

Principles of Animal Communication, Second Edition
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Chapter 4: Light and Visual Signal Production

Literature Cited

- 1** Andersson, S. 1999. Morphology of UV reflectance in a whistling-thrush: implications for the study of structural colour signalling in birds. *Journal of Avian Biology* 30: 193–204.
- 2** Andrews, K., S. M. Reed, and S. E. Masta. 2007. Spiders fluoresce variably across many taxa. *Biology Letters* 3: 265–267.
- 3** Arnold, K. E., I. P. F. Owens, and N. J. Marshall. 2002. Fluorescent signaling in parrots. *Science* 295: 92.
- 4** Aspengren, S., D. Hedberg, H. N. Skold, and M. Wallin. 2009. New insights into melanosome transport in vertebrate pigment cells. *International Review of Cell and Molecular Biology* 272: 245–302.
- 5** Bagnara, J. T. and M. E. Hadley. 1973. *Chromatophores and Color Change*. Englewood Cliffs, NJ: Prentice-Hall.
- 6** Bagnara, J. T. 1998. Comparative anatomy and physiology of pigment cells in non-mammalian tissues. In *The Pigmentary System - Physiology and Pathophysiology* (R. E. Nordlund, R. E. Boissy, V. J. Hearing, R. A. King, and J. P. Ortonne, eds.), pp. 9–40. Oxford: Oxford University Press.
- 7** Bagnara, J. T. 2003. Enigmas of pterorhodin, a red melanosomal pigment of tree frogs. *Pigment Cell Research* 16: 510–516.
- 8** Bagnara, J. T., P. J. Fernandez, and R. Fujii. 2007. On the blue coloration of vertebrates. *Pigment Cell Research* 20: 14–26.
- 9** Ball, P. 1998. *The Self-made Tapestry: Pattern Formation in Nature*. Oxford: Oxford University Press.
- 10** Barreira, A. S., D. A. Lijtmaer, S. C. Lougheed, and P. L. Tubaro. 2007. Subspecific and temporal variation in the structurally based coloration of the Ultramarine Grosbeak. *Condor* 109: 187–192.
- 11** Barrow, G. M. 1963. *The Structure of Molecules*. New York: W. A. Benjamin.

- 12 Benedek, G. B. 1971. Theory of transparency of the eye. *Applied Optics* 10: 459–473.
- 13 Berg, M. L. and A. T. D. Bennett. 2010. The evolution of plumage colouration in parrots: a review. *Emu* 110: 10–20.
- 14 Berthier, S. 2003. *Iridescences, les couleurs physiques des insectes*. Paris: Springer-Verlag.
- 15 Blount, J. D. and K. J. McGraw. 2008. Signal functions of carotenoid colouration. In *Carotenoids: Natural Functions* (G. Britton, ed.), pp. 213–236. Basel: Birkhäuser Verlag.
- 16 Bokony, V., L. Z. Garamszegi, K. Hirschenhauser, and A. Liker. 2008. Testosterone and melanin-based black plumage coloration: a comparative study. *Behavioral Ecology and Sociobiology* 62: 1229–1238.
- 17 Brady, P. and M. Cummings. 2010. Natural History Note Differential Response to Circularly Polarized Light by the Jewel Scarab Beetle *Chrysina gloriosa*. *American Naturalist* 175: 614–620.
- 18 Branham, M. A. and J. W. Wenzel. 2003. The origin of photic behavior and the evolution of sexual communication in fireflies (Coleoptera : Lampyridae). *Cladistics-the International Journal of the Willi Hennig Society* 19: 1–22.
- 19 Brink, D. J. and N. G. van der Berg. 2004. Structural colours from the feathers of the bird *Bostrychia hagedash*. *Journal of Physics D-Applied Physics* 37: 813–818.
- 20 Britton, G. and J. R. Helliwell. 2008. Carotenoid-protein interactions. In *Carotenoids: Natural Functions* (G. Britton, ed.), pp. 99–118. Basel: Birkhäuser Verlag.
- 21 Brush, A. H. 1990. Metabolism of carotenoid pigments in birds. *Faseb Journal* 4: 2969–2977.
- 22 Campbell, A. L., R. R. Naik, L. Sowards, and M. O. Stone. 2002. Biological infrared imaging and sensing. *Micron* 33: 211–225.
- 23 Cloney, R. and E. Florey. 1968. Ultrastructure of cephalopod chromatophore organs. *Zeitschrift für Zellforschung und mikroskopische anatomie* 89: 250–280.
- 24 Cohen, A. C. and J. G. Morin. 1995. Sex and Ostracods. *Trends in Ecology and Evolution* 10: 246–246.
- 25 Demski, L. S. 1992. Chromatophore systems in teleosts and cephalopods: A levels oriented analysis of convergent systems. *Brain Behavior Evolution* 40: 141–156.

- 26 Denton, E. J. and M. F. Land. 1971. Mechanism of reflexion in silvery layers of fish and cephalopods. *Proceedings of the Royal Society of London Series B-Biological Sciences* 178: 43–61.
- 27 Denton, E. J., P. J. Herring, E. A. Widder, M. F. Latz, and J. F. Case. 1985. The roles of filters in the photophores of oceanic animals and their relation to vision in the oceanic environment. *Proceedings of the Royal Society of London Series B-Biological Sciences* 225: 63–97.
- 28 Doucet, S. M. 2002. Structural plumage coloration, male body size, and condition in the Blue-Black Grassquit. *Condor* 104: 30–38.
- 29 Doucet, S. M. and R. Montgomerie. 2003. Multiple sexual ornaments in satin bowerbirds: ultraviolet plumage and bowers signal different aspects of male quality. *Behavioral Ecology* 14: 503–509.
- 30 Doucet, S. M., M. D. Shawkey, G. E. Hill, and R. Montgomerie. 2006. Iridescent plumage in satin bowerbirds: structure, mechanisms and nanostructural predictors of individual variation in colour. *Journal of Experimental Biology* 209: 380–390.
- 31 Doucet, S. M. and M. G. Meadows. 2009. Iridescence: a functional perspective. *Journal of the Royal Society Interface* 6: S115–S132.
- 32 Douglas, R. H., J. C. Partridge, K. S. Dulai, D. M. Hunt, C. W. Mullineaux, and P. H. Hynninen. 1999. Enhanced retinal longwave sensitivity using a chlorophyll-derived photosensitizer in *Malacosteus niger*, a deep-sea dragon fish with far red bioluminescence. *Vision Research* 39: 2817–2832.
- 33 Ducrest, A. L., L. Keller, and A. Roulin. 2008. Pleiotropy in the melanocortin system, coloration and behavioural syndromes. *Trends in Ecology and Evolution* 23: 502–510.
- 34 Durbeej, B. and L. A. Eriksson. 2003. On the bathochromic shift of the absorption by astaxanthin in crustacyanin: a quantum chemical study. *Chemical Physics Letters* 375: 30–38.
- 35 Durrer, H. and W. Villiger. 1966. Schillerfarben der Trogoniden - Eine Elektronenmikroskopische Untersuchung. *Journal für Ornithologie* 107: 1–26.
- 36 Durrer, H. and W. Villiger. 1967. Bildung der Schillerstruktur beim Glanzstar - Elektronenmikroskopische Untersuchungen der Entstehung gasgefüllter Melaninkörner. *Zeitschrift für Zellforschung und Mikroskopische Anatomie* 81: 445–546.

