

Subject Index

- Activity, season of, 219–220
Adaptations, diversity of, 3, 212–230, 278–297
Additivity, 200
Aestivation, terminology, 12, 13, 14; see also Dormancy
Age, effects on diapause, 77–78, 126, 188
Aggregation, 34, 43
Allochrony, 294
Allopause, terminology, 13
Amino acids, 33
Anaerobic conditions/Anoxia, 32, 40, 41, 157, 246
Anatrepsis, 64, 65
Annual rhythms, 178–187, 187–190
 of physical factors, 83–98
Arctic insects, 47, 49, 56, 57, 63, 66, 79, 91, 117, 130, 176, 186, 212, 221, 224, 285, 289
Artificial shocks, 155
Asynchrony of development, 286–287
Ateleodiapause, terminology, 13, 14
Athermopause, terminology, 13, 14, 15
- Behaviour
 during diapause, 28, 34, 43
 post-diapause, 43
 pre-diapause, 34, 43, 259
 See also Mating
Bimodal emergence, 173, 176–178
Biochemistry, 32–33
Biological clocks, 2, 17, 244–253
 cellular or molecular mechanisms, 250–251
 experimental protocols, 244–247
Blastokinesis, 64, 65
- Canalization, 293
Carotenoids, 240, 241
Caves, 91, 131, 235
Changes in response, 144, 158, 209
Characteristics of dormancy, 19–45; see specific entries under Diapause
Chemical factors
 in control of development, 216, 218
 in induction of diapause, 128–129
 summary of effects, 216, 218
 to end diapause, 155
Chromosomal puffs, 24
Circadian elements in response, 54, 248–250, 251, 252–253
Circannual rhythms, 187; see also Annual rhythms
Classifications of diapause, 12–16, 18
Climates, 83–85, 92, 97–98, 101–102, 291–292
Clinal changes in response, 160, 165–166, 172–173, 202
Clock, see Biological clock
Cocoons
 during diapause, 35, 36, 66
 and light reception, 231, 232–235
Cold-hardiness and diapause, 33, 41–42, 45
Colour, during diapause, 25–26, 38, 39, 44
Colour of light, see Light, wavelength
Competition, 3, 58, 286–287
Completion, 133, 138, 139
 terminology, 11
Consecutive dormancy, terminology, 8
Continuous responses to cues, 225–226
Counter for photoperiodic response, 244, 251–252
Crep, 91
Critical photoperiod, see Photoperiod, critical
Crowding, see Density
Cryophase, 121, 122
Cryoprotectants, 20, 33, 41, 42, 262–263, 292;
 see also Cold-hardiness
Cryptobiosis, 42
Cues
 environmental, 1, 46–47, 83–103, 216, 279
 continuous responses to, 225–226
 interaction of, 101–102
 in induction of diapause, 131; see also individual cues
 in experiments, 268–270
 reception of, 80, 89, 96, 231–243
 reliability of, 85–86, 102–103
 seasonal changes in responsiveness to, 187–190
 See also Photoperiod, Temperature, Food, Moisture, etc.
Cuticle, changes during diapause, 23, 35, 42
Cyclomorphosis, 23
Cyttoplasmic factors, 188, 196, 200
- Day, sidereal, 86
Day-degrees, 51, 178, 221
Daylength, see Photoperiod
Degrowth, see Growth, reverse
Delayed metamorphosis, terminology, 9
Density
 as an indicator of season, 100–101
 effects on size, 214
 in control of growth, 210–212
 in diapause development, 154
 in induction of diapause, 127–128, 286
 summary of effects, 216, 218
Desert insects, 157, 186, 190, 219, 221
Description of dormancy responses, 266–277
Desiccation and diapause, 23–24, 35, 42
Development
 direct control of, 46–59
 disturbance of, 116–117
 models for, 50–52
 rate of, see Growth-rate
 requirement for change in conditions, 16, 57, 61, 144–145, 150, 187, 209, 280
 resumption in spring, 55, 159, 178, 185–186, 224

