(3): 381–388.

Edelman, S. (1995). Representation of similarity in 3D object discrimination. *Neural Computation* 7: 407–422.

Edelman, S. and Buelthoff, H.H. (1992). Orientation dependence in the recognition of familiar and novel views of 3D objects. *Vision Research* 32: 2385–2400.

Edwards, B. (1979). *Drawing on the Right Side of the Brain.* J.P. Tarcher, Los Angeles.

Ekman, P. (2003). *Emotions Revealed: Recognizing Faces and Feelings to Improve Communication and Emotional Life.* Times Books, New York.

Ekman, P. and Friesen, W. (1975). *Unmasking the Face: A Guide to Recognizing Emotions from Facial Expressions.* Prentice Hall, Upper Saddle River, New Jersey.

Ekman, P. and Friesen, W. (1978). *The Facial Action Coding System.* Consulting Psychologists Press, Palo Alto, CA.

Ekman, P., Friesen, W., and O'Sullivan, M. (1988). Smiles when lying. *Journal of Personality and Social Psychology* 54: 414–420.

Eley, M.G. (1988). Determining the shapes of land surfaces from topographical maps. *Ergonomics* 31: 355–376.

Elmes, D., Kantowitz, B.H., and Roedinger, H.L. (1999). *Research Methods in Psychology,* 6th ed. Brooks/Cole, Pacific Grove, CA.

Elvins, T.T., Nadeau, D.R., and Kirsh, D. (1997). Worldlets—3D thumbnails for wayfinding in virtual environments. *UIST '97 Proceedings,* 21–30.

Elvins, T.T., Nadeau, D.R., Schul, R., and Kirsh, D. (1998). Worldlets: 3D thumbnails for 3D browsing. *Proceedings of CHI '98,* ACM, 163–170.

Englehardt, Y., de Bruin, J., Janssen, T., and Scha, R. (1996). The visual grammar of information graphics. *Artificial Intelligence in Design (AID '96)* in the Workshop on Visual Representation, Reasoning and Interaction in Design, 24–27, June.

Enns, J.T., Austin, E.L., Di Lollo, V., Rauchenberger, R., and Yantis, S. (2001). New objects dominate luminance transients in setting attentional priority. *Journal of Experimental Psychology: Human Perception and Performance* 27(6): 1287–1302.

Fach, P.W. and Strothotte, T. (1994). Cognitive maps: A basis for designing user manuals for direct manipulation interfaces. In *Cognitive Aspects of Visual Languages and Visual Interfaces*, ed. M.J. Tauber, D.E. Mahling, and F. Arefi., 89–117. Elsevier Science Inc., New York.

Faraday, P. (1998). Theory-based design and evaluation of multimedia presentation interfaces. Ph.D. thesis. School of Informatics, City University, London.

Faraday, P. and Sutcliffe, A. (1997). Designing effective multimedia presentations. *Proceedings of CHI '97,* ACM, 272–279.

Faraday, P. and Sutcliffe, A. (1999). Authoring animated Web pages using "contact points." *Proceedings of CHI '99,* ACM, 458–465.

Farah, M.J., Soso, M.J., and Dashieff, R.M. (1992). Visual angle of the mind's eye before and after unilateral occipital lobectomy. *Journal of Experimental Psychology: Human Perception and Performance* 18: 214–246.

Feiner, S., MacIntyre, B., Haupt, M., and Solomon, E. (1993). Windows on the world, 2D windows for 3D augmented reality. *Proceedings UIST '93,* ACM Atlanta, GA, Nov.: 145–155.

Feldman, J.A. (1985). Four frames suffice: A provisional model of vision and space. *Behavioural and Brain Sciences* 8: 265–289.

Field, D.J., Hayes, A., and Hess, R.F. (1993). Contour integration by the human visual system: Evidence for a local "association field." *Vision Research* 33(2): 173–193.

Field G. and Spence R. (1994). Now, where was I? *New Zealand Journal of Computing* 5(1): 35–43.

Fine, I. and Jacobs, R.A. (2000). Perceptual learning for a pattern discrimination task. *Vision Research* 41: 449–461.

Fine, I. and Jacobs, R.A. (2002). Comparing perceptual learning across tasks: A review. *Journal of Vision* 2: 190–203.

Fisher, S.K. and Cuiffreda, K.J. (1990). Adaptation to optically increased interocular separation under naturalistic viewing conditions. *Perception* 19: 171–180.

Fitts, P.M. (1954). The information capacity of the human motor system in controlling the amplitude of movements. *Journal of Experimental Psychology* 47: 381–391.

Fleet, D. (1998). *Visualization of Communications in 3D.* Unpublished master's thesis. Faculty of Computer Science, University of New Brunswick.

Foley, J.D., van Dam, A., Feiner, S.K., and Hughes, J.F. (1990). *Computer Graphics: Principles and Practice,* 2d ed. Addison-Wesley, Reading, MA.

Fowler, D. and Ware, C. (1989). Strokes for representing univariate vector field maps. *Graphics Interface '89 Proceedings,* 249–253.

Fowler, R.H. and Dearholt, D.W. (1990). Information retrieval using pathfinder networks. In *Pathfinder Associative Networks: Studies in Knowledge Organization,* ed. R.W. Schvaneveldt, 165–178. Ablex, Norwood, NJ.

Frisby, J.P. (1979). *Seeing, Illusion, Brain and Mind.* Oxford University Press, Oxford.

Frisby, J.P., Buckley, D., and Duke, P.A. (1996). Evidence for good recovery of lengths of real objects seen with natural stereo viewing. *Perception* 25: 129–154.

Furnas, G. (1991). New graphical reasoning models for understanding graphical interfaces. *Proceedings of CHI '91,* ACM, 71–78.

Furnas, G.W. (1986). Generalized fisheye views. *Proceedings of CHI '86,* ACM, 17–26.

Garner, W.R. (1974). *The Processing of Information and Structure.* Lawrence Erlbaum Associates, Hillsdale, NJ.

Geertz, C. (1973). *The Interpretation of Cultures.* Basic Books, New York.

Gibson, J.J. (1979). *The Ecological Approach to Visual Perception.* Houghton Mifflin, Boston. (Currently published by Lawrence Erlbaum, Hillsdale, NJ.)

Gibson, J.J. (1986). *The Ecological Approach to Visual Perception.* Lawrence Erlbaum Associates, Hillsdale, NJ.

Gilbert, S.A. (1997). Mapping mental spaces: How we organize perceptual and cognitive information. Ph.D. thesis. MIT.

Gilchrist, A.L. (1979). The perception of surface blacks and whites. *Scientific American,* March, 88–96.

Gilchrist, A.L. (1980). When does perceived lightness depend on perceived spatial arrangement? *Perception and Psychophysics* 28: 527–538.

Gilhooly, K.J. (1988). *Thinking: Directed, Undirected and Creative.* Academic Press, London.

Ginsburg, A.P., Evans, D.W., Sekuler, R., and Harp, S.A. (1982). Contrast sensitivity predicts pilots' performance in aircraft simulators. *American Journal of Optometry and Physiological Optics* 59: 105–108.

Goldin-Meadow, S. and Mylander, C. (1998). Spontaneous sign systems created by deaf children in two cultures. *Nature* 391: 279–281.

Goldstein, D.A. and Lamb, J.C. (1967). Visual coding using flashing lights. *Human Factors* 9: 405–408.

Gonzalez, R.C. and Woods, P. (1993). *Digital Image Processing,* 2d ed. Addison-Wesley, Reading, MA.

Goodman, N. (1968). *Language of Art.* Bobbs Merrill, New York.

Goodwin, C.J. (2001). *Research in Psychology: Methods and Design.* Wiley, New York.

Gray, C.M., Konig, P., Engel, A.K., and Singer, W. (1989). Oscillatory responses in cat visual cortex exhibit intercolumnar synchronisation which reflects global stimulus properties. *Nature* 388: 334–337.

Gray, W.G.D., Mayer, L.A., and Hughes Clarke, J.E. (1997). Geomorphological applications of multibeam sonar and high-resolution DEM data from Passamaquoddy Bay. Geological Association of Canada, Ottawa, *'97 Proceedings Abstracts 57.*

Gregory, R.L. (1977). Vision with isoluminance color contrast: A projection technique and observations. *Perception* 6(1): 113–119.

Guiard, Y. (1987). Asymmetric division of labor in skilled bimanual action: The kinematic chain as a model. *Journal of Motor Behavior* 19: 486–517.

Guitard, R. and Ware, C. (1990). A color sequence editor. *ACM Transactions on Graphics* 9(3): 338–341.

Gutwin, C., Greenberg, S., and Roseman, M. (1996). Workspace awareness support with radar views. *CHI '96 Conference Companion,* ACM, 210–211.

Hagen, M.A. (1974). Picture perception: Toward a theoretical model. *Psychology Bulletin* 81: 471–497.

Hagen, M.A. and Elliott, H.B. (1976). An investigation of the relationship between viewing conditions and preference for true and modified perspective with adults. *Journal of Experimental Psychology: Human Perception and Performance* 5: 479–490.

Hallett, P.E. (1986). Eye movements. In *Handbook of Perception and Human Performance,* ed. K.R. Boff, L. Kaufman, and J.P. Thomas. vol. 1, ch. 10: 25–28. Wiley, New York.