- 37 Durrer, H. and W. Villiger. 1970b. Schillerfarben der Stare (Sturnidae). *Journal für Ornithologie* 111: 133–153.
- 38 Dyck, J. 1971. Structure and spectral reflectance of green and blue feathers of the Lovebird (*Agapornis roseicollis*). *Biol Skrift* 18: 1–67.
- 39 Dyck, J. 1979. Winter plumage of the Rock Ptarmigan: Structure of the air-filled barbules and function of the white colour. *Dansk Orn Foren Tidsskr* 73: 41–58.
- 40 Dyck, J. 1987. Structure and light reflection of green feathers of fruit doves (*Ptilinopus* spp.) and an Imperial Pigeon (*Ducula concinna*). *Biol Skrift* 30: 2–43.
- 41 Faaborg, J. and S. B. Chaplin. 1988. *Ornithology: an ecological approach*. Englewood Cliffs, NJ: Prentice-Hall.
- 42 Fargallo, J. A., T. Laaksonen, E. Korpimäki, and K. Wakamatsu. 2007. A melanin-based trait reflects environmental growth conditions of nestling male Eurasian kestrels. *Evolutionary Ecology* 21: 157–171.
- 43 Fleisher, K. J. and J. F. Case. 1995. Cephalopod predation facilitated by dinoflagellate luminescence. *Biological Bulletin* 189: 263–271.
- 44 Fox, D. L. 1976. *Animal Biochromes and Structural Colours*. Berkeley, CA: University of California Press.
- 45 Fox, D. L. 1979. *Biochromy: Natural Coloration of Living Things*. Berkeley, CA: University of California Press.
- 46 Gagnon, M. M. 2006. Serum biliverdin as source of colouration upon sexual maturation in male blue-throated wrasse *Notolabrus tetricus*. *Journal of Fish Biology* 68: 1879–1882.
- 47 Galusha, J. W., L. R. Richey, J. S. Gardner, J. N. Cha, and M. H. Bartl. 2008. Discovery of a diamond-based photonic crystal structure in beetle scales. *Physical Review E* 77: 4.
- 48 Ghiradella, H. 1989. Structure and development of iridescent butterfly scales: Lattices and laminae. *Journal of Morphology* 202: 69–88.
- 49 Ghiradella, H. 1991. Light and color on the wing - Structural colors in butterflies and moths. *Applied Optics* 30: 3492–3500.
- 50 Ghiradella, H. and J. T. Schmidt. 2004. Fireflies at one hundred plus: A new look at flash control. *Integrative and Comparative Biology* 44: 203–212.

- 51 Ghiradella, H. 2010. Insect cuticular surface modifications: scales and other structural formations. *Advances in Insect Physiology* 38: 135–180.
- 52 Giambattista, A., B. M. Richardson, and R. C. Richardson. 2007. *College Physics*. New York: McGraw Hill.
- 53 Gilbert, S. F. 2006. *Developmental Biology*. Sunderland, MA: Sinauer Associates.
- 54 Goda, M. and R. Fujii. 1995. Blue chromatophores in two species of callionymid fish. *Zoological Science* 12: 811–813.
- 55 Gonzalez, G., G. Sorci, L. C. Smith, and F. de Lope. 2001. Testosterone and sexual signalling in male house sparrows (*Passer domesticus*). *Behavioral Ecology and Sociobiology* 50: 557–562.
- 56 Gonzalez, G., G. Sorci, L. C. Smith, and F. de Lope. 2002. Social control and physiological cost of cheating in status signalling male house sparrows (*Passer domesticus*). *Ethology* 108: 289–302.
- 57 Gracheva, E. O., N. T. Ingolia, Y. M. Kelly, J. F. Cordero-Morales, G. Hollopeter, A. T. Chesler, E. E. Sanchez, J. C. Perez, J. S. Weissman, and D. Julius. 2010. Molecular basis of infrared detection by snakes. *Nature* 464: 1006-U66.
- 59 Greenewalt, C. H., W. Brandt, and D. D. Friel. 1960. Iridescent colors of hummingbird feathers. *Journal of the Optical Society of America* 50: 1005–1013.
- 59 Grether, G. F., G. R. Kolluru, and K. Nersissian. 2004. Individual colour patches as multicomponent signals. *Biological Reviews* 79: 583–610.
- 60 Griffith, S. C., T. H. Parker, and V. A. Olson. 2006. Melanin-versus carotenoid-based sexual signals: is the difference really so black and red? *Animal Behaviour* 71: 749–763.
- 61 Haddock, S. H. D., C. M. McDougall, and J. F. Case. 2010. *The Bioluminescence Web Page*. <http://lifesci.ucsb.edu/~biolum/> (created 1997, updated 2010).
- 62 Haddock, S. H. D., M. A. Moline, and J. F. Case. 2010. Bioluminescence in the Sea. *Annual Review of Marine Science* 2: 443–493.
- 63 Hairston, N. G. 1976. Photoprotection by carotenoid pigments in copepod *Diatomus nevadensis*. *Proceedings of the National Academy of Sciences of the United States of America* 73: 971–974.
- 64 Hanlon, R. T. and J. B. Messenger. 1996. *Cephalopod Behavior*. Cambridge: Cambridge University Press.

- 65 Hegedüs, R., G. Szél, and G. Horváth. 2006. Imaging polarimetry of the circularly polarizing cuticle of scarab beetles (Coleoptera : Rutelidae, Cetoniidae). *Vision Research* 46: 2786–2797.
- 66 Hegyi, G., B. Szigeti, J. Torok, and M. Eens. 2007. Melanin, carotenoid and structural plumage ornaments: information content and role in great tits *Parus major*. *Journal of Avian Biology* 38: 698–708.
- 67 Herring, P. J. 2007. Sex with the lights on? A review of bioluminescent sexual dimorphism in the sea. *Journal of the Marine Biological Association of the United Kingdom* 87: 829–842.
- 68 Hill, G. E. 2006. Environmental regulation of ornamental coloration. In *Bird Coloration* (G. E. Hill and K. J. McGraw, eds.), pp. 507–560. Cambridge, MA: Harvard University Press.
- 69 Hill, G. E. and K. J. McGraw. 2006. *Bird Coloration*. Cambridge, MA: Harvard University Press.
- 70 Hinton, H. E. and D. F. Gibbs. 1969. Diffraction gratings in Plalacrid beetles. *Nature* 221: 953–4.
- 71 Hinton, H. E. and G. M. Jarman. 1972. Physiological color change in Hercules beetle. *Nature* 238: 160–161.
- 72 Hinton, H. E. 1976. Recent work of physical colours of insect cuticle. In *The Insect Integument* (H. R. Hepburn, ed.), pp. 475–496. Amsterdam: Elsevier.
- 73 Hirata, M., K. Nakamura, and S. Kondo. 2005. Pigment cell distributions in different tissues of the zebrafish, with special reference to the striped pigment pattern. *Developmental Dynamics* 234: 293–300.
- 74 Huxley, A. F. 1968. A theoretical treatment of reflexion of light by multilayer structures. *Journal of Experimental Biology* 48: 227–245.
- 75 Inouye, C. Y., G. E. Hill, R. D. Stradi, and R. Montgomerie. 2001. Carotenoid pigments in male House Finch plumage in relation to age, subspecies, and ornamental coloration. *Auk* 118: 900–915.
- 76 Jewell, S. A., P. Vukusic, and N. W. Roberts. 2007. Circularly polarized colour reflection from helicoidal structures in the beetle *Plusiotis boucardi*. *New Journal of Physics* 9: 10.
- 77 Joannopoulos, J. D. 1995. Photonics - Minding the gap. *Nature* 375: 278–278.

- 78** Joannopoulos, J. D., R. D. Meade, and J. N. Will. 1995. *Photonic Crystals: Molding the Flow of Light*. Princeton: Princeton University Press.
- 79** Johnsen, S. and E. A. Widder. 1999. The physical basis of transparency in biological tissue: Ultrastructure and the minimization of light scattering. *Journal of Theoretical Biology* 199: 181–198.
- 80** Johnsen, S. 2000. Transparent animals. *Scientific American* 282: 80–89.
- 81** Johnsen, S. 2001. Hidden in plain sight: The ecology and physiology of organismal transparency. *Biological Bulletin* 201: 301–318.
- 82** Johnsen, S. and H. M. Sosik. 2003. Cryptic coloration and mirrored sides as camouflage strategies in near-surface pelagic habitats: Implications for foraging and predator avoidance. *Limnology and Oceanography* 48: 1277–1288.
- 83** Johnsen, S., E. A. Widder, and C. D. Mobley. 2004. Propagation and perception of bioluminescence: Factors affecting counterillumination as a cryptic strategy. *Biological Bulletin* 207: 1–16.
- 84** Johnsen, S. 2011. *A Photon's Life: Optics for Biologists*. Princeton, NJ: Princeton University Press.
- 85** Kadakaro, A. L., R. J. Kavanagh, K. Wakamatsu, S. Ito, M. A. Pipitone, and Z. A. Abdel-Malek. 2003. Cutaneous photobiology. The melanocyte vs. the sun: Who will win the final round? *Pigment Cell Research* 16: 434–447.
- 86** Keilin, J. 1951. Turacin and the supposed catalytic activity of copper-porphyrins. *Biochemical Journal* 49: 544–550.
- 87** Kelber, A. and D. Osorio. 2010. From spectral information to animal colour vision: experiments and concepts. *Proceedings of the Royal Society B-Biological Sciences* 277: 1617–1625.
- 88** Kemp, D. J., P. Vukusic, and R. L. Rutowski. 2006. Stress-mediated covariance between nano-structural architecture and ultraviolet butterfly coloration. *Functional Ecology* 20: 282–289.
- 89** Kemp, D. J. and R. L. Rutowski. 2007. Condition dependence, quantitative genetics, and the potential signal content of iridescent ultraviolet butterfly coloration. *Evolution* 61: 168–183.
- 90** Kemp, D. J. 2008. Resource-mediated condition dependence in sexually dichromatic butterfly wing coloration. *Evolution* 62: 2346–2358.

- 91** Kemp, D. J., J. M. Macedonia, T. S. Ball, and R. L. Rutowski. 2008. Potential direct fitness consequences of ornament-based mate choice in a butterfly. *Behavioral Ecology and Sociobiology* 62: 1017–1026.
- 92** Keyser, A. J. and G. E. Hill. 1999. Condition-dependent variation in the blue-ultraviolet coloration of a structurally based plumage ornament. *Proceedings of the Royal Society of London Series B-Biological Sciences* 266: 771–777.
- 93** Keyser, A. J. and G. E. Hill. 2000. Structurally based plumage coloration is an honest signal of quality in male blue grosbeaks. *Behavioral Ecology* 11: 202–209.
- 94** Kimball, R. T. and J. D. Ligon. 1999. Evolution of avian plumage dichromatism from a proximate perspective. *American Naturalist* 154: 182–193.
- 95** Kinoshita, S., S. Yoshioka, and K. Kawagoe. 2002. Mechanisms of structural colour in the Morpho butterfly: cooperation of regularity and irregularity in an iridescent scale. *Proceedings of the Royal Society of London Series B-Biological Sciences* 269: 1417–1421.
- 96** Kinoshita, S., S. Yoshioka, and J. Miyazaki. 2008. Physics of structural colors. *Reports on Progress in Physics* 71: 30.
- 97** Kondo, S. and H. Shirota. 2009. Theoretical analysis of mechanisms that generate the pigmentation pattern of animals. *Seminars in Cell and Developmental Biology* 20: 82–89.
- 98** Kritzler, H., D. L. Fox, C. L. Hubbs, and S. C. Crane. 1950. Carotenoid pigmentation of the pomacentric fish *Hypsypops rubicunda*. *Copeia* 125–138.
- 99** Kurachi, M., Y. Takaku, Y. Komiya, and T. Hariyama. 2002. The origin of extensive colour polymorphism in *Plateumaris sericea* (Chrysomelidae, Coleoptera). *Naturwissenschaften* 89: 295–298.
- 100** Land, M. F. 1972. The physics and biology of animal reflectors. *Progress in Biophysics and Molecular Biology* 24: 75–106.
- 101** Large, M. C. J., D. R. McKenzie, A. R. Parker, B. C. Steel, K. Ho, S. G. Bosi, N. Nicorovici, and R. C. McPhedran. 2001. The mechanism of light reflectance in silverfish. *Proceedings of the Royal Society of London Series A-Mathematical Physical and Engineering Sciences* 457: 511–518.
- 102** Leclercq, E., J. F. Taylor, and H. Migaud. 2010. Morphological skin colour changes in teleosts. *Fish and Fisheries* 11: 159–193.
- 103** Lee, J. 1989. Bioluminescence. In *The Science of Photobiology* (K. C. Smith, ed.), pp. 391–417. New York: Plenum Press.

- 103** Lewis, S. M. and C. K. Cratsley. 2008. Flash signal evolution, mate choice, and predation in fireflies. *Annual Review of Entomology* 53: 293–321.
- 105** Li, Q. G., K. Q. Gao, J. Vinther, M. D. Shawkey, J. A. Clarke, L. D'Alba, Q. J. Meng, D. E. G. Briggs, and R. O. Prum. 2010. Plumage Color Patterns of an Extinct Dinosaur. *Science* 327: 1369–1372.
- 106** Lim, M. L. M., M. F. Land, and D. Q. Li. 2007. Sex-specific UV and fluorescence signals in jumping spiders. *Science* 315: 481–481.
- 107** Lloyd, J. E. 1983. Bioluminescence and communication in insects. *Annual Review of Entomology* 28: 131–160.
- 108** Loyau, A., D. Gomez, B. T. Moureau, M. Thery, N. S. Hart, M. Saint Jalme, A. T. D. Bennett, and G. Sorci. 2007. Iridescent structurally based coloration of eyespots correlates with mating success in the peacock. *Behavioral Ecology* 18: 1123–1131.
- 109** Luke, S. M., P. Vukusic, and B. Hallam. 2009. Measuring and modelling optical scattering and the colour quality of white pierid butterfly scales. *Optics Express* 17: 14729–14743.
- 110** Lythgoe, J. N. 1988. Light and vision in the aquatic environment. In *Sensory Biology of Aquatic Animals* (J. Atema, R. R. Fay, and A. N. Popper, eds.), pp. 57–82. Heidelberg: Springer-Verlag.
- 111** Martínez, A. 2009. Donator acceptor map of psittacofulvins and anthocyanins: Are they good antioxidant substances? *Journal of Physical Chemistry B* 113: 4915–4921.
- 112** Martins, E. P., T. J. Ord, and S. W. Davenport. 2005. Combining motions into complex displays: playbacks with a robotic lizard. *Behavioral Ecology and Sociobiology* 58: 351–360.
- 113** Masello, J. F., M. L. Pagnossin, T. Lubjuhn, and P. Quillfeldt. 2004. Ornamental non-carotenoid red feathers of wild burrowing parrots. *Ecological Research* 19: 421–432.
- 114** Masello, J. F., T. Lubjuhn, and P. Quillfeldt. 2008. Is the structural and psittacofulvin-based coloration of wild burrowing parrots *Cyanoliseus patagonus* condition dependent? *Journal of Avian Biology* 39: 653–662.
- 115** Mather, J. A. and D. L. Mather. 2004. Apparent movement in a visual display: the 'passing cloud' of *Octopus cyanea* (Mollusca : Cephalopoda). *Journal of Zoology* 263: 89–94.

- 116** Mähger, L. M., M. F. Land, U. E. Siebeck, and N. J. Marshall. 2003. Rapid colour changes in multilayer reflecting stripes in the paradise whiptail, *Pentapodus paradiseus*. *Journal of Experimental Biology* 206: 3607–3613.
- 117** Mähger, L. M., E. J. Denton, N. J. Marshall, and R. T. Hanlon. 2009. Mechanisms and behavioural functions of structural coloration in cephalopods. *Journal of the Royal Society Interface* 6: S149–S163.
- 118** Mazel, C. H., T. W. Cronin, R. L. Caldwell, and N. J. Marshall. 2004. Fluorescent enhancement of signaling in a mantis shrimp. *Science* 303: 51–51.
- 119** McGraw, K. J. 2003. Melanins, metals, and mate quality. *Oikos* 102: 402–406.
- 120** McGraw, K. J. 2005. The antioxidant function of many animal pigments: are there consistent health benefits of sexually selected colourants? *Animal Behaviour* 69: 757–764.
- 121** McGraw, K. J. and M. C. Nogare. 2005. Distribution of unique red feather pigments in parrots. *Biology Letters* 1: 38–43.
- 122** McGraw, K. J., R. J. Safran, and K. Wakamatsu. 2005. How feather colour reflects its melanin content. *Functional Ecology* 19: 816–821.
- 123** McGraw, K. J. 2006. Mechanisms of carotenoid-based coloration. In *Bird Coloration* (G. E. Hill and K. J. McGraw, eds.), pp. 177–242. Cambridge, MA: Harvard University Press.
- 124** McGraw, K. J. 2006. Mechanisms of melanin-based coloration. In *Bird Coloration* (G. E. Hill and K. J. McGraw, eds.), pp. 243–294. Cambridge, MA: Harvard University Press.
- 125** McGraw, K. J. 2006. Mechanisms of uncommon colors: pterins, porphyrins, and psittacofulvins. In *Bird Coloration* (G. E. Hill and K. J. McGraw, eds.), pp. 354–398. Cambridge, MA: Harvard University Press.
- 126** McGraw, K. J., M. B. Toomey, P. M. Nolan, N. I. Morehouse, M. Massaro, and P. Jouventin. 2007. A description of unique fluorescent yellow pigments in penguin feathers. *Pigment Cell Research* 20: 301–304.
- 127** McGraw, K. J. 2008. An update on the honesty of melanin-based color signals in birds. *Pigment Cell and Melanoma Research* 21: 133–138.
- 128** McGraw, K. J., M. Massaro, T. J. Rivers, and T. Mattern. 2009. Annual, sexual, size- and condition-related variation in the colour and fluorescent pigment content of yellow crest-feathers in Snares Penguins (*Eudyptes robustus*). *Emu* 109: 93–99.

- 129** McPhedran, R. C., N. A. Nicorovici, D. R. McKenzie, G. W. Rouse, L. C. Botten, V. Welch, A. R. Parker, M. Wohlgenannt, and V. Vardeny. 2003. Structural colours through photonic crystals. *Physica B-Condensed Matter* 338: 182–185.
- 130** Meinhardt, H. 1982. *Models of Biological Pattern Formation*. London: Academic Press.
- 131** Mensinger, A. F. and J. F. Case. 1992. Dinoflagellate luminescence increases susceptibility of zooplankton to teleost predation. *Marine Biology* 112: 207–210.
- 132** Michiels, N. K., N. Anthes, N. S. Hart, J. Herler, A. J. Meixner, F. Schleifenbaum, G. Schulte, U. E. Siebeck, D. Sprenger, and M. F. Wucherer. 2008. Red fluorescence in reef fish: A novel signalling mechanism? *BMC Ecology* 8: 16.
- 133** Milicua, J. C. G., A. Barandiaran, J. M. Macarulla, A. M. Garate, and R. Gomez. 1985. Structural characteristics of the carotenoids binding to the blue carotenoprotein from *Procambarus clarkii*. *Experientia* 41: 1485–1486.
- 134** Moiseenkova, V., B. Bell, M. Motamedi, E. Wozniak, and B. Christensen. 2003. Wide-band spectral tuning of heat receptors in the pit organ of the copperhead snake (Crotalinae). *American Journal of Physiology-Regulatory Integrative and Comparative Physiology* 284: R598–R606.
- 135** Montgomerie, R. 2006. Analyzing colors. In *Bird Coloration* (G. E. Hill and K. J. McGraw, eds.), pp. 90–147. Cambridge, MA: Harvard University Press.
- 136** Moran, N. A. and T. Jarvik. 2010. Lateral transfer of genes from fungi underlies carotenoid production in aphids. *Science* 328: 624–627.
- 137** Moreau, R. E. 1958. Some aspects of the Musophagidae. Part 3. *Ibis* 100: 238–270.
- 138** Morehouse, N. I., P. Vukusic, and R. Rutowski. 2007. Pterin pigment granules are responsible for both broadband light scattering and wavelength selective absorption in the wing scales of pierid butterflies. *Proceedings of the Royal Society B-Biological Sciences* 274: 359–366.
- 139** Moreno, J. and J. L. Osorno. 2003. Avian egg colour and sexual selection: does eggshell pigmentation reflect female condition and genetic quality? *Ecology Letters* 6: 803–806.
- 140** Moreno, J., J. L. Osorno, J. Morales, S. Merino, and G. Tomas. 2004. Egg colouration and male parental effort in the pied flycatcher *Ficedula hypoleuca*. *Journal of Avian Biology* 35: 300–304.

- 141** Morin, J. G., A. Harrington, K. Neelson, N. Krieger, T. O. Baldwin, and J. W. Hastings. 1975. Light for all reasons - versatility in behavioral repertoire of flashlight fish. *Science* 190: 74–76.
- 142** Morin, J. G. 1986. Firefleas of the sea - luminescent signaling in marine ostracode crustaceans. *Florida Entomologist* 69: 105–121.
- 143** Morin, J. G. and A. C. Cohen. 2010. It's all about sex: bioluminescent courtship displays, morphological variation and sexual selection in two new genera of caribbean Ostracodes. *Journal of Crustacean Biology* 30: 56–67.
- 144** Moynihan, M. 1985. *Communication and Noncommunication by Cephalopods*. Bloomington, IN: Indiana University Press.
- 145** Murray, J. D. 1989. *Mathematical Biology*. Berlin: Springer-Verlag.
- 146** Nassau, K. 2001. *The Physics and Chemistry of Color, 2nd ed.* New York: John Wiley.
- 147** Nave, C. R. 2005. *HyperPhysics*. <http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html> (created 2000, updated 2010).
- 148** Negro, J. J. and J. Garrido-Fernandez. 2000. Astaxanthin is the major carotenoid in tissues of white storks (*Ciconia ciconia*) feeding on introduced crayfish (*Procambarus clarkii*). *Comparative Biochemistry and Physiology B-Biochemistry and Molecular Biology* 126: 347–352.
- 149** Negro, J. J., J. H. Sarasola, F. Farinas, and I. Zorrilla. 2006. Function and occurrence of facial flushing in birds. *Comparative Biochemistry and Physiology A-Molecular and Integrative Physiology* 143: 78–84.
- 150** Nemésio, A. 2001. Colour production and evolution in parrots. *International Journal of Ornithology* 4: 75–102.
- 151** Nemésio, A. 2005. Fluorescent colors in orchid bees (Hymenoptera : Apidae). *Neotropical Entomology* 34: 933–936.
- 152** Neville, A. C. 1977. Metallic gold and silver colors in some insect cuticles. *Journal of Insect Physiology* 23: 1267–1274.
- 153** New, S. T. D. and R. A. Peters. 2010. A framework for quantifying properties of 3-dimensional movement-based signals. *Current Zoology* 56: 327–336.
- 154** Newman, E. A. and P. H. Hartline. 1982. The infrared “vision” of snakes. *Scientific American* 246: 116–127.

- 155** Nicoletto, P. F. and A. Kodric-Brown. 1999. The use of digitally-modified videos to study the function of ornamentation and courtship in the guppy, *Poecilia reticulata*. *Environmental Biology of Fishes* 56: 333–341.
- 156** Nijhout, H. F. 1997. Ommochrome pigmentation of the linea and rosa seasonal forms of *Precis coenia* (Lepidoptera: Nymphalidae). *Archives of Insect Biochemistry and Physiology* 36: 215–222.
- 157** Nijhout, H. F. 2001. Elements of butterfly wing patterns. *Journal of Experimental Zoology* 291: 213–225.
- 158** Nijhout, H. J. 1991. *The development and evolution of butterfly wing patterns*. Washington, DC: Smithsonian Institution Press.
- 159** Oliphant, L. W. 1987. Pteridines and purines as major pigments of the avian iris. *Pigment Cell Research* 1: 129–131.
- 160** Oliphant, L. W. and J. Hudon. 1993. Pteridines as reflecting pigments and components of reflecting organelles in vertebrates. *Pigment Cell Research* 6: 205–208.
- 161** Ord, T. J., R. A. Peters, C. S. Evans, and A. J. Taylor. 2002. Digital video playback and visual communication in lizards. *Animal Behaviour* 63: 879–890.
- 162** Ortonne, J. P. 2002. Photoprotective properties of skin melanin. *British Journal of Dermatology* 146: 7–10.
- 163** Osborn, K. J., S. H. D. Haddock, F. Pleijel, L. P. Madin, and G. W. Rouse. 2009. Deep-sea, swimming worms with luminescent “bombs”. *Science* 325: 964–964.
- 164** Osorio, D. and A. D. Ham. 2002. Spectral reflectance and directional properties of structural coloration in bird plumage. *Journal of Experimental Biology* 205: 2017–2027.
- 165** Painter, K. J., P. K. Maini, and H. G. Othmer. 1999. Stripe formation in juvenile *Pomacanthus* explained by a generalized Turing mechanism with chemotaxis. *Proceedings of the National Academy of Sciences of the United States of America* 96: 5549–5554.
- 166** Parichy, D. M. 2003. Pigment patterns: fish in stripes and spots. *Current Biology* 13: R947–R950.
- 167** Parichy, D. M. 2006. Evolution of danio pigment pattern development. *Heredity* 97: 200–210.

- 168** Parker, A. R. 1995. Discovery of functional iridescence and its coevolution with eyes in the phylogeny of Ostracoda (Crustacea). *Proceedings of the Royal Society B-Biological Sciences* 262: 349–355.
- 169** Parker, A. R. 1998. Colour in Burgess Shale animals and the effect of light on evolution in the Cambrian. *Proceedings of the Royal Society of London Series B-Biological Sciences* 265: 967–972.
- 170** Parker, A. R., D. R. McKenzie, and M. C. J. Large. 1998. Multilayer reflectors in animals using green and gold beetles as contrasting examples. *Journal of Experimental Biology* 201: 1307–1313.
- 171** Parker, A. R. 1999. Light-reflection strategies. *American Scientist* 87: 248–255.
- 172** Parker, A. R. 2000. 515 million years of structural colour. *Journal of Optics A-Pure and Applied Optics* 2: R15–R28.
- 173** Parker, A. R. 2002. Fluorescence of yellow budgerigars. *Science* 296: 655–655.
- 174** Parker, A. R. and D. R. McKenzie. 2003. The cause of 50 million-year-old colour. *Proceedings of the Royal Society of London Series B-Biological Sciences* 270: S151–S153.
- 175** Parker, A. R., V. L. Welch, D. Driver, and N. Martini. 2003. Structural colour - Opal analogue discovered in a weevil. *Nature* 426: 786–787.
- 176** Parker, A. R. 2004. A vision for natural photonics. *Philosophical Transactions of the Royal Society of London Series A-Mathematical Physical and Engineering Sciences* 362: 2709–2720.
- 177** Parker, A. R. 2005. A geological history of reflecting optics. *Journal of the Royal Society Interface* 2: 1–17.
- 178** Parker, A. R. and N. Martini. 2006. Structural colour in animals - simple to complex optics. *Optics and Laser Technology* 38: 315–322.
- 179** Parker, A. R. 2009. Natural photonics for industrial inspiration. *Philosophical Transactions of the Royal Society A-Mathematical Physical and Engineering Sciences* 367: 1759–1782.
- 180** Partan, S., S. Yelda, V. Price, and T. Shimizu. 2005. Female pigeons, *Columba livia*, respond to multisensory audio/video playbacks of male courtship behaviour. *Animal Behaviour* 70: 957–966.

- 181** Patricelli, G. L., S. W. Coleman, and G. Borgia. 2006. Male satin bowerbirds, *Ptilonorhynchus violaceus*, adjust their display intensity in response to female startling: an experiment with robotic females. *Animal Behaviour* 71: 49–59.
- 182** Pearn, S. M., A. T. D. Bennett, and I. C. Cuthill. 2003. The role of ultraviolet-A reflectance and ultraviolet-A induced fluorescence in the appearance of budgerigar plumage: insights from spectrofluorometry and reflectance spectrophotometry. *Proceedings of the Royal Society of London Series B-Biological Sciences* 270: 859–865.
- 183** Pederzoli, A. and P. Trevisan. 1990. Pigmentary system of the adult alpine salamander *Salamandra atra aurorae* (Trevisan, 1982). *Pigment Cell Research* 3: 80–89.
- 184** Peters, R. A., C. W. G. Clifford, and C. S. Evans. 2002. Measuring the structure of dynamic visual signals. *Animal Behaviour* 64: 131–146.
- 185** Pietsch, T. W. 2009. *Oceanic Anglerfishes: Extraordinary Diversity in the Deep Sea*. Berkeley: University of California Press.
- 186** Protas, M. E. and N. H. Patel. 2008. Evolution of Coloration Patterns. *Annual Review of Cell and Developmental Biology* 24: 425–446.
- 187** Prum, R. O., T. H. Torres, S. Williamson, and J. Dyck. 1998. Coherent light scattering by blue feather barbs. *Nature* 396: 28–29.
- 188** Prum, R. O., R. Torres, S. Williamson, and J. Dyck. 1999. Two-dimensional Fourier analysis of the spongy medullary keratin of structurally coloured feather barbs. *Proceedings of the Royal Society of London Series B-Biological Sciences* 266: 13–22.
- 189** Prum, R. O. and S. Williamson. 2002. Reaction-diffusion models of within-feather pigmentation patterning. *Proceedings of the Royal Society of London Series B-Biological Sciences* 269: 781–792.
- 190** Prum, R. O. and R. H. Torres. 2003. Structural colouration of avian skin: convergent evolution of coherently scattering dermal collagen arrays. *Journal of Experimental Biology* 206: 2409–2429.
- 191** Prum, R. O. 2006. Anatomy, physics, and evolution of structural colors. In *Bird Coloration* (G. E. Hill and K. J. McGraw, eds.), pp. 295–353. Cambridge, MA: Harvard University Press.
- 192** Pye, J. D. 2010. The distribution of circularly polarized light reflection in the Scarabaeoidea (Coleoptera). *Biological Journal of the Linnean Society* 100: 585–596.

- 193** Rao, A. V. and L. G. Rao. 2007. Carotenoids and human health. *Pharmacological Research* 55: 207–216.
- 194** Rassart, M., J. F. Colomer, T. Tabarrant, and J. P. Vigneron. 2008. Diffractive hydrochromic effect in the cuticle of the hercules beetle *Dynastes hercules*. *New Journal of Physics* 10: 14.
- 195** Riley, P. A. 1997. Melanin. *International Journal of Biochemistry and Cell Biology* 29: 1235–1239.
- 196** Rivers, T. J. and J. G. Morin. 2008. Complex sexual courtship displays by luminescent male marine ostracods. *Journal of Experimental Biology* 211: 2252–2262.
- 197** Rivers, T. J. and J. G. Morin. 2009. Plasticity of male mating behaviour in a marine bioluminescent ostracod in both time and space. *Animal Behaviour* 78: 723–734.
- 198** Robison, B. H. and R. E. Young. 1981. Bioluminescence in pelagic octopods. *Pacific Science* 35: 39–44.
- 199** Rosenthal, G. G. 2007. Spatiotemporal dimensions of visual signals in animal communication. *Annual Review of Ecology Evolution and Systematics* 38: 155–178.
- 200** Rowe, M. and K. J. McGraw. 2008. Carotenoids in the seminal fluid of wild birds: interspecific variation in fairy-wrens. *Condor* 110: 694–700.
- 201** Rudiger, W., W. Klose, Vuillaum. M, and M. Barbier. 1968. On structure of pterobilin blue pigment of *Pieris brassicae*. *Experientia* 24: 1000.
- 202** Rutowski, R. L., J. M. Macedonia, N. Morehouse, and L. Taylor-Taft. 2005. Pterin pigments amplify iridescent ultraviolet signal in males of the orange sulphur butterfly, *Colias eurytheme*. *Proceedings of the Royal Society B-Biological Sciences* 272: 2329–2335.
- 203** Rutowski, R. L., J. M. Macedonia, J. W. Merry, N. I. Morehouse, K. Yturralde, L. Taylor-Taft, D. Gaalema, D. J. Kemp, and R. S. Papke. 2007. Iridescent ultraviolet signal in the orange sulphur butterfly (*Colias eurytheme*): spatial, temporal and spectral properties. *Biological Journal of the Linnean Society* 90: 349–364.
- 204** Saranathan, V., C. O. Osuji, S. G. J. Mochrie, H. Noh, S. Narayanan, A. Sandy, E. R. Dufresne, and R. O. Prum. 2010. Structure, function, and self-assembly of single network gyroid (I4(1)32) photonic crystals in butterfly wing scales. *Proceedings of the National Academy of Sciences of the United States of America* 107: 11676–11681.

- 205** Sasaki, A., K. Ikejima, S. Aoki, N. Azuma, N. Kashimura, and M. Wada. 2003. Field evidence for bioluminescent signaling in the pony fish, *Leiognathus elongatus*. *Environmental Biology of Fishes* 66: 307–311.
- 206** Schiedt, K., S. Bischof, and E. Glinz. 1993. Metabolism of carotenoids and in vivo racemization of (3S,3'S)-Astaxathin in the crustacean *Penaeus*. *Methods in Enzymology* 214: 148–168.
- 207** Schiedt, K. 1998. Absorption and metabolism of carotenoids in birds, fish, and crustaceans. In *Carotenoids* (G. Britton, S. Liaaen-Jensen, and H. Pfander, eds.), pp. 285–358. Basel: Birkhäuser.
- 208** Scholes, E. 2008. Structure and composition of the courtship phenotype in the bird of paradise *Parotia lawesii* (Aves : Paradisaeidae). *Zoology* 111: 260–278.
- 209** Schultz, T. D. and M. A. Rankin. 1985. The ultrastructure of the epicuticular interference reflectors of tiger beetles (*Cicindela*). *Journal of Experimental Biology* 117: 87–110.
- 210** Schultz, T. D. and G. D. Bernard. 1989. Pontillistic mixing of interference colors in cryptic tiger beetles. *Nature* 337: 72–73.
- 211** Seago, A. E., P. Brady, J. P. Vigneron, and T. D. Schultz. 2009. Gold bugs and beyond: a review of iridescence and structural colour mechanisms in beetles (Coleoptera). *Journal of the Royal Society Interface* 6: S165–S184.
- 212** Segal, S. J. 1957. Response of weaver finch to chorionic gonadotrophin and hypophysial luteinizing hormone. *Science* 126: 1242–1243.
- 213** Sharma, V., M. Crne, J. O. Park, and M. Srinivasarao. 2009. Structural origin of circularly polarized iridescence in jeweled beetles. *Science* 325: 449–451.
- 214** Shawkey, M. D. and G. E. Hill. 2005. Carotenoids need structural colours to shine. *Biology Letters* 1: 121–124.
- 215** Shawkey, M. D., M. E. Hauber, L. K. Estep, and G. E. Hill. 2006. Evolutionary transitions and mechanisms of matte and iridescent plumage coloration in grackles and allies (Icteridae). *Journal of the Royal Society Interface* 3: 777–786.
- 216** Shawkey, M. D. and G. E. Hill. 2006. Significance of a basal melanin layer to production of non-iridescent structural plumage color: evidence from an amelanotic Steller's jay (*Cyanocitta stelleri*). *Journal of Experimental Biology* 209: 1245–1250.
- 217** Shawkey, M. D., N. I. Morehouse, and P. Vukusic. 2009. A protean palette: colour materials and mixing in birds and butterflies. *Journal of the Royal Society Interface* 6: S221–S231.

- 218** Shawkey, M. D., V. Saranathan, H. Palsdottir, J. Crum, M. H. Ellisman, M. Auer, and R. O. Prum. 2009. Electron tomography, three-dimensional Fourier analysis and colour prediction of a three-dimensional amorphous biophotonic nanostructure. *Journal of the Royal Society Interface* 6: S213–S220.
- 219** Siefferman, L. and G. E. Hill. 2003. Structural and melanin coloration indicate parental effort and reproductive success in male eastern bluebirds. *Behavioral Ecology* 14: 855–861.
- 220** Siefferman, L., G. E. Hill, and F. S. Dobson. 2005. Ornamental plumage coloration and condition are dependent on age in eastern bluebirds *Sialia sialis*. *Journal of Avian Biology* 36: 428–435.
- 221** Smith, C. B. and E. P. Martins. 2006. Display plasticity in response to a robotic lizard: Signal matching or song sharing in lizards? *Ethology* 112: 955–962.
- 222** Srinivasarao, M. 1999. Nano-optics in the biological world: Beetles, butterflies, birds, and moths. *Chemical Reviews* 99: 1935–1961.
- 223** Stavenga, D. G., S. Stowe, K. Siebke, J. Zeil, and K. Arikawa. 2004. Butterfly wing colours: scale beads make white pierid wings brighter. *Proceedings of the Royal Society of London Series B-Biological Sciences* 271: 1577–1584.
- 224** Steffen, J. E. and K. J. McGraw. 2007. Contributions of pterin and carotenoid pigments to dewlap coloration in two anole species. *Comparative Biochemistry and Physiology B-Biochemistry and Molecular Biology* 146: 42–46.
- 225** Stiles, F. G. 1982. Aggressive and courtship displays of the male Anna's Hummingbird. *Condor* 84: 208–225.
- 226** Stradi, R., J. Hudon, G. Celentano, and E. Pini. 1998. Carotenoids in bird plumage: the complement of yellow and red pigments in true woodpeckers (Picinae). *Comparative Biochemistry and Physiology B-Biochemistry and Molecular Biology* 120: 223–230.
- 227** Stradi, R., E. Pini, and G. Celentano. 2001. The chemical structure of the pigments in *Ara macao* plumage. *Comparative Biochemistry and Physiology B-Biochemistry and Molecular Biology* 130: 57–63.
- 228** Strasser, R. and H. Schwabl. 2004. Yolk testosterone organizes behavior and male plumage coloration in house sparrows (*Passer domesticus*). *Behavioral Ecology and Sociobiology* 56: 491–497.

- 229** Tada, H., S. E. Mann, I. N. Miaoulis, and P. Y. Wong. 1998. Effects of a butterfly scale microstructure on the iridescent color observed at different angles. *Applied Optics* 37: 1579–1584.
- 230** Tanaka, G., H. Taniguchi, H. Maeda, and S. Nomura. 2010. Original structural color preserved in an ancient leaf beetle. *Geology* 38: 127–129.
- 231** Turing, A. M. 1952. The chemical basis of morphogenesis. *Philosophical Transactions of the Royal Society of London A* 237: 37–72.
- 232** Umebachi, Y. 1980. Wing pigments derived from tryptophan in butterflies. In *Biochemical and medical aspects of tryptophan metabolism* (O. Hayaishi, Y. Ishimura, and R. Kido, eds.), pp. 117–124. Amsterdam: Elsevier.
- 233** Umebachi, Y. 1985. Papiliochrome, a new pigment group of butterfly. *Zoological Science* 2: 163–174.
- 234** Van Tyne, J. and A. J. Berger. 1976. *Fundamentals of Ornithology*. New York: Wiley.
- 235** van Wijk, A. A. C., A. Spaans, N. Uzunbajakava, C. Otto, H. J. M. de Groot, J. Lugtenburg, and F. Buda. 2005. Spectroscopy and quantum chemical modeling reveal a predominant contribution of excitonic interactions to the bathochromic shift in alpha-crustacyanin, the blue carotenoprotein in the carapace of the lobster *Homarus gammarus*. *Journal of the American Chemical Society* 127: 1438–1445.
- 236** Vigneron, J. P., J. M. Pasteels, D. M. Windsor, Z. Vertesy, M. Rassart, T. Seldrum, J. Dumont, O. Deparis, V. Lousse, L. P. Biro, D. Ertz, and V. Welch. 2007. Switchable reflector in the Panamanian tortoise beetle *Charidotella egregia* (Chrysomelidae : Cassidinae). *Physical Review E* 76: 10.
- 237** Vinther, J., D. E. G. Briggs, J. Clarke, G. Mayr, and R. O. Prum. 2010. Structural coloration in a fossil feather. *Biology Letters* 6: 128–131.
- 238** Vukusic, P., J. R. Sambles, C. R. Lawrence, and R. J. Wootton. 1999. Quantified interference and diffraction in single Morpho butterfly scales. *Proceedings of the Royal Society B: Biological Sciences* 266: 1403–1403.
- 239** Vukusic, P., J. R. Sambles, and C. R. Lawrence. 2000. Structural colour - Colour mixing in wing scales of a butterfly. *Nature* 404: 457–457.
- 240** Vukusic, P., J. R. Sambles, C. R. Lawrence, and R. J. Wootton. 2001. Structural colour: Now you see it - now you don't. *Nature* 410: 36–36.
- 241** Vukusic, P., R. Sambles, C. Lawrence, and G. Wakely. 2001. Sculpted-multilayer optical effects in two species of Papilio butterfly. *Applied Optics* 40: 1116–1125.

- 242** Vukusic, P. and J. R. Sambles. 2003. Photonic structures in biology. *Nature* 424: 852–855.
- 243** Vukusic, P. and I. Hooper. 2005. Directionally controlled fluorescence emission in butterflies. *Science* 310: 1151–1151.
- 244** Vukusic, P., B. Hallam, and J. Noyes. 2007. Brilliant whiteness in ultrathin beetle scales. *Science* 315: 348–348.
- 245** Vulinec, K. 1997. Iridescent dung beetles: a different angle. *Florida Entomologist* 80: 132–141.
- 246** Waterman, T. H. 1981. Polarization sensitivity. In *Comparative Physiology and Evolution of Vision in Invertebrates: B: Invertebrate Visual Centers and Behavior* (H. Autrum, ed.), pp. 281–470. Berlin: Springer-Verlag.
- 247** Waterman, T. H. 1984. Natural polarized light and vision. In *Photoreception and Vision in Invertebrates* (M. A. Ali, ed.), pp. 63–114. New York: Plenum Press.
- 248** Weesie, R. J., J. C. Merlin, H. J. M. De Groot, G. Britton, J. Lugtenburg, F. Jansen, and J. P. Cornard. 1999. Resonance Raman spectroscopy and quantum chemical modeling studies of protein-astaxanthin interactions in alpha-crustacyanin (major blue carotenoprotein complex in carapace of lobster, *Homarus gammarus*). *Biospectroscopy* 5: 358–370.
- 249** Weiskopf, V. F. 1968. How light interacts with matter. *Scientific American* 235: 106–115.
- 250** Welch, V. L. and J. P. Vigneron. 2007. Beyond butterflies - the diversity of biological photonic crystals. *Optical and Quantum Electronics* 39: 295–303.
- 251** Widder, E. A. 1999. Bioluminescence. In *Adaptive mechanisms in the ecology of vision* (S. N. Archer, M. B. A. Djamgoz, E. R. Loew, J. C. Partridge, and S. Vallergera, eds.), pp. 555–581. Boston: Kluwer Academic.
- 252** Widder, E. A. 2002. Bioluminescence and the pelagic visual environment. *Marine and Freshwater Behaviour and Physiology* 35: 1–26.
- 253** Wijnen, B., H. L. Leertouwer, and D. G. Stavenga. 2007. Colors and pterin pigmentation of pierid butterfly wings. *Journal of Insect Physiology* 53: 1206–1217.
- 254** Williams, J. 1970. *Optical Properties of the Sea*. Annapolis, MD: United States Naval Institute.

- 255** Wilson, K., S. C. Cotter, A. F. Reeson, and J. K. Pell. 2001. Melanism and disease resistance in insects. *Ecology Letters* 4: 637–649.
- 256** Wilson, T. and J. W. Hastings. 1998. Bioluminescence. *Annual Review of Cell and Developmental Biology* 14: 197–230.
- 257** Woodland, D. J., A. S. Cabanban, V. M. Taylor, and R. J. Taylor. 2002. A synchronized rhythmic flashing light display by schooling *Leiognathus splendens* (Leiognathidae : Perciformes). *Marine and Freshwater Research* 53: 159–162.
- 258** Yoshioka, S. and S. Kinoshita. 2002. Effect of Macroscopic Structure in Iridescent Color of the Peacock Feathers. *Forma* 17: 159–181.
- 259** Yoshioka, S. and S. Kinoshita. 2004. Wavelength-selective and anisotropic light-diffusing scale on the wing of the Morpho butterfly. *Proceedings of the Royal Society of London Series B-Biological Sciences* 271: 581–587.
- 260** Yoshioka, S. and S. Kinoshita. 2006. Structural or pigmentary? Origin of the distinctive white stripe on the blue wing of a Morpho butterfly. *Proceedings of the Royal Society B-Biological Sciences* 273: 129–134.
- 261** Yoshioka, S., E. Nakamura, and S. Kinoshita. 2007. Origin of two-color iridescence in rock dove's feather. *Journal of the Physical Society of Japan* 76: 4.
- 262** Zhang, F. C., S. L. Kearns, P. J. Orr, M. J. Benton, Z. H. Zhou, D. Johnson, X. Xu, and X. L. Wang. 2010. Fossilized melanosomes and the colour of Cretaceous dinosaurs and birds. *Nature* 463: 1075–1078.
- 263** Zi, H., X. D. Yu, Y. Z. Li, X. H. Hu, C. Xu, X. J. Wang, X. H. Liu, and R. T. Fu. 2003. Coloration strategies in peacock feathers. *Proceedings of the National Academy of Sciences of the United States of America* 100: 12576–12578.