Developmental pathways, see Life cycle

Diapause

activity during, 28, 34, 37, 42, 43
 adult, 71–74; and see other topics
 age effects, 70–71, 126, 188
 and cold-hardiness, 33, 41–42, 45
 and fecundity, 39–40, 174, 192, 281
 and migration, 43–44, 227–228
 and physiology, 290–291
 and geography, 291–292
 and habitat, see Habitat
 and speciation, 294–295
 and taxonomic group, 61–63, 290–291
 biochemical changes for, 32–33, 44
 characteristics of, 19–45
 classifications of, 12–16, 18
 cocoons for, 35, 36, 42
 colour changes, 25–26, 38, 44
 definitions of, 7–10
 embryonic, 17, 64–65, 78, 128–129, 157, 281;
 and see other topics
 end of, see End of diapause
 facultative, 16
 food reserves, see Fat, reserves for diapause
 genetics of, see Genetics of diapause
 hormonal control, 254–265
 in other organisms, 3, 7, 281, 282–283
 independent evolution of, 3–4, 282–283,
 290–291
 induction, see Induction of diapause
 integration of responses, 203, 216–230, 287–288
 intensification of, 10, 11, 134, 149
 larval, 66–70; and see other topics
 life stages of, terminology, 17
 metabolic changes, 27–33, 160
 mortality during, 40, 42
 number during life cycle, see Life cycle
 obligate, 16, 60–61, 106, 127, 161, 176, 279, 280,
 293
 practical implications, 2
 prepupal, 66–68
 prolonged, 40, 137, 170, 175, 176, 178–187, 200,
 285
 proteins, see Proteins
 pupal, 70–71; and see other topics
 re-entry into, 71, 149, 221, 278
 reproductive structures, 35, 37
 reproductive, terminology and stages, 17, 71–74
 resistance to adverse conditions, 32, 35, 40–43
 respiratory rates, 27–32, 139, 270
 selection for, see Selection
 sensitive stages for, 60–82
 duration of, 69–70, 71
 in previous generation, 74–77
 regional differences, 162
 sexual differences, 27, 43, 170, 174–175
 size of individuals, 26, 40, 186
 stages of, 10–12, 17, 60–82
 variation in, 64
 at different latitudes, 63
 in aestivation and overwintering, 63
 in experiments, 270–271
 in taxonomic groups, 61–63, 290–291

regional differences, 162

See also names of stages

structural changes, 20, 23–25, 37–39
 terminology, 7–10, 18

Diapause development, 56, 133, 138–155, 158–159

individual differences, 173, 175, 185, 187

regional differences, 162, 170–171, 172

sexual differences, 175

spontaneous, 139, 154–155, 158, 159, 279–280

terminology, 10, 11

See also Diapause intensity

Diapause hormone, of silkworm, 262–263

Diapause intensity, 133–138, 139, 169–170, 171

change in adults, 134–135

definition, 17

effect of inductive conditions on, 77, 136–138

individual differences in, 133–135, 187

regional differences in, 169–170, 172

sexual differences in, 170, 175

See also Diapause, intensification of

Diapause regulating processes, terminology, 138

Diapauseless, 260

Dispersal, see Migration

Disturbance, in induction of diapause, 127

Dominance, 198

Dormancy

characteristics of, 19–45

definitions of, 7–10

number during life cycle, 218–221

See also Quiescence, Diapause

Dual system theory, 250

Ecdysone, 150, 256, 257, 258, 259, 260, 262, 263,
 264

Ecdysterone, see Moulting hormone

Ecotypes, 166, 172, 173

Ectoparasites, diapause responses of, 126, 153

Egg diapause, see Diapause, embryonic

Electromagnetic fields, 92, 250

Embryogenesis, 64, 65

End of diapause

by artificial shocks, 155

by chemical factors, 155

by food, 153

by host factors, 153

by mating, 154–155

by moisture, 152–153

by photoperiod, 139–146, 151–152, 170

by temperature, 146–152, 170–171

Endocrines, see Hormonal control

Endogenous seasonal patterns, 187–190

Energy and diapause, 227–228

Environmental factors, responses to, 5; see also

Cues, and entry under each factor

Enzymes, 33

Epistasis, 200

Equator, 83

Equinox, 83, 84, 86, 87, 88, 89, 91, 144

Eudiapause, terminology, 10, 12, 13, 15

Evolution of dormancies, 282–295; see also

Selection

Evolutionarily stable strategies, 293

- Experimental techniques
 biological clocks, 244-247
 cue reception, 231-232, 236
 general, 266-277
 hormones, 254-255
 summary of difficulties, 276
 External coincidence model, 248-249
 Extra-retinal reception of photoperiodic cues, 89, 240, 242
- Factors controlling seasonal development, diversity of, 216-218, 271-281, 297
- Fat (lipid)
 reserves for diapause, 19, 20-22, 32, 39, 40, 150, 153, 227-228, 264
 related to food supply, 124, 125
 utilization of reserves, 20, 39, 150
 Fat body, 19, 20, 25, 35, 39, 44, 71, 124, 213, 264
 Fatty acids, 32, 123, 160
 Fecundity, 39-40, 48, 174, 187, 192, 212, 213, 214-216, 281
 Flexible responses to cues, 226
 Flight muscles, 20, 24
 Flooding, protection from, during diapause, 35
- Food
 as a cue, 86, 99-100
 consumption during diapause, 9, 14, 26, 28, 34, 40
 direct effects on development, 49, 53, 57, 214
 direct effects on ovarian development, 49-50, 215
 in diapause development, 153, 158-159
 in induction of diapause, 122-126, 128, 131, 169, 172, 281
 influence on diapause intensity, 138
 pre-diapause, 20, 26, 34, 124, 125
 quality of, 123-125
 storage for diapause, see Fat, reserves for diapause
 summary of effects, 216, 218
- Freezing
 protection from, during diapause, 35
 to end diapause, 155
 See also Cold-hardiness
- Genetic assimilation, 293
 Genetics of diapause, 192-201
 additivity, 200
 and biological clocks, 252
 cytoplasmic factors, 188, 200
 dominance, 198
 epistasis, 200
 heritability, 198
 in *Bombyx mori*, 200-201
 linkage, 198-199
 "Mendelian" inheritance, 196, 295
 pleiotropism, 200, 288
 polygenic inheritance, 196-197, 201, 202
 sex-linkage, 199-200
- Geographical differences, see Regional differences
 Geophysical cues, 85, 91-92, 187, 250
 Geotaxis, 34
- Glycerol, 20, 23, 41, 42, 263
 Glycogen, 20, 42, 262, 263
 Gonotrophic cycle, 270
 Gonotrophic dissociation, 17, 34
 Growing-season, 171, 201, 221
- Growth
 and development, 46
 reverse, 27, 49, 176, 222, 227
- Growth-rate
 and light, 54, 239, 241
 control by direct action of temperature and other factors, 47, 50-54
 control by seasonal cues, 39, 203-212, 221-222, 225-227, 281
 in relation to diapause, 207-208, 221
 regional differences in, 58, 171
 sexual differences in, 175
- Habitats
 and cold-hardiness, 42
 and direct control of development, 49, 52, 54-58
 and environmental cues, 85, 91, 96, 103, 117, 130-131, 159, 242, 243
 and presence of diapause, 219, 291
 and spectral composition, 242
 heterogeneity or unpredictability of, 81, 130, 134, 178, 185-187, 191-192, 201, 219, 230, 280, 287, 289-290
 measurement of conditions, 277
 selection of, 34, 43, 56-57, 78
- Haemocytes, 24
 Heart rate, 27
 Heritability, 198
 Heterodynamic development, terminology, 7
 Hibernation, terminology, 13, 14; and see Overwintering
- History of studies of dormancy, 1-3
 Hormonal control of diapause, 2, 25, 33, 254-265, 291, 292
 in adults, 258, 260-262
 in eggs, 262-263
 in larvae and pupae, 257-258, 259-260
 See also Juvenile hormone, Moulting hormone, Prothoracicotropic hormone
- Horotelic processes, 16, 138
- Host factors
 in diapause development, 153
 in induction of diapause, 86, 125-126
- Hour-glass timers, 247, 249, 250, 252, 253
 Humidity, see Moisture
- Hybridization, 173, 196, 197, 198, 199, 201, 267
 Hyperpause, terminology, 12, 13
 Hypobiosis, terminology, 7
- Inactivity and mortality, 42, 43
 Individual differences, see Variation
- Induction of diapause
 by chemical factors, 128-129
 by density, 127-128
 by food, 122-126, 131, 169
 by moisture, 127
 by photoperiod, 104-114, 129, 162-168

- by temperature, 114–122, 130, 168
- individual differences in, 173, 187–188
- regional differences in, 162–169
- response curves, see Photoperiod, Temperature, Thermoperiod
- sexual differences in, 175
- terminology, 10
- Inheritance of diapause, 196–201
- Injury, to end diapause, 155, 156
- Instars, number of, 57, 209
- Integration of diapause responses, 203, 216–230, 287–288, 296–297
- Intensity of diapause, see Diapause intensity
- Intermediate type of photoperiodic response, 106
- Internal coincidence model, 249
- Interval timer, 74, 171, 187–190

- Juvenile hormone, 139, 255, 256, 258–262, 263, 264

- Katatropis, 64, 65

- Larval diapause, see Diapause, larval
- Latency, 8
- Latent development, terminology, 10
- Latitude
 - change of critical photoperiod with, 162–168, 172
 - equivalence with altitude, in critical photoperiod, 170
- Life cycle
 - diversity of developmental pathways, 4, 5, 79, 218–227, 228–229, 274, 278–279, 296–297
 - methods of summarizing, 274–275
 - number of dormant periods, 79, 139, 218–221
 - selection for, 79, 218
 - summary of controlling variables, 297
 - systems for control, 56–58, 218–230, 279–281
- Life stages of diapause, see Diapause, stages
- Light
 - intensity
 - effects in induction, 110
 - effects on development, 54
 - effects on diapause development, 144, 146
 - environmental, 90
 - threshold for response, 231–235, 243
 - in experiments, 268–269
 - relationships and units, 231–232
 - wavelength, 54, 146, 231, 235–239, 245, 247
- Limits for development, of temperature and other factors, 47–50, 96
- Lineatin, 270
- Linkage, 198–199
- Linoleic acid, 123
- Lipid, see Fat
- Longevity, 39, 40, 48, 212, 216
- Lunar cycles, 90, 91–92, 243

- Maternal effects on diapause response, 74–78, 126, 168, 188–190, 200, 241, 262–263, 282
- Mating, 37, 43, 128, 153–154, 215
- Measurement of dormancy responses, 266–277
- Mendelian inheritance, 196

- Meso-diapause, terminology, 151
- Metabolism, 27–32, 53, 160
- Meta-diapause, terminology, 151
- Methods, see Experimental techniques
- Microhabitats, see Habitats
- Microsporidia, 138
- Migration, 5, 43–44, 227–228, 262
- Models
 - biological clocks, 244, 247–253
 - development with temperature, 50–52
 - life-cycle, 274, 276
- Moisture,
 - as a cue, 86, 98
 - conservation during diapause, 23–24, 32, 35, 42
 - in diapause development, 149, 152–153, 158–159
 - in direct control of development, 50, 53, 219
 - in induction of diapause, 127
 - in plant tissues, 123–124, 281
 - in post-diapause development, 156–157
 - seasonal and geographic patterns of, 97–98, 102
 - summary of effects, 216, 218
- Moonlight, 90, 91
- Mortality, 40, 42, 48
- Moulting hormone, 256, 257–258, 261, 263

- Neurohormones, Neurosecretions, see Hormonal control . . .

- Obligate diapause, see Diapause, obligate
- Oligopause, terminology, 12, 13, 15
- Ommochromes, 25, 263
- Oogenesis
 - direct limitation, 49–50
 - suppression during diapause, 17, 24, 35
- Optimum temperatures, 48, 266
- Oscillators, see Circadian elements . . .
- Ovarian stages, identification of, 270
- Overwintering, survival during, 42, 43; see also Dormancy, Cold-hardiness
- Oxygen
 - consumption during diapause, 27–32, 260
 - direct control of development, 50, 55, 157
 - role in egg diapause, 128–129, 157, 281

- Parapatric speciation, 294
- Parapause, terminology, 12, 13
- Parasitoids
 - diapause responses of, 2, 125–126, 153, 186, 285
 - effects on host development, 50, 53
 - of diapause forms, 42, 181, 183, 184, 186, 285
- Pathogens, 43, 50, 216
- Pest species, diapause of, 2, 4
- Pharate adult, 60, 70, 149, 181, 186
- Pharate larva, 60, 64, 65
- Pheromone, 40
- Photoperiod
 - as a cue, 1, 86
 - critical
 - changed by conditions experienced, 110, 115, 124, 125, 136, 151
 - changed by selection, 194–195, 198
 - definition, 17–18
 - for different features, 38–39, 142, 281

- latitude-altitude equivalence in, 170
- regional differences in, 162-168, 170-171, 172
- seasonal differences in, 187-188
- sexual differences in, 175
- day-to-day changes, 89, 91
- direct effects on development, 53-54
- effects on reproduction, 213, 215
- effects on size, 213
- extra-retinal reception, 89, 240, 242
- in induction of diapause, 104-114, 129-132, 162-168, 221
- in control of growth-rate, 203-210, 225-226, 227
- in diapause development, 139-146, 151-152, 158-159
- in experiments, 268-269, 272-273
- influence on diapause intensity, 136-137
- manipulation for control, 2
- number of cycles necessary for response, 69, 80, 107-110, 131-132, 166, 168, 251, 271
- pigments in response, 200, 236, 240-241
- quantitative responses, 110, 136-137, 143
- reception of cues, 89, 91, 231-241
- response curves, 18, 104-110, 113, 115, 145, 165-167, 173, 190, 272, 273
- response thresholds, 231-235
- responses to absolute levels of, 104-110, 139-143, 210-219
- responses to changing, 110-113, 136, 143-144, 210
- seasonal and geographic patterns of, 85-89
- sensitivity to, as a property of organisms, 89, 242
- skeleton, 245-246
- spectral sensitivity of response to, 235-241, 245, 247
- summary of effects, 216-217
- Photoperiod-temperature interactions
 - environmental, 101-102
 - in diapause development, 140-142, 151-152, 279
 - in induction, 114-117, 168, 279
- Photoperiodic quiescence, terminology, 15
- Phototaxis, 34
- Photothermographs, 273
- Physiogenesis, terminology, 10, 13
- Physiology of dormancy, see Biological clocks, Cues, reception of, Hormonal control
- Phytophages, 123-125
- Pigmentation, 25, 26; see also Colour
- Pigments, in photoperiodic response, 200, 236, 240-241
- Plankton, 284
- Pleiotropism, 200, 288
- Polygenic inheritance, 196-197, 201, 202
- Polymodal emergence, 173, 178-187, 190
- Polymorphism
 - in aphids, 4, 77, 124, 187, 188, 189
 - seasonal, 23, 37, 38, 130, 173, 175-187, 190-192, 227, 228, 258, 296
- Polyphenism, seasonal, 38, 39, 45, 173, 290, 293
- Post-diapause development, 40, 55, 56, 133, 135, 152, 156-159, 208
 - individual differences in, 178, 185
 - regional differences in, 171
 - sexual differences in, 175
 - terminology, 11
- Pre-diapause development, terminology, 10
- Pre-diapause growth-rate, 207-208, 259
- Precipitation, see Rainfall
- Precision of seasonal response, summary of factors influencing, 229
- Predation of diapause forms, 42
- Predators
 - diapause of, 125, 169, 285-286
 - growth rