

Cambridge University Press

0521498902 - An Introduction to the Biology of Vision

James T. McIlwain

Index

[More information](#)

# INDEX

- a-wave, 98  
aberration, 35, 39, 42–3, 148, 154  
    chromatic, 40, 151  
    spherical, 40, 47, 151  
absorption spectra, 5, 67, 95, 98, 184  
accessory optic system, 51, 57, 76  
accommodation, 25, 43  
acetylcholine, 44, 91, 113  
acuity, 11, 38, 116, 124, 150, 152  
    foveal, 92, 144, 155  
    grating, 146, 157  
    hyperacuity, 148, 167  
    MAR, 143, 144, 146, 156  
    minimum separable, 143  
    Snellen, 144  
    stereo, 167, 171  
    vernier, 148, 157  
adaptation, 91, 144  
    network, 93  
    receptor, 93  
aliasing, 153  
amacrine cell, 76, 77, 86, 91  
    AII, 82, 87, 91  
    displaced, 77  
amblyopia, 124–5  
antenna pigments, 188  
anterior chamber, 11, 12, 18  
APB, 2-amino-4-phosphonobutyric  
    acid, 79, 86  
aqueous humor, 23, 34, 46  
area centralis, 88  
arrestin, 70  
astigmatism, 41  
ATP, adenosine triphosphate, 16, 71  
  
b-wave, 99  
bandpass, 146, 153, 155  
binocular vision, 111, 125, 164, 168,  
    172, 177  
bipolar cell, 93, 95  
    cone, 87  
    electroretinogram, 98–9  
    flat, 77, 79  
    invaginating, 77  
    midget, 77, 92, 151  
    off, 77, 79  
    on, 77, 79  
    receptive field, 80  
    rod, 77, 79, 86–7  
bleaching, 67, 70, 71, 74, 93–7  
blind spot, 51, 53  
blob, *see* cytochrome oxidase

Cambridge University Press

0521498902 - An Introduction to the Biology of Vision

James T. McIlwain

Index

[More information](#)

218

## Index

- blur circle, 40, 43, 148, 149
- Brodmann's areas, *see* visual cortex, terminology
- c-wave, 98
- calcarine cortex, *see* visual cortex, terminology
- calcium ions, 70, 74, 96
- camera eye, 9
- canal of Schlemm, 18
- center-surround organization, 101, 112, 126, 193
- cerebellum, 203, 205–8
- cGMP, cyclic guanosine monophosphate, 79
- choroid, 20, 22–3, 25, 71, 151
- choroid plexus, 22
- chromophore, 67, 70, 74, 183
- ciliary
  - body, 12, 23, 45
  - ganglion, 44, 56
  - muscle, 12, 45, 48
  - process, 14, 17–8, 23
  - stalk, 63, 71
- color vision, 92, 136
  - color constancy, 195
  - deficiencies, 189–91
  - dichromacy, 189, 190
  - neutral point, 185
  - opponency, 101, 103, 112, 191–4
  - simultaneous color contrast, 191
  - successive color contrast, 191
  - trichromacy, 111, 184–91
  - Young-Helmholtz theory, 184
- compound eye, 9, 60, 72, 156, 188
- cone, 5, 63, 71
  - adaptation, 92, 93
  - electroretinogram, 99
  - foveal, 92, 151, 189
  - mosaic, 144, 148, 152–5
  - pathway, 87
  - pedicle, 77
  - pigment, 67, 186, 189, 190
  - synapse, 79
  - types, 151, 184–90
- contrast
  - definition, 146
  - enhancement, 89, 91, 126
  - sensitivity function or CSF, 146, 148, 152
- simultaneous color, 191, 194
- successive color, 191, 194
- cornea, 9, 11, 15–8, 25, 34
  - development, 21
  - epithelium, 15
  - ommatidial, 156, 188
  - optical power, 37, 46
  - transparency, 30
- corpus callosum, 116, 177
- cortex, *see* visual cortex
- cortico-collicular projection, 58, 121
- cortico-geniculate projection, 58, 121
- coverage factor, 88, 159
- critical period, 124
- cytochrome oxidase, 120, 132, 136, 195
- d-wave, 98
- dark current, 64–71
- depth of field, 43
- depth perception, 164–82
- deutanopia, 189–90
- development
  - ocular, 19–26
  - ocular dominance, 124
- diacylglycerol, 74
- diencephalon, 19, 20
- diffraction, 43, 149, 156
- diopter, 37
- diplopia, 164
- directional selectivity, 80, 86, 126, 129, 137, 176
- disparity, *see* retinal disparity
- distributed code, 186, 213
- dopamine, 82, 91
- duplex retina, 91
- dyad, 82
- Edinger-Westphal nucleus, 56
- electrical synapse, 81, 87
- electromagnetic waves, 3, 5, 27, 28
- electroretinogram (ERG), 98–9
- embryonic fissure, 21
- emmetropia, 41
- ensemble code, *see* distributed code
- enzymatic cascade, 67
- equidistant horizon, 171
- eye movements
  - describing, 199
- extraocular muscles, 200

- nystagmus, 204
- optokinetic, 204, 206
- physiologic nystagmus, 203
- recording methods, 198
- saccade, 197, 203, 207, 208
- smooth pursuit, 202, 203
- eye spots, 8
- feature detector, 134
- feedback, 70, 82, 94, 112, 113
- filters
  - oil droplet, 187
  - ommatidial, 188
- filtration angle, 18
- focal length
  - eye, 45
  - thin lens, 35
- focal point, 35
- folding frequency, *see* Nyquist frequency
- fovea, 11, 51
  - cortical representation, 54
  - development, 24
  - evolution, 190
  - receptive fields, 88
- frontal eye fields, 207
- frontal lobe, 207–8
- frontoparallel plane, 171
- fusion, 164–6
- GABA,  $\gamma$ -aminobutyric acid, 91, 112, 119, 133
- gain
  - network, 94
  - photoreceptor, 94, 96
  - VOR, 204–6
- ganglion cell
  - comparative issues, 107
  - displaced, 76
  - layer, 24
  - morphologic classes: cat alpha & beta, 104; primate midget & parvocellular, 102
  - physiologic classes: cat W, X & Y cells, 117; primate M & P cells, 155, 193, 195
- gap junction, 87
- glaucoma, 18
- glutamate, 79, 91
- glycine, 87, 91
- guanylate cyclase, 70
- hemianopia, 53
- Hering, E., 191
- Hermann grid, 89
- hierarchical model, 128
- horizontal cell, 75, 77, 81, 82, 86
- horopter, 168–72, 177
- Huygens's principle, 31
- hypercolumn, 131, 162
- hypermetropia, hyperopia, 41
- hypothalamus, 51, 100, 105
- image quality, 24–5, 34, 44, 148
- incidence, angle of, 32
- inner nuclear layer, 24, 75–7, 82, 84
- inner plexiform layer, 24, 76, 77
- interference, 28–30
- interommatidial angle, 156
- interplexiform cell, 76, 82
- intraocular pressure, 14, 17, 48
- iris, 11, 14, 18, 44
  - accommodation, 46, 48
  - development, 20, 23
  - optical function, 42
- koniocellular pathway, 120
- labeled line, 134
- lateral geniculate nucleus, 51, 59, 100, 105, 194
- binocular interactions, 110, 113
- cortico-geniculate projection, 58, 112
- geniculo-cortical projection, 116, 129
- lamination, 111
- M-, P-, and K-type cells, 120
- magnocellular layer, 101, 102, 111, 195
- nonretinal inputs, 112
- parvocellular layer, 101, 102, 111, 195
- projection column, 110
- receptive fields, 112, 122
- W-, X-, and Y-type cells, 107
- lateral inhibition, 81, 89, 91, 126
- lens, 9, 11, 14, 17
  - accommodation, 44–6
  - development, 19, 21

- lens (*cont.*)
  - diverging, 38
  - optical power, 37
  - shape, 12
  - spectacle, 39
  - thin, 34–7
  - transparency, 30
  - vesicle, 21
- line-spread function, 149
- M pathway, 102, 120
- Mach band, 89
- macula lutea, 18, 54, 151, 189
- macular sparing, 54
- magnesium ions, 64
- magnification
  - factor, 54, 59, 152, 156, 161–2
  - image, 36
  - retinal, 155
- magnocellular layer, *see* lateral geniculate nucleus
- map, retinotopic, *see* retinotopy
- medial longitudinal fasciculus, 201
- Meyer's loop, 53
- microspectrophotometry, 186
- midbrain, 51, 55–60, 105–6, 195
  - oculomotor control, 202, 208, 212
- miosis, 44
- modulation transfer function, 148–9, 155
- monochromacy, 93, 189
- monocular crescent, 51
- motion parallax, 166
- Müller cell, 76, 97
- Müller's law, 134
- mydriasis, 44
- myopia, 41
- nasotemporal raphé, 178
- near response, 46
- neurotransmitter, *see* specific agent
- Newton, Isaac, 184
- nodal point, 36, 37
- nonius horopter, 171
- norepinephrine, 44
- nucleus rotundus, 59
- Nyquist frequency, 153–4
- occipital lobe, 51, 54, 116
- ocellus, 9
- ocular dominance
  - column, 122–5, 131
  - histogram, 123
- oil droplet, *see* filters
- ommatidium, 9, 72, 156, 188
- opsin, 5, 67, 70, 74, 183, 184
- optic
  - chiasm, 49–53, 57
  - disc or papilla, 11, 13, 18, 21, 51
  - nerve, 11, 20–1, 51, 76
  - tract, 51, 101, 103
  - vesicle, 19, 21, 76
- orientation
  - column, 129–32
  - selectivity, 126, 128–35, 137, 195
- outer nuclear layer, 24
- outer plexiform layer, 24
- P pathway, 102, 110, 120
- Panum's fusional area, 165, 168
- Panum's zone of single vision, 165, 167, 171, 176
- parallel processing, 100–1
- parietal lobe, 138, 207–8, 212
- parietal stream, 135–8
- parvocellular layer, *see* lateral geniculate nucleus
- PGO waves, 114
- phosphodiesterase, 68
- photopic vision, 111, 150
- photoreceptor, 8, 61–74
  - adaptation, *see* adaptation, receptor axons, 75
  - blood supply, 14, 20
  - development, 24
  - disc shedding, 71
  - inner segment, 63, 64, 71, 151, 153
  - invertebrate, 72, 188
  - layer, 24
  - ommatidial, 9, 72
  - outer segment, 63, 70, 71
  - oxygen consumption, 71
  - synapses, 77–80, 91
- phototransduction, 64–72
- pigment epithelium, 11, 14, 71, 97, 98
  - development, 19, 20, 22
  - photopigment regeneration, 70, 96
- point image, 89, 157–62
- point-spread function, 149
- polarized light sensitivity, 73

- posterior chamber, 11, 18
- posterior nodal distance, 37
- potassium ions, 64
- presbyopia, 45
- prectectum, 51, 56, 100, 105, 206
- protanopia, 189–90
- pupil, 11, 18
  - accommodation, 46
  - optical function, 42–3, 154
- pupillary light reflex, 56, 91
- Purkinje shift, 92
- quadrantanopia, 53
- random-dot stereogram, 172
- real image, 36
- receptive field
  - definition, 80
  - difference-of-Gaussians model, 84
  - disparity, 175
- receptive-field image, 160
- reciprocal synapse, 82
- reflectance, 183
- refraction, 30–4
  - angle of, 32
  - index of, 31
- refractive error, 40
- retina, 11
  - circulation, 13
  - detached, 20
  - development, 24
  - layers, 75–7
- retinal
  - correspondence, 168–73
  - densitometry, 94
  - disparity, 167
- retinal, 11-*cis*, 5, 67
- retinomotor movements, 97
- retinopathy of prematurity, 21
- retinotopy, 54–5, 58, 110, 112, 116, 135, 213
- retinula, 72
- rhabdom, 72
- rhodopsin, 67–71, 92, 96, 98, 188, 190
- ribbon, synaptic, 77, 82
- rod, 5, 63–7, 71
  - adaptation, 92–7
  - bipolar cell, *see* bipolar cell, rod
  - electroretinogram, 99
- pathway, 86–7, 101
- saturation, 96
- spherule, 77
- sampling theory, 153
- scatter, 28–30
- scotoma, 53
- scotopic vision, 111, 150
- serial processing, 128
- serotonin, 113
- sign-conserving synapse, 79, 84
- sign-inverting synapse, 79, 87
- Snell's law, 32
- solar spectrum, 3
- somatostatin, 91
- spatial frequency, 146
- spectral sensitivity, *see* absorption spectra
- stabilized image, 204
- stereopsis
  - global, 174
  - in visual quadrants, 180
  - local, 174
  - midline, 176
  - neural substrate, 174
- Stiles-Crawford effect, 151
- strabismus, 198
- substance P, 91
- superior colliculus, 51, 55, 58–9, 100, 102, 116, 203
- tear film, 15
- tectum, 55, 59
- temporal lobe, 53, 136–8, 195, 207, 208
- temporal stream, 135–8
- transducin, 68
- transparency, 28–30
- triad, 77
- tritanopia, 189–90
  - foveal, 189
- univariance, principle of, 184
- uvea, 12, 13, 22–3
- V1, V2, V3, *see* visual cortex, terminology
- Vieth-Müller circle, 170–1, 180
- virtual image, 38
- visual angle, 38

Cambridge University Press

0521498902 - An Introduction to the Biology of Vision

James T. McIlwain

Index

[More information](#)

222

## Index

- visual cortex
  - binocular neurons, 111, 137, 179
  - cell types, 117
  - color-opponent cells, 195
  - complex cell, 126
  - extrastriate, 135
  - foveal magnification, 54
  - geniculate afferents, 120
  - lamination, 120
  - magnification factor, 54
  - microcircuitry, 120
  - MT, 207
  - point image, 162
  - primary, 51
  - receptive fields, 126
- retinotopy, 116
- simple cell, 126
- and smooth pursuit, 207
- striate cortex, 51, 54, 59, 115–6, 160
- terminology, 51
- visual field, 49–54
  - binocular, 51, 102, 124
  - monocular, 49
- visual streak, 88
- visuotopy, *see* retinotopy
- vitamin A, 5, 67, 70, 74
- vitreous humor, 11, 14, 18, 21, 76
- Young, Thomas, 184