Halverston, J. (1992). The first pictures: Perceptual foundations of paleolithic art. *Perception* 21: 389–404.

Hammond, N. (1987). Principles from the psychology of skill acquisition. In *Applying Cognitive Psychology to User Interface Design,* ed. M.M. Gardener and B. Christie, 163–188. Wiley, Chichester.

Haring, M.J. and Fry, M.A. (1979). Effect of pictures on children's comprehension of written text. *Educational Communication and Technology Journal* 27(3): 185–190.

Harris, C.S. (1965). Perceptual adaptation to inverted, reversed and displaced vision. *Psychological Review* 72(6): 419–444.

Harrison, B. and Vincente, K.J. (1996). An experimental evaluation of transparent menu usage. *CHI Conference Proceedings,* ACM, 391–398.

Healey, C.G. (1996). Choosing effective colors for data visualization. *IEEE Visualization '96 Proceedings,* 263–270.

Healey, C.G., Booth, K.S., and Enns, J.T. (1998). High-speed visual estimation using pre-attentive processing. *ACM Transactions on Human-Computer Interaction* 3(2): 107–135.

Heider, F. and Simmel, M. (1944). An experimental study of apparent behavior. *American Journal of Psychology* 57: 243–259.

Held, R., Efstanthiou, A., and Green, M. (1966). Adaptation to displaced and delayed visual feedback from the hand. *Journal of Experimental Psychology* 72: 887–891.

Hendrix, C. and Barfield, W. (1996). Presence within virtual environments as a function of visual display parameters. *Presence* 5(3): 272–289.

Hering, E. (1920). *Grundzuge der Lehr vom Lichtsinn.* Springer-Verlag, Berlin. (*Outlines of a Theory of Light Sense.* Translated by L.M. Hurvich and D. Jameson. Harvard University Press, Cambridge, MA, 1964.)

Herndon, K.P., Zelenik, R.C., Robbins, D.C., Conner, D.B., Snibbe, S.S., and van Dam, A. (1992). Interactive shadows. In *Proceedings of the ACM Symposium on User Interface Software and Technology, UIST '92,* ACM, 1–6.

Herskovits, M.J. (1948). *Man and His Works.* Knopf, New York.

Hill, B., Roger, T., and Vorhagen, F.W. (1997). Comparative analysis of the quantization of color spaces on the basis of the CIELAB color-difference formula. *ACM Transactions on Graphics,* 16(2): 109–154.

Hillstrom, A.P. and Yantis, S. (1994). Visual attention and motion capture. *Perception and Psychophysics* 55(4): 399–411.

Hochberg, J. (1968). In the mind's eye. In *Contemporary Theory and Research in Visual Perception*, ed. R.N. Haber, 309–331. Holt, Rinehart, and Winston, New York.

Hochberg, J. (1971). Perception: Space and movement. In *Experimental Psychology*, ed. J.W. Klink and L.A. Riggs, 475–550. Holt, Rinehart and Winston, New York.

Hochberg, J. (1986). Representation of motion and space in video and cinematic display. In *Handbook of Perception and Human Performance*, ed. K.R. Boff, L. Kaufman, and J.P. Thomas, 1–64. Wiley, New York.

Hochberg, J. and Brooks, V. (1978). Film cutting and visual momentum. In *Eye Movements and the Higher Psychological Functions*, ed. J.W. Senders, D.F. Fisher, and R.A. Mony, 293–313. Lawrence Erlbaum Associates, Hillsdale, NJ.

Hochberg, J.E. and Brooks, V. (1962). Pictorial recognition as an unlearned ability. *American Journal of Psychology* 75: 624–628.

Hollingworth, A. and Henderson, J.M. (2002). Accurate visual memory for previously attended objects in natural scenes. *Journal of Experimental Psychology: Human Perception and Performance* 28(1): 113–136.

Horgan, J. (1997) *The End of Science: Facing the Limits of Knowledge in the Twilight of the Scientific Age.* Helix Books, Reading, MA.

Hotelling, H. (1933). Analysis of a complex of statistical variables into principal components. *Journal of Educational Psychology* 24: 498–520.

Houde, S. (1992). Iterative design of an interface for easy 3-D direct manipulation. *CHI '92, ACM, Monterey, May Proceedings.* 135–142.

Howard, I.P. (1991). Spatial vision within egocentric and exocentric frames of reference. In *Pictorial Communication in Virtual and Real Environments*, ed. S.R. Ellis, M.K. Kaiser, and A.J. Grunwald, 338–358. Taylor and Francis, London.

Howard, I.P. and Childerson, L. (1994). The contributions of motion, the visual frame, and visual polarity to sensations of body tilt. *Perception* 23: 753–762.

Howard, I.P. and Heckman, T. (1989). Circular vection as a function of the relative sizes, distances and positions of two competing visual displays. *Perception* 18(5): 657–667.

Howard, J.H. and Kerst, S.M. (1981). Memory and perception of cartographic information for familiar and unfamiliar environments. *Human Factors* 23(4): 495–504.

Huber, D.E. and O'Reilly, R.C. (2003). Persistence and accommodation in short-term priming and other perceptual paradigms: Temporal segregation through synaptic depression. *Cognitive Science* 27: 403–430.

Hummel, J.E. and Biederman, I. (1992). Dynamic binding in a neural network for shape recognition. *Psychological Review* 99(3): 480–517.

Humphreys, G.W. and Bruce, V. (1989). *Visual Cognition: Computational, Experimental and Neurological Perspectives.* Lawrence Erlbaum Associates, Hillsdale, NJ.

Hurvich, L.M. (1981). *Color Vision.* Sinauer Associates, Sunderland, MA.

Hutchins, E. (1995). *Distributed Cognition.* MIT Press, Cambridge, MA.

Hyman, R. (1953). Stimulus information as a determinant of reaction time. *Journal of Experimental Psychology* 45: 423–432.

Iavecchia, J.H., Iavecchia, H.P., and Roscoe, S.N. (1988). Eye accommodation to head-up virtual images. *Human Factors* 30(6): 689–702.

Immel, D.S. and Brock, P.J. (1986). An effecient radiosity aproach for realistic image synthesis. *IEEE Computer Graphics and Applications* 6(2): January, 26–35.

Inselberg, A. and Dimsdale, B. (1990). Parallel coordinates: A tool for visualizing multidimensional geometry. In *Proceedings of IEEE Conference on Visualization,* Los Angeles, 361–378.

Interrante, V., Fuchs, H., and Pizer, S.M. (1997). Conveying 3D shape of smoothly curving transparent surfaces via texture. *IEEE Transactions on Visualization and Computer Graphics* 3(2): 98–117.

Intraub, H. and Hoffman, J. E. (1992). Reading and visual memory: Remembering scenes that were never seen. *American Journal of Psychology* 105: 101–114.

Irani, P., Tingley, M., and Ware, C. (2001). Using perceptual syntax to enhance semantic content in diagrams. *IEEE Computer Graphics and Applications,* September, 76–84.

Irani, P. and Ware, C. (2003). Diagramming information structures using 3D perceptual primitives. *ACM Transactions on Computer-Human Interaction* 10(1): 1–19.

Irwin, D.E. (1992). Memory for position or identity across eye movements. *Journal of Experimental Psychology: Learning, Memory and Cognition* 18: 307–317.

Irwin, R.J. and McCarthy, D. (1998). Psychophysics: Methods and analyses of signal detection. In *Handbook of Research Methods in Human Operant Behavior*, ed. K.A. Lattal, M. Perone, et al., 291–321. Plenum Press, New York.

Ishii, H. and Kobayashi, M. (1992). ClearBoard: a seamless medium of shared drawing and conversation with eye contact. *Proceedings of CHI '92,* ACM, 525–532.

Jackson, R., MacDonald, L., and Freeman, K. (1994). *Computer-Generated Color: A Practical Guide to Presentation and Display.* Wiley, New York.

Jackson, R., MacDonald, L., and Freeman, K. (1998). *Computer-Generated Color.* Wiley Professional Computing, Chichester.

Jacob, R.J.K. (1991). The use of eye movements in human-computer interaction techniques: What you look at is what you get. *ACM Transactions on Information Systems* 9(3): 152–169.

Jacob, R.J.K., Egeth, H.E., and Bevon, W. (1976). The face as a data display. *Human Factors* 18: 189–200.

Johansson, G. (1973). Visual perception of biological motion and a model for its analysis. *Perception and Psychophysics* 14(2): 201–211.

Johansson, G. (1975). Visual motion perception. *Scientific American* (232): June, 76–98.

Johnson, B. and Shneiderman, B. (1991). Treemaps: A space-filling approach to the visualization of hierarchical information structures. *Proceedings IEEE Information Visualization '95,* 43–50.

Johnson, S.H. (2001). Seeing two sides at once: Effects of viewpoint and object structure on recognizing three-dimensional objects. *Journal of Experimental Psychology: Human Perception and Performance* 27(6): 1468–1484.

Jonassen, D.H., Beissner, K., and Yacci, M.A. (1993). Structural knowledge: Techniques for conveying, assessing, and acquiring structural knowledge. Lawrence Erlbaum Associates, Hillsdale, NJ.

Jonides, J. (1981). Voluntary versus automatic control over the mind's eye. In *Attention and Performance*, vol. 9, ed. J. Long and A.D. Baddeley, 187–203. Erlbaum, Hillsdale, NJ.

Jorg, S. and Hormann, H. (1978). The influence of general and specific labels on the recognition of labelled and unlabelled parts of pictures. *Journal of Verbal Learning and Verbal Behaviour* 17: 445–454.

Judd, D.B. and Wyszecki, G.W. (1975). *Color in Business, Science and Industry,* 3d ed. Wiley, New York.

Kabbash, P., Buxton, W., and Sellen, A. (1994). Two-handed input in a compound task. *Proceedings of CHI '94,* ACM, 417–423.

Kahn, K. (1996a). Drawings on napkins, video-game animation and other ways to program computers. *Communications of the ACM* 39(8): 49–59.

Kahn, K. (1996b). ToonTalk—an animated programming environment for children. *Journal of Visual Languages and Computing* 7(2): 197–217.

Kahneman, D. and Henik, A. (1981). Perceptual organization and attention. In *Perceptual Organization*, ed. M. Kubovy and J.R. Pomerantz, 181–209. Lawrence Erlbaum Associates, Hillsdale, NJ.

Kahneman, D., Triesman, A., and Gibbs, B.J. (1992). The reviewing of object files: Object-specific integration of information. *Cognitive Psychology* 24: 175–219.

Kaiser, M., Proffitt, D., Whelan, S., and Hecht, H. (1992). Influence of animation on dynamic judgments. *Journal of Experimental Psychology: Human Perception and Performance* 18(34): 669–690.

Kalaugher, P.G. (1985). Visual effects with a miniature Leonardo's window: Photographs and real scenes fused stereoscopically. *Perception* 14: 553–561.

Kalra, P., Gobbetti, E., Magnenat-Thalmann, N., and Thalmann, D. (1993). A multimedia testbed for facial animation control. In *International Conference of Multi-Media Modeling, MMM '93*, ed. T.S. Chua and T.L. Kunii, Singapore, 59–72.

Kanizsa, G. (1976). Subjective contours. *Scientific American* (234): April, 48–64.

Kanwisher, N., McDermott, J., and Chun, M. (1997). The fusiform face area: A module in human extrastriate cortex specialized for the perception of faces. *Journal of Neuroscience* 17: 4302–4311.

Kanwisher, N., Stanley, D., and Harris, A. (1999). The fusiform face area is selective for faces, not animals. *NeuroReport* 10(1): 183–187.

Kawai, M., Uchikawa, K., and Ujike, H. (1995). Influence of color category on visual search. *Annual Meeting of the Association for Research in Vision and Ophthalmology, Paper #2991,* Fort Lauderdale, FL.

Kelly, D.H. (1979). Motion and vision II: Stabilized spatio-temporal threshold surface. *Journal of the Optical Society of America* 69: 1340–1349.

Kennedy, J.M. (1974). *A Psychology of Picture Perception.* Jossey-Bass, San Francisco.

Kennedy, R.S., Lilienthal, M.G., Berbaum, K.S., Baltzley, D.R., and McCauley, M.E. (1989). Simulator sickness in U.S. Navy flight simulators. *Aviation, Space and Environmental Medicine* 15: 10–16.

Kersten, D., Mamassian, P., and Knill, D.C. (1997). Moving cast shadows induce apparent motion in depth. *Perception* 26: 171–192.

Kersten, D., Mamassian, P., Knill, D.C., and Bulthoff, I. (1996). Illusory motion from shadows, *Nature* 351: 228–230.

Kieras, D.E. and Meyer, D.E. (1997). An overview of the EPIC architecture for cognition and performance with application to human-computer interaction. *Human-Computer Interaction* 12: 391–438.

Kim, S., Hagh-Shenas, H., and Interrante, V. (1993). Showing shape with texture: Two directions are better than one. *Human Vision and Electronic Imaging VIII, SPIE 5007,* 332–339.

Kim, W.S., Tendick, F., and Stark, L. (1991). Visual enhancements in pick-and-place tasks. In *Pictorial Communication in Virtual and Real Environments*, ed. S.R. Ellis, 265–282. Taylor and Francis, London.

Kirby, R.M., Marmanis, H., and Laidlaw, D.H. (1999). Visualizing multivalued data from 2D incompressible flows using concepts from painting. *Proceedings of Visualization'99,* IEEE, 333–340.

Kirsh, D. and Maglio, P. (1994). On distinguishing epistemic from pragmatic action. *Cognitive Science* 18: 513–549.

Koffka, K. (1935). *Principles of Gestalt Psychology.* Harcourt-Brace, New York.

Kohlberg, D.L. (1971). Simple reaction time as a function of stimulus intensity in decibels of light and sound. *Journal of Experimental Psychology* 54: 757–764.

Kolers, P.A. (1975). Memorial consequences of automatized encoding. *Journal of Experimental Psychology: Human Learning and Memory* 1: 689–701.

Komerska, R. and Ware, C. (2003). Haptic task constraints for 3D interaction. *Proceedings, IEEE Haptic Interfaces for Virtual Environments and Teleoperator Systems Symposium,* 270–277.

Kosara, R., Miksch, S., Hauser, H., (2002). Focus+context taken literally. *IEEE Computer Graphics and Appplications* 22(1): 22–29.

Kosslyn, S.M. (1987). Seeing and imagining in the cerebral hemispheres: A computational approach. *Psychological Review* 94: 148–175.

Kosslyn, S.M. (1994). *Image and Brain: The Resolution of the Imagery Debate.* MIT Press, Cambridge, MA.

Kosslyn, S.M., Alpert, N.M., Thompson, W.L., Maljkovic, S.B., Weise, C.F., Chabreis, S., Hamilton, E., Rauch, S.L., and Buonanno, F.S. (1993). Visual mental imagery activates topographically organized visual context: PET investigations. *Journal of Cognitive Neuroscience* 5: 263–287.

Kroll, J.F. and Potter, M.C. (1984). Recognizing words, pictures and concepts: A comparison of lexical, object and reality decisions. *Journal of Verbal Learning and Verbal Behaviour* 23: 39–66.

Kubovy, M. (1986). *The Psychology of Linear Perspective and Renaissance Art.* Cambridge University Press, Cambridge.

Kurtenbach, G., Fitzmaurice, G., Baudel, T., and Buxton, B. (1997). The design and evaluation of a GUI paradigm based on two-hands, tablets and transparency. *Proceedings of CHI '97*, ACM, 35–42.

Laidlaw, D.H., Ahrens, E.T., Kramers, D., Avalos, M.J., Readhead, C., and Jacobs, R.E. (1998). Visualizing diffusion tensor images of the mouse spinal cord. *Proceedings of IEEE Visualization Conference*, 127–134.

Laidlaw, D.H., Kirby, R.M., Davidson, J.S., Miller, T.S., da Silva, M., Warren, W.H., and Tarr, M. (2001). Quantitative comparative evaluation of 2D vector field visualization methods. *Proceedings of IEEE Visualization 2001*, 143–150. San Diego, CA, October.

Lamping, J., Rao, R., and Pirolli, P. (1995). A focus + content technique based on hyperbolic geometry for viewing large hierarchies. *Proceedings CHI '95*, ACM, 401–408.

Landauer, T.K. (1986). How much do people remember? Some estimates of the quantity of learned information in long-term memory. *Cognitive Science* 10: 477–493.

Laramee, R.S. and Ware, C. (2002). Rivalry and interference with a head-mounted display. *ACM Transactions on Human-Computer Interaction* 9(3): 1–14.

Larkin, J.H. and Simon, H.A. (1987). Why a diagram is (sometimes) worth ten thousand words. *Cognitive Science* 11: 65–99.

Lawson, R., Humphreys, G.W., and Watson, D. (1994). Object recognition under sequential viewing conditions: Evidence for viewpoint-specific recognition procedures. *Perception* 23: 595–614.

Lennie, P. (1998). Single units and cortical organization. *Perception* 27: 889–935.

Leslie, A.M. and Keeble, S. (1987). Do six-month-old infants perceive causality? *Cognition* 25: 265–288.

Levelt, W., Richardson, G., and Heu, W. (1985). Pointing and voicing in deictic expressions. *Journal of Memory and Language* 24: 133–164.

Levine, M. (1975). *A Cognitive Theory of Learning.* Lawrence Erlbaum Associates, Hillsdale, NJ.

Levkowitz, H. and Herman, G.T. (1992). Color scales for image data. *IEEE Computer Graphics and Applications*, 12: 72–80.

Levoy, M. and Whitaker, R. (1990). Gaze-directed volume rendering. *Proceedings of ACM Symposium on Interactive 3D Graphics, Computer Graphics* 24(2): 217–224.

Li, Y. (1997). Oriented particles for scientific visualization. M.S. thesis. Computer Science, University of New Brunswick.

Liang, J., Shaw, C., and Green, M. (1991). On temporal-spatial realism in the virtual reality environment. *Proceedings of UIST '91*, ACM, 19–25.

Limoges, S., Ware, C., and Knight, W. (1989). Displaying correlation using position, motion, point size, or point color. *Proceedings, Graphics Interface '89*, 262–265.

Linos, P.K., Aubet, P., Dumas, L., Helleboid, Y., Lejeune, D., and Tulula, P. (1994). Visualizing program dependencies: An experimental study. *Software Practice and Experience* 24(4): 387–403.

Linstrom, C.J., Silverman, C.A., and Susman, W.M. (2000). Facial motion analysis with a video and computer system: A preliminary report. *American Journal of Otology* 21: 123–129.

Liu, F. and Picard, R.W. (1994). Periodicity, directionality, and randomness: World features for perceptual pattern recognition. *Proceedings of the 12th International Conference on Pattern Recognition*, vol. II, 184–189, Jerusalem, October 9–13.

Livingston, M.S. and Hubel, D.H. (1988). Segregation of form, movement and depth: Anatomy, physiology and perception. *Science* 240: 740–749.

Lloyd, R. (1997). Visual search processes used in map reading. *Cartographica* 34(1): 11–32.

Loftus, E.F. and Hoffman, H.G. (1989). Misinformation and memory: The creation of new memories. *Journal of Experimental Psychology: General* 118: 100–104.

Logan, G.D. (1994). Spatial attention and the apprehension of spatial relations. *Journal of Experimental Psychology: Human Perception and Performance* 20: 1015–1036.

Lokuge, I., Glibert, S.A., and Richards, W. (1996). Structuring information with mental models: A tour of Boston. *CHI '96 Proceedings*, ACM, 413–419.

Lowther, K. and Ware, C. (1996). Vection with large-screen 3D imagery. *CHI '96 Conference Companion*, ACM, 233–234.

Lu, C. and Fender, D.H. (1972). The interaction of color and luminance in stereoscopic vision. *Investigative Opthalmology* 11: 482–490.

Luck, S.J. and Vogel, E.K. (1997). The capacity of visual working memory for features and conjunctions. *Nature* 390: 279–280.

Lynch, K. (1960). *The Image of the City.* MIT Press, Cambridge, MA.

Mack, A. and Rock, I. (1998). *Inattentional Blindness.* MIT Press, Cambridge MA.

Mackenzie, C.L. and Iberall, T. (1994). *The Grasping Hand.* Advances in Psychology Series, 104. North-Holland, Amsterdam.

MacKenzie, I.S. (1992). Fitts' law as a research and design tool in human-computer interaction. *Human-Computer Interaction* 7: 91–139.

Mackinlay, J.D., Card, S.K., and Robertson, G.G. (1990). Rapid controlled movement through a virtual 3D workspace. *Proceedings SIGGRAPH '90*, ACM, 24: 171–176.

MacLeod, C.M. (1991). Half a century of research on the Stroop effect: An integrative review. *Psychological Bulletin* 109(2): 163–203.

Mackworth, N.H. (1976). Ways of recording line of sight. In *Eye Movements and Psychological Processing*, ed. R.A. Monty and J.W. Senders, 173–178. Erlbaum, Hillsdale, NJ.

Madison, C., Thompson, W., Kersen, D., Shirley, P., and Smits, B. (2001). Use of interreflection and shadow for surface contact. *Perception and Psychophysics* 63: 187–193.

Malik, J. and Perona, P. (1990). Preattentive texture discrimination with early vision mechanisms. *Journal of the Optical Society of America* A 7(5): 923–932.

Mark, D.M. and Franck, A.U. (1996). Experiential and formal models of geographical space. *Environment and Planning*, B. 23: 3–24.

Marr, D. (1982). *Vision.* W.H. Freeeman and Company, New York.

Marr, D. and Nishihara, H.K. (1978). Representation and recognition of the spatial organization of three-dimensional shapes. *Proceedings of the Royal Society of London*, B. 207: 269–294.

Masin, S.C. (1997). The luminance conditions of transparency. *Perception* 26: 39–50.

Massie, T.H. and Salisbury, J.K. (1994). The phantom haptic interface: A device for probing virtual objects, ASME haptic interfaces for virtual environments and teleoperator systems. *Dynamic Systems and Control* 1 (Nov.): 295–301.

Matlin, M.W. (1994). *Cognition*, 3d ed. Harcourt Brace, Fort Worth.

Mayer, L.A., Dijkstra, S., Hughes Clarke, J., Paton, M., and Ware, C. (1997). High-frequency acoustics in shallow water. *SACLANT Conference Proceedings Series*, CP-45, ed. N.G. Pace, E. Pouliquen, O. Bergem, and J. Lyons.

Mayer, R.E., Moreno, R., Boire, M., and Vagge, S. (1999). Maximizing constructivist learning from multimedia communications by minimizing cognitive load. *Journal of Educational Psychology* 91(4): 638–643.

Mayer, R.E. and Sims, V.K. (1994). For whom is a picture worth a thousand words? Extensions of a dual-coding theory of multimedia learning. *Journal of Educational Psychology* 86: 389–401.

McCauley, M.E. and Sharkey, T.J. (1992). Cybersickness: Perception of self-motion in virtual environments. *Presence* 1(3): 311–318.

McCormick, E., Wickens, C.D., Banks, R., and Yeh, M. (1998). Frame of reference effects on scientific visualization subtasks. *Human Factors* 40: 443–451.

McGreevy, M.W. (1992). The presence of field geologists in Mars-like terrain. *Presence* 1(4): 375–403.

McManus, I.C. (1977). Note: Half a million basic color words: Berlin and Kay and the usage of color words in literature and science. *Perception* 26: 367–370.

McNeill, D. (1992). *Hand and Mind: What Gestures Reveal about Thought.* University of Chicago Press, Chicago.

Megaw, E.D. and Richardson, J. (1979). Target uncertainty and visual scanning strategies. *Human Factors* 21(3): 303–316.

Melcher, D. (2001). Persistence of visual memory for scenes: A medium-term memory may help us keep track of objects during visual tasks. *Nature* 412: 401.

Metelli, F. (1974). The perception of transparency. *Scientific American* 230 (April): 91–98.

Meyer, G.W. and Greenberg, D.P. (1988). Color-defective vision and computer graphics displays. *IEEE Computer Graphics and Applications* September: 28–40.

Michotte, A. (1963). *The Perception of Causality.* (Translated by T. Miles and E. Miles.) Methuen, London.

Milner, A.D. and Goodale, M.A. (1995). *The Visual Brain in Action.* Oxford Psychology Series 27. Oxford University Press, Oxford.

Miyake, A. and Shah, P. (1999). Toward unified theories of working memory: Emerging general consensus, unresolved theoretical issues, and future research directions. In *Models of Working Memory*, ed. A. Miyake and P. Shah, 442–481. Cambridge University Press, Cambridge.

Mon-Williams, M. and Wann, J.P. (1998). Binocular virtual reality displays: When problems do and don't occur. *Human Factors* 40(1): 42–49.

Moray, N. (1981). Monitoring behavior and supervising control. In *Handbook of Perception and Human Performance*, Vol. 2, ed. K.R. Boff, L. Kaufman, and J.P. Thomas, 40–46. Wiley, New York.

Moray, N. and Rotenberg, I. (1989). Fault management in process control: Eye movements and action. *Ergonomics* 32(11): 1319–1342.

Morton, J. and Johnson, M.H. (1991). CONSPEC and CONLEARN: A two-process theory of infant face recognition. *Psychological Review* 98: 164–181.

Mousavi, S.Y., Low, R., and Sweller, J. (1995). Reducing cognitive load by mixing auditory and visual presentation modes. *Journal of Educational Psychology* 87: 319–334.

Mullen, K.Y. (1985). The contrast sensitivity of human color vision to red–green and blue–yellow chromatic gratings. *American Journal of Optometry and Physiological Optics* 359: 381–400.

Munzner, T., Guimbretière, F., and Robertson, G. (1999). Constellation: A visualization tool for linguistic queries from MindNet. *Proceedings of the 1999 IEEE Symposium on Information Visualization*, 132–135, San Francisco, CA, October 25–26, 1999.

Najjar, L.J. (1998). Principles of educational multimedia user interface design. *Human Factors* 40(2): 311–323.

Nakayama, K., Shimono, S., and Silverman, G.H. (1989). Stereoscopic depth: Its relation to image segmentation, grouping and the recognition of occluding objects. *Perception* 18: 55–68.

Nakayama, K. and Silverman, G.H. (1986). Serial and parallel processing of visual feature conjunctions. *Nature* 320: 264–265.

Nemire, K., Jacoby, R.H., and Ellis, S.R. (1994). Simulation fidelity of a virtual environment display. *Human Factors* 36(1): 79–93.

Neveau, C.F. and Stark, L.W. (1998). The virtual lens. *Presence* 7(4): 370–381.

Newell, A. (1990). *Unified Theories of Cognition.* Harvard University Press, Cambridge, MA.

Newell, A. and Rosenbloom, P. (1981). Mechanisms of skill acquisition and the law of practice. In *Cognitive Skills and Their Acquisition*, ed. J.R. Anderson, 1–55. Lawrence Erlbaum Associates, Hillsdale, N.J.

Norman, D.A. (1988). *The Psychology of Everyday Things.* Basic Books, New York.

Norman, J.F., Todd, J.T., and Phillips, F. (1995). The perception of surface orientation from multiple sources of optical information. *Perception and Psychophysics* 57(5): 629–636.

Noro, K. (1993). Industrial application of virtual reality and possible health problems. *Japan. Journal Ergonomica* 29: 126–129.

North, M.N., North, S.M., and Coble, J.R. (1996). Effectiveness of virtual environment desensitization in the treatment of agoraphobia. *Presence* 5(3): 346–352.

Novak, J.D. (1991). Clarify with concept maps: A tool for students and teachers alike. *The Science Teacher* 58(7): 45–49.

O'Regan, J.K. (1992). Solving the "real" mysteries of visual perception: The world as an outside memory. *Canadian Journal of Psychology* 46: 461–488.

Oakes, L.M. (1994). Development of infants' use of continuity cues in their perception of causality. *Developmental Psychology* 30: 869–879.

Ogle, K.N. (1962). The visual space sense. *Science* 135: 763–771.

Oliva, A. and Schyns, P. (1997). Coarse blobs or fine edges? Evidence that information diagnosticity changes the perception of complex visual stimuli. *Cognitive Psychology* 34: 72–107.

Oviatt, S. (1999). Mutual disambiguation of recognition errors in a multimodal architecture. *Proceedings of CHI '99*, ACM, 576–583.

Oviatt, S., DeAngeli, A., and Kuhn, K. (1997). Integration and synchronization of input modes during multimodal human-computer interaction. *Proceedings of CHI '97*, ACM, 415–422.

Owlsley, C.J., Sekuler, R., and Siemensne, D. (1983). Contrast sensitivity through adulthood. *Vision Research* 23: 689–699.

Paivio, A. (1987). *Mental Representations: A Dual Coding Approach.* Oxford Psychology Series. Oxford University Press, Oxford.

Paivio, A. and Csapo, K. (1969). Concrete image and verbal memory codes. *Journal of Experimental Psychology* 80: 279–285.

Palmer, S.E. (1975). The effect of contextual scenes on the identification of objects. *Memory and Cognition* 3(5): 519–526.

Palmer, S.E. (1992). Common region: A new principle of perceptual grouping. *Cognitive Psychology* 24: 436–447.

Palmer, S.E. and Rock, I. (1994). Rethinking perceptual organization: The role of uniform connectedness. *Psychonomic Bulletin and Review* 1(1): 29–55.

Palmer, S.E., Rosh, E., and Chase, P. (1981). Canonical perspective and perception of objects. *Attention and Performance IX*, ed. J. Long and A. Baddeley, 135–151. Lawerence Erlbaum Associates, Hillsdale, N.J.

Palmiter, S., Elkerton, J., and Paggett, P. (1991). Animated demonstrations vs. written instructions for learning procedural tasks: A preliminary investigation. *International Journal of Man-Machine Studies* 34: 687–701.

Parker, G., Franck, G., and Ware, C. (1998). Visualizing of large nested graphs in 3D: Navigation and interaction. *Journal of Visual Languages* 9: 299–317.

Pashler, H. (1995). Attention and visual perception: Analyzing divided attention. In *An Invitation to Cognitive Science: Visual Cognition*, vol. 2, ed. S. Kosslyn and D. Osherson, 71–100. MIT Press, Cambridge, MA.

Patterson, R. and Martin, W.L. (1992). Human stereopsis. *Human Factors* 34(6): 669–692.

Pausch, R., Snoddy, J., Taylor, R., Watson, S., and Haseltine, E. (1996). Disney's Aladdin: First steps towards storytelling in virtual reality. *SIGGRAPH '96 Proceedings*, 193–203.

Pearson, D., Hanna, E., and Martinez, K. (1990). Computer-generated cartoons. In *Images and Understanding*, ed. H. Barlow, C. Blakemore, and M. Weston Smith, 46–60. Cambridge University Press, Cambridge.

Peli, E. (1999). Optometric and perceptual issues with head-mounted display (HMD). In *Optical Design for Visual Instrumentation*, ed. P. Mouroulis, 205–276. McGraw-Hill, New York.

Perrett, D.I., Oram, M.W., Harries, M.H., Bevan, R., Hietanen, J.K., Benson, P.J., and Thomas, S. (1991). Viewer-centered and object-centered coding of heads in the Macaque temporal cortex. *Experimental Brain Research* 86: 159–173.

Perry, M. (2003). Distributed cognition. In *HCI Models, Theories, and Frameworks: Toward a Multidisciplinary Science*, ed. John M. Carroll, 193–223. Morgan Kaufmann, San Francisco.

Peterson, H.E. and Dugas, D.J. (1972). The relative importance of contrast and motion in visual detection. *Human Factors* 14: 207–216.

Phillips, W.A. (1974). On the distinction between sensory storage and short-term visual memory. *Perception and Psychophysics* 16: 283–290.

Pickett, R.M. and Grinstein, G.G. (1988). Iconograhic displays for visualizing multidimensional data. *Proceedings of the 1988 IEEE Conference on Systems, Man and Cybernetics*, vol. I, 514–519.

Pickett, R.M., Grinstein, G.G., Levkowitz, H., and Smith, S. (1995). Harnessing pre-attentive perceptual processes in visualization. In *Perceptual Issues in Visualization*, ed. G. Grinstein and H. Levkowitz. 33–45. Springer, New York.

Pirolli, P. (2003). Exploring and Finding Information. In *HCI Models, Theories and Frameworks: Toward a Multidisciplinary Science*, ed. John M. Caroll. Morgan Kaufmann, San Francisco.

Pirolli, P. and Card, S.K. (1995). Information foraging in information access environments. *Proceedings of CHI '95*, ACM, 51–58.

Plumlee, M. and Ware, C. (2002). Modeling performance for zooming vs multi-window interfaces based on visual working memory. *Advanced Visual Interfaces*, Trento, Italy, May Proceedings, 59–68.

Plumlee, M. and Ware, C. (2003). An evaluation of methods for linking 3D views. *Proceedings of the ACM SIGGRAPH 2003 Symposium on Interactive 3D Graphics*, Monterey, CA, 193–201.

Posner, M.I. and Keele, S. (1968). On the generation of abstract ideas. *Journal of Experimental Psychology* 77: 353–363.

Post, D.L. and Greene, F.A. (1986). Color name boundaries for equally bright stimuli on a CRT: Phase I. *Society for Information Display, Digest of Technical Papers* 86: 70–73.

Postma, A. and De Haan, E.H.F. (1996). What was where? Memory for object locations. *Quarterly Journal of Experimental Psychology* 49A(1): 178–199.

Postma, A., Izendoorn, R., and De Haan, E.H.F. (1998). Sex differences in object location memory. *Brain and Cognition* 36: 334–345.

Potter, M.C. (1976). Short-term conceptual memory for pictures. *Journal of Experimental Psychology: Human Learning and Memory* 2: 509–522.

Potter, M.C. (2002). Recognition memory for briefly presented pictures: The time course of rapidly forgetting. *Journal of Experimental Psychology: Human Perception and Performance* 28(5): 1163–1175.

Potter, M.C. and Levy, E.I. (1969). Recognition memory for a rapid sequence of pictures. *Journal of Experimental Psychology* 81: 10–15.

Poupyrev, I., Billinghurst, M., Weghorst, S., and Ichikawa, T. (1996). The Go-Go interaction technique: Non-linear mapping for direct manipulation in VR. *Proceedings of UIST '96*, Seattle, WA, November 6–8, 1996.

Price, C.J. and Humphreys, G.W. (1989). The effects of surface detail on object categorization and naming. *Quarterly Journal of Experimental Psychology* 41A: 797–828.

Puce, A., Allison, T., Gore, J.C., and McCarthy, G. (1995). Face-sensitive regions in human extra-striated cortex studied by functional MRI. *Journal of Neurophysiology* 74: 1192–1199.

Pylyshyn, Z.W. and Storm, R.W. (1988). Tracking multiple independent targets: Evidence for a parallel tracking mechanism. *Spatial Vision* 3: 179–197.

Quinlan, P. and Humphreys, G. (1987). Visual search for targets defined by combinations of color, shape and size: An examination of task constraints on feature and conjunction searches. *Perception and Psychophysics* 41(5): 455–472.

Rader, C., Brand, C., and Lewis, C. (1997). Degrees of comprehension: Children's understanding of a visual programming environment. *Proceedings of CHI '97*, ACM, 351–358.

Ramachandran, V.S. (1988). Perception of shape from shading. *Nature* 331: 163–166.

Ramachandran, V.S. (1999). *Phantoms in the Brain: Probing the Mysteries of the Human Mind.* Quill Press, New York.

Rao, R. and Card, S.K. (1994). The table lens: Merging graphical and symbolic representations in an interactive focus + context visualization for tabular information. *Proceedings of CHI '94*, ACM, 318–322.

Raymond, J.E., Shapiro, K.L., and Arnell, K.M. (1992). Temporary suppression of visual processing in an RSVP task: An attentional blink? *Journal of Experimental Psychology: Human Perception and Performance* 18: 849–860.

Regan, D. (1989). Orientation discrimination for objects defined by relative motion and objects defined by luminance contrasts. *Vision Research* 18: 1389–1400.

Regan, D. and Hamstra, S. (1991). Shape discrimination for motion and contrast defined contours: Squareness is special. *Perception* 20: 315–336.

Rensink, R.A. (2000). The dynamic representation of scenes. *Visual Cognition* 7: 17–42.

Rensink, R.A. (2002). Change detection. *Annual Review of Psychology* 53: 245–277.

Rensink, R.A., O'Reagan, J.K., and Clark, J.J. (1997). To see or not to see: The need for attention to perceive changes in scenes. *Psychological Science* 8(5): 368–373.

Rheingans, P. (1999). Task-based color scale design: 3D visualization for data exploration and decision making. *28th Applied Image and Pattern Recognition Workshop*, October 1999, Washington D.C., SPIE, 35–43.

Rhodes, G. (1995). Face recognition and configurational coding. In *Cognitive and Computational Aspects of Face Recognition*, ed. T. Valentine. Routledge, New York.

Rhodes, P.A. and Luo, M.R. (1996). A system of WYSIWYG colour communication. *Displays*, Elsevier Science 16(4): 213–221.

Richards, W. (1967). Differences among color normals: Classes I and II. *Journal of the Optical Society of America* 57: 1047–1055.

Richards, W. and Koenderink, J.J. (1995). Trajectory mapping: A new non-metric scaling technique. *Perception* 24: 1315–1331.

Riggs, L.A., Merton, P.A., and Mortion, H.B. (1974). Suppression of visual phosphenes during saccadic eye movements. *Vision Research* 14: 997–1010.

Rimé, B., Boulanger, B., Laubin, P., Richants, M., and Stroobants, K. (1985). The perception of interpersonal emotions originated by patterns of movements. *Motivation and Emotion* 9: 241–260.

Robertson, G., Czerwinski, M., Larson, K., Robbins, D., Thiel, D., and van Dantzich, M. (1998). Data Mountain: Using spatial memory for document management. *Proceedings of UIST '89*, ACM, 153–162.

Robertson, G., Mackinlay, J.D., and Card, S.W. (1993). Information Visualization Using 3D Interactive Animation. *Communications of the ACM* 36(4), 57–71.

Robertson, P.K. and O'Callaghan, J.F. (1986). The generation of color sequences for univariate and bivariate mapping. *IEEE Computer Graphics and Applications* 6(2): 24–32.

Robertson, P.K. and O'Callaghan, J.F. (1988). The application of perceptual colour spaces to the display of remotely sensed data. *IEEE Transactions on Geoscience and Remote Sensing* 26(1): 49–59.

Rock, I. and Gutman, D. (1981). The effect of inattention on form perception. *Journal of Experimental Psychology: Human Perception and Performance* 7(2): 275–285.

Rogers, B. and Cagnello, R. (1989). Disparity curvature and the perception of three-dimensional surfaces. *Nature* 339: 137–139.

Rogers, B. and Graham, M. (1979). Similarities between motion parallax and stereopsis in human depth perception. *Vision Research* 22: 261–270.

Rogers, E. (1995). A cognitive theory of visual interaction. In *Diagrammatic Reasoning: Cognitive and Computational Perspectives*, ed. J. Glasgos, N.H. Narayanan, and B. Chandraseekaran, 481–500. AAAI Press/MIT Press, Cambridge, MA.

Rogowitz, B.E. and Treinish, L.A. (1996). How not to lie with visualization. *Computers in Physics* 10(3): 268–273.

Romesburg, C.H. (1984). *Cluster Analysis for Researchers*. Lifetime Learning Publications, Belmont, CA.

Rood, O.N. (1897). *Modern Chromatics*. Reprinted in facsimile, 1973, Van Nostrand Reinhold, New York.

Roscoe, S.R. (1991). The eyes prefer real images. *Pictoral Communication in Virtual and Real Environments*, ed. S.R. Ellis, M. Kaiser, and A.J. Grunwald, 577–585. Taylor and Francis, London.

Rosenthal, N.E. (1993). Diagnosis and treatment of seasonal affective disorder. *Journal of the American Medical Association* 270: 2717–2720.

Rosetti, Y., Koga, K., and Mano, T. (1993). Prismatic displacement of vision induces transient changes in the timing of eye-hand coordination. *Perception and Psychophysics* 54(3): 355–364.

Rumbaugh, J., Booch, G., and Jacobson, I. (1999). *Unified Modeling Language Reference Manual*. Addison-Wesley Object Technology Series, Reading, MA.

Russo, J.E. and Rosen, L.D. (1975). An eye fixation analysis of multi-alternative choice. *Memory and Cognition* 3: 267–276.

Rutkowski, C. (1982). An introduction to the Human Applications Standard Computer Interface, Part 1: Theory and principles. *BYTE* 7(11): 291–310.

Ruttkay, Z., Noot, H., and Hagen, P. (2003). Emotion disc and emotion squares: Tools to explore the facial expression space. *Computer Graphics Forum* 22(1): 49–53.

Ryan, T.A. and Schwartz, C.B. (1956). Speed of perception as a function of mode of representation. *American Journal of Psychology* 69: 60–69.

Sadr, J., Jarudi, F., and Sinha, P. (2003). The role of the eyebrows in face recognition. *Perception* 32(3): 285–293.

Saito, T. and Takahashi, T. (1990). Comprehensible rendering of 3-D shapes. *SIGGRAPH '90 Proceedings, Computer Graphics* 24(4): 197–206.

Sarkar, M. and Brown, M.H. (1994). Graphical fisheye views. *Communications of the ACM* 37(12): 73–83.

Saussure, F. de. (1959). *Course in General Linguistics.* Reprinted by Fontana/Collins, New York. (Published posthumously based on lectures given at the University of Geneva between 1906 and 1911.)

Scanlan, L.A. (1975). Visual time compression: Spatial and temporal cues. *Human Factors* 17: 337–345.

Schroeder, W., Martin, K., and Lorenson, B. (1997). *The Visualization Toolkit.* Prentice Hall, Upper Saddle River, NJ.

Schumann, J., Strotthotte, T., Raab, A., and Laser, S. (1996). Assessing the effect of non-photorealistic rendered images in CAD. *CHI '96 Proceedings*, ACM, 35–41.

Schwarz, M., Cowan, W., and Beatty, J. (1987). An experimental comparison of RGB, YIQ, LAB, HSV and opponent color models. *ACM Transactions on Graphics* 6(2): 123–158.

Seigel, A.W. and White, S.H. (1975). The development of spatial representations of large-scale environments. In *Advances in Child Development and Behaviour*, ed. H.W. Reese, 9–55. Academic Press, London.

Sekuler, R. and Blake, R. (1990). *Perception*, 2d ed. McGraw-Hill, New York.

Selker, T. and Koved, L. (1988). Elements of visual language. *IEEE Conference of Visual Languages, Proceedings*, 38–44.

Sellen, A., Buxton, B., and Arnott, J. (1992). Using spatial cues to improve videoconferencing. *CHI '92 Proceedings*, ACM, 651–652. Also, CHI video proceedings, same year.

Serra, L., Hern, N., Choon, C.B., and Poston, T. (1997). Interactive vessel tracing in volume data. *1997 Symposium on Interactive 3D Graphics, Proceedings*, 131–137.

Shelton, A.L. and McNamara, T.P. (2001). Systems of spatial reference in human memory. *Cognitive Psychology* 43: 274–310.

Shenker, M. (1987). Optical design criteria for binocular helmet-mounted display. *Display System Optics, SPIE Proceedings* 778: 173–185.

Shepard, R.N. (1962). The analysis of proximities: Multidimensional scaling with unknown distance function, Part I. *Psychometrika* 27(2): 125–140.

Sheridan, T. (1972). On how often the supervisor should sample. *IEEE Transactions on Systems Man and Cybernetics* 6: 140–145.

Shneiderman, B. (1987). *Designing the User Interface.* Addison-Wesley, Reading, MA.

Shneiderman, B. (1998). *Designing the User Interface*, 3d ed. Addison-Wesley, Reading, MA.

Shorter Oxford English Dictionary, Volume II. (1972). Prepared by Little, W., Fowler, H.W., and Coulson, J. Revised by C.T. Onions. N–Z, 3d ed, 2364. Oxford University Press, Oxford, U.K.

Sigman, M. and Gilbert, C.D. (2000). Learning to find a shape. *Nature Neuroscience* 3: 264–269.

Simons, D.J. and Levin, D.T. (1998). Failure to detect changes to people during a real-world interaction. *Psychonomic Bulletin and Review* 5: 644–669.

Singer, W. and Gray, C.M. (1995). Visual feature integration and the temporal correlation hypothesis. *Annual Review of Neuroscience* 18: 555–586.

Slater, A. and Kirby, R. (1998). Innate and learned perceptual abilities in the newborn infant. *Experimental Brain Research* 123: 90–94.

Slater, M., Usoh, M., and Steed, A. (1995). Taking steps, the influence of walking technique on presence in virtual reality. *ACM Transactions on CHI* 2(3): 201–219.

Slocum, T.S. (1983). Predicting visual clusters on graduated circle maps. *American Cartographer* 10(1): 59–72.

Smith, A.R. (1978). Color gamut transform pairs. *Computer Graphics* 12: 12–19.

Smith, G. and Atchison, D.A. (1997). *The Eye and Visual Optical Instruments.* Cambridge University Press, Cambridge.

Snyder, F.W. and Pronko, N.H. (1952). *Vision with Spatial Inversion.* University of Wichita Press: Wichita, KS.

Sollenberger, R.L. and Milgram, P. (1993). The effects of stereoscopic and rotational displays in the three-dimensional path tracing task. *Human Factors* 35(3): 483–500.

Spangenberg, R.W. (1973). The motion variable in procedural learning. *AV Communications Review* 21(4): 419–436.

Spence, I. and Efendov, A. (2001). Target detection in scientific visualization. *Journal of Experimental Psychology: Applied* 7(1): 13–26.

Spence, I., Kutlesa, N., and Rose, D.L. (1999). Using color to code quantity in spatial displays. *Journal of Experimental Psychology: Applied* 5(4): 393–412.

Spence, R. (2002). Rapid, serial and visual: A presentation technique with potential. *Information Visualization* 1: 13–19.

Sperling, G. (1960). The information available in brief visual presentations. *Psychological Monographs: General and Applied* 74(11).

Standing, L., Conezio, I., and Haber, R.N. (1970). Perception and memory for pictures: Single trial learning of 2560 visual stimuli. *Psychonomic Science* 19: 73–74.

Stankiewicz, B.J., Hummerl, J.E., and Cooper, E.E. (1998). The role of attention in priming for left–right reflections of object images: Evidence for a dual representation of object shape. *Journal of Experimental Psychology: Human Perception and Performance* 24: 732–744.

Stasko, J.T. (1990). Tango: A framework and system for algorithm animation. *IEEE Computer* 23(9): 27–39.

State, A., Livingston, M.A., Garrett, W.F., Hirotal, G., Whitton, M.C., and Pisano, E.D. (1996). Technologies for augmented reality systems: Realizing ultrasound-guided needle biopsies. *SIGGRAPH '96 Proceedings*, ACM, 439–446.

Stenning, K. and Oberlander, J. (1994). A cognitive theory of graphical and linguistic reasoning: Logic and implementation. *Cognitive Science* 19: 97–140.

Stevens, S.S. (1946). On the theory of scales of measurement. *Science* 103: 677–680.

Stevens, S.S. (1961). The psychophysics of sensory function. In *Sensory Communication*, ed. W.A. Rosenblith, 1–33. MIT Press, Cambridge, MA.

Stone, M.C., Cowan, W.B., and Beatty, J.C. (1988). Color gamut mapping and the printing of digital color images. *ACM Transactions on Graphics* 7(4): 249–292.

Stone, M.C., Fishkin, K., and Bier, E.A. (1994). The movable filter as a user interface tool. *Proceedings of CHI '94*, ACM, 306–312.

Stroop, J.R. (1935). Studies of interference in serial verbal reactions. *Journal of Experimental Psychology* 18: 643–662.

Strothotte, C. and Strothotte, T. (1997). *Seeing between the Pixels.* Springer-Verlag, Berlin.

Sun, F., Staerk, L., Nguyen, A., Wong, J., Lakshminarayanan, V., and Mueller, E. (1988). Changes in accommodation with age: Static and dynamic. *American Journal of Optometry and Physiological Optics* 65(6): 492–498.

Sweller, J., Chandler, P., Tierner, P., and Cooper, G. (1990). Cognitive load as a factor in the structuring of technical material. *Journal of Experimental Psychology* 119(2): 176–192.

Swets, J.A. (1996). *Signal Detection Theory and ROC Analysis in Psychology and Diagnostics: Collected Papers.* Erlbaum, Mahwah, NJ.

Tabachnick, B.G. and Fidell, L.S. (2001). *Using Multivariate Statistics*, 4th ed. HarperCollins, New York.

Thomas, K.M., King, S.W., Franzen, P.L., Welsh, T.F., Berkowitz, A.L., Noll, D.C., Birmaher, V., and Casey , B.J. (1999). A developmental functional MRI study of spatial working memory. *NeuroImage* 10: 327–338.

Thorisson, K., Koons, D., and Bolt, R. (1992). Multi-modal natural dialogue, *CHI '92 Video Proceedings*, ACM, 653.

Thorndyke, P.W. and Hayes-Roth, B. (1982). Differences in spatial knowledge acquired from maps and navigation. *Cognitive Psychology* 14: 560–589.

Tittle, J.S., Todd, J.T., Perotti, V.J., and Norman, J.F. (1995). Systematic distortion of perceived three-dimensional structure from motion and binocular stereopsis. *Journal of Experimental Psychology: Human Perception and Performance* 21(3): 663–687.

Todd, J.T. and Mingolla, E. (1983). Perception of surface curvature and direction of illumination from patterns of shading. *Journal of Experimental Psychology: Human Perception and Performance* 9(4): 583–595.

Treisman, A. (1985). Preattentive processing in vision. *Computer Vision, Graphics and Image Processing* 31: 156–177.

Treisman, A. and Gelade, G. (1980). A feature integration theory of attention. *Cognitive Psychology* 12: 97–136.

Treisman, A. and Gormican, S. (1988). Feature analysis in early vision: Evidence from search asymmetries. *Psychological Review* 95(1): 15–48.

Trumbo, B.E. (1981). A theory for coloring bivariate statistical maps. *American Statistician* 35: 220–226.

Tufte, E.R. (1983). *The Visual Display of Quantitative Information.* Graphics Press, Cheshire, CT.

Tufte, E.R. (1990). *Envisioning Information.* Graphics Press, Cheshire, CT.

Tulving, E. (1983). *Elements of Episodic Memory.* Oxford University Press, New York.

Tulving, E. and Madigan, S.A. (1970). Memory and verbal learning. *Annual Review of Psychology* 21: 437–484.

Turk, G. and Banks, D. (1996). Image-guided streamline placement. *SIGGRAPH '96 Proceedings*, ACM, 453–460.

Tweedie, L. (1997). Characterizing interactive externalizations. *CHI '97, ACM, Atlanta Proceedings*, 375–382.

Tweedie, L., Spence, R., Dawkes, H., and Su, H. (1996). Externalizing abstract mathematical models. *CHI '96 Proceedings*, 406–412.

Uomori, K. and Nishida, S. (1994). The dynamics of the visual system in combining conflicting KDE and binocular stereopsis cues. *Perception and Psychophysics* 55(5): 526–536.

Valyus, N.A. (1966). *Stereoscopy.* (Translated from the original). Focal Press, London.

Venturino, M. and Gagnon, D. (1992). Information trade-offs in complex stimulus structures: Local and global levels in naturalistic scenes. *Perception and Psychophysics* 52(4): 425–436.

Veron, H., Southard, D.A., Leger, J.R., and Conway, J.L. (1990). Stereoscopic displays of terrain database visualization. *Proceedings of the 1992 ACM Symposium on Interactive 3D Graphics*, 39–42.

Viguier, A., Clement, G., and Trotter, Y. (2001). Distance perception within near visual space. *Perception* 30: 115–124.

Vinson, N.G. (1999). Design guidelines for landmarks to support navigation in virtual environments. *Proceedings of CHI '99*, ACM, 278–285.

Vishton, P.M. and Cutting, J.E. (1995). Wayfinding, displacements, and mental maps: Velocity fields are not typically used to determine one's aimpoint. *Journal of Experimental Psychology: Human Perception and Performance* 21(5): 978–995.

Vogel, E.K., Woodman, G.F., and Luck, S.J. (2001). Storage of features, conjunctions and objects in visual working memory. *Journal of Experimental Psychology: Human Perception and Performance* 27(1): 92–114.

Wade, N.J. and Swanston, M.T. (1966). A general model for the perception of space and motion. *Perception* 25: 187–194.

Wadill, P. and McDaniel, M. (1992). Pictorial enhancement of text memory: Limitations imposed by picture type and comprehension skill. *Memory and Cognition* 20(5): 472–482.

Wainer, H. and Francolini, C.M. (1980). An empirical enquiry concerning human understanding of two variable maps. *American Statistician* 34(2): 81–93.

Wallach, H. (1959). The perception of motion. *Scientific American* 201 (July): 56–60.

Wallach, H. and Floor, L. (1971). The use of size matching to demonstrate the effectiveness of accommodation and convergence as cues for distance. *Perception and Psychophysics* 10: 423–428.

Wallach, H. and Karsh, E. (1963). The modification of stereoscopic depth perception based on oculomotor cues. *Perception and Psychophysics* 11: 110–116.

Wallach, H. and O'Connell, D.N. (1953). The kinetic depth effect. *Journal of Experimental Psychology* 45: 205–217.

Wang, W. and Milgram, P. (2001). Dynamic viewpoint tethering for navigation in large-scale virtual environments. *Proceedings of the Human Factor and Ergonomics Society*, 1862–1866.

Wang, Y. and Frost, B.J. (1992). Time to collision is signaled by neurons in the nucleus rotundus of pigeons. *Nature* 356: 236–238.

Wang, Y., and MacKenzie, C.L. (1999). Object manipulation in virtual environments: Relative size matters. *Proceedings of CHI '99*, ACM, 48–55.

Wanger, L. (1992). The effect of shadow quality on the perception of spatial relationships in computer-generated images. *Proceedings of the 1992 ACM Symposium on Interactive 3D Graphics*, 39–42.

Wanger, L.R., Ferwander, J.A., and Greenberg, D.A. (1992). Perceiving spatial relationships in computer-generated images. *IEEE Computer Graphics and Applications*, 12(3): 44–58.

Wann, J.P., Rushton, S., and Mon-Williams, M. (1995). Natural problems for stereoscopic depth perception in virtual environments. *Vision Research* 35(19): 2731–2736.

Wann, J.P., Rushton, S.K., and Lee, D.N. (1995). Can you control where you are heading when you are looking at where you want to go? In *Studies in Perception and Action III*, ed. B.G. Bardy, R.J. Bootsmal, and Y. Guiard, 201–210. Lawrence Erlbaum Associates, Hillsdale, NJ.

Ware, C. (1988). Color sequences for univariate maps: Theory, experiments, and principles. *IEEE Computer Graphics and Applications*, Sept., 41–49.

Ware, C. (1989). Fast hill shading with specular reflection and cast shadows. *Computers and Geosciences* 15: 1327–1334.

Ware, C., Arthur, K.W., and Booth, K.S. (1993). Fish-tank virtual reality. In *Proceedings of INTERCHI '93 Conference on Human Factors in Computing Systems*, ACM, New York, 37–42.

Ware, C. and Balakrishnan, R. (1994). Object acquisition in VR displays: Lag and frame rate. *ACM Transactions on Computer Human Interaction* 1(4): 331–357.

Ware, C. and Beatty, J.C. (1988). Using color dimensions to display data dimensions. *Human Factors* 30(2): 127–142.

Ware, C., Bonner, J., Knight, W., and Cater, R. (1992). Moving icons as a human interrupt. *International Journal of Human-Computer Interaction* 4(4): 341–348.

Ware, C. and Cowan, W.B. (1982). Changes in perceived color due to chromatic interactions. *Vision Research* 22: 1353–1362.

Ware, C. and Cowan, W.B. (1987). Chromatic mach bands: Behavioral evidence of lateral inhibition in color vision. *Perception and Psychophysics* 41: 173–178.

Ware, C. and Cowan, W.B. (1990). The RGYB color geometry. *ACM Transactions on Graphics* 9(2): 226–232.

Ware, C. and Franck, G. (1996). Evaluating stereo and motion cues for visualizing information nets in three dimensions. *ACM Transactions on Graphics* 15(2): 121–140.

Ware, C., Gobrecht, C., and Paton, M. (1998). Dynamic adjustment of stereo display parameters. *IEEE Transactions on Systems, Man and Cybernetics* 28(1): 56–65.

Ware, C. and Knight, W. (1995). Using visual texture for information display. *ACM Transactions on Graphics* 14(1): 3–20.

Ware, C. and Lewis, M. (1995). The DragMag image magnifier. *CHI '95 Conference Companion* and *Conference Video Proceedings*, ACM, 407–408.

Ware, C. and Mikaelian, H. (1987). An evaluation of an eye tracker as a device for computer input. *Proceedings of CHI '87*, ACM, 183–188.

Ware, C. and Osborne, S. (1990). Explorations and virtual camera control in virtual three-dimensional environments. *Computer Graphics* 24(2): 175–183.

Ware, C., Plumlee, M., Arsenault, R., Mayer, L.A., Smith, S., and House, D. (2001). GeoZui3D: Data fusion for interpreting oceanographic data. *Oceans 2001 Proceedings*, Hawaii, 1960–1964.

Ware, C., Purchase, H., Colpoys, L., and McGill, M. (2002). Cognitive measurements of graph aesthetics. *Information Visualization* 1: 103–110.

Ware, C. and Rose, J. (1999). Rotating virtual objects with real handles, *ACM Transactions on CHI* 6(2): 162–180.

Warren, W.H. (1984). Perceiving affordances: Visual guidance of stair climbing. *Journal of Experimental Psychology: Human Perception and Performance* 10: 683–703.

Warrick, M.S., Kibler, A., Topmiller, D.H., and Bates, C. (1964). Response time to unexpected stimuli. *American Psychologist* 19: 528.

Watanabe, T. and Cavanaugh, P. (1996). Texture laciness: The texture equivalent of transparency. *Perception* 25: 293–303.

Weigle, C., Emigh, W., Liu, G., Taylor, R., Enns, J., Healey, C. (2000). Oriented texture slivers: A technique for local value estimation of multiple scalar fields *Proceedings of Graphics Interface2000*, 163–170.

Welch, R.B. (1978). *Perceptual Modification: Adapting to Altered Sensory Environments.* Academic Press, New York.

Welch, R.B. and Cohen, M.M. (1991). Adaptation to variable prismatic displacement. In *Pictorial Communication in Virtual and Real Environments*, ed. S.R. Ellis, 295–304. Taylor and Francis, London.

Wetherill, G.B. and Levitt, H. (1965). Sequential estimation of points on a psychometric function. *British Journal of Mathematical and Statistical Psychology* 18: 1–10.

Wickens, C.D. (1992). *Engineering Psychology and Human Performance*, 2d ed. HarperCollins, New York.

Wickens, C.D., Haskell I., and Harte, K. (1989). Ergonomic design for perspective flight path displays. *IEEE Control Systems Magazine* 9(4): 3–8.

Wijk, J.J. van, Wetering, H. van de. (1999). Cushion treemaps. In *Proceedings 1999 IEEE Symposium on Information Visualization (InfoVis '99)*, ed. G. Wills, D. Keim, 73–78, IEEE Computer Society, October 25–26, 1999.

Wilkins, A. (1995). *Visual Stress.* Oxford Psychology Series #24. Oxford University Press, Oxford.

Williams, A.J. and Harris, R.L. (1985). Factors affecting dwell times on digital displays. *NASA Technical Memorandum 86406.* NASA Langley Research Center.

Williams, L.J. (1985). Tunnel vision induced by a foveal load manipulation. *Human Factors* 27(2): 221–227.

Williams, M.D. and Hollan, J.D. (1981). The process of retrieval from very long-term memory. *Cognitive Science* 5: 87–119.

Williams, S.P. and Parrish, R.V. (1990). New computational control techniques and increased understanding for stereo 3-D displays. *Proc. SPIE Stereoscopic Display Applications*, Santa Clara, CA, 73–82.

Wilson, H.R. and Bergen, J.R. (1979). A four mechanism model for threshold spatial vision. *Vision Research* 19: 19–32.

Wise, J.A., Thomas, J.J., Pennock, K., Lantrip, D., Pottier, M., Schur, A., and Crow, V. (1995). Visualizing the non-visual: Spatial analysis and interaction with information and text documents. *Proceedings of IEEE Information Visualization '95*, 51–58.

Witkin, A. and Kass, M. (1991). Reaction diffusion textures. *SIGGRAPH '91 Proceedings: Computer Graphics*, 25(4): 299–308.

Wittenburg, K., Ali-Ahmad, W., LaLiberte, D., Lanning, T. (1998). Rapid-fire image previews for information navigation. *Proceedings, Advance Visual Interfaces (AVI '98)*, 76–82, Aquila, Italy ACM Press, New York.

Wolfe, J.M. and Gancarz, G.G. (1996). Guided Search 3.0. A model of visual search catches up with Jay Enoch 40 Years Later. In *Basic and Clinical Application of Visual Science*, ed. V. Lakshminarayanan, 189–192. Kluwer Academic, Dordrecht, Netherlands.

Wong, P.C. and Bergeron, R.D. (1997). Multivariate visualization using metric scaling. *Proceedings IEEE Visualization*, 111–118.

Wyszecki, G. and Stiles, W.S. (1982). *Color Science Concepts and Methods, Quantitative Data and Formulae*, 2d ed. Wiley Interscience, New York.

Xu, Y. (2002). Limitations of object-based features encoding in visual short-term memory. *Journal of Experimental Psychology: Human Perception and Performance* 28(2): 458–468.

Yaniv, I. and Mayer, D.E. Activation and metacognition of inaccessible stored information: Potential basis for incubation effects in problem solving. *Journal of Experimental Psychology: Learning, Memory and Cognition* 13: 187–205.

Yantis, S. (1992). Multielement visual tracking: Attention and perceptual organization. *Cognitive Psychology* 24: 295–340.

Yates, F.A. (1966). *The Art of Memory.* University of Chicago Press, Chicago.

Yeh, Y. and Silverstein, L.D. (1990). Limits of fusion and depth judgment in stereoscopic color displays. *Human Factors* 32(1): 45–60.

Yoshimura, T., Nakamura, Y., and Sugiura, M. (1994). 3D direct manipulation interface: Development of the Zashiki-Warashi system. *Computers and Graphics* 18(2): 201–207.

Young, F.W., Takane, Y., and de Leeuw, J. (1978). The principal components of mixed measurement level multivariate data: An alternating least squares method with optimal scaling features. *Psychometrika* 43: 279–281.

Young, M.J., Landy, M.S., and Maloney, L.T. (1993). A perturbation analysis of depth perception from combinations of texture and motion cues. *Vision Research* 33: 2685–2696.

Yufic, Y.M. and Sheridan, T.B. (1996). Virtual networks: New framework for operator modeling and interface optimization in complex supervisory control systems. *Annual Review of Control* 20: 179–195.

Zeki, S. (1992). The visual image in mind and brain. *Scientific American* (Sept.): 69–76.

Zeki, S. (1993). *A vision of the brain.* Blackwell, Oxford.

Zhai, S., Buxton, W., and Milgram, P. (1994). The "silk cursor": Investigating transparency for 3D target acquisition. *CHI '94 Proceedings*, ACM, 459–464.

Zhang, J. (1997). The nature of external representations in problem solving. *Cognitive Science* 21(2): 179–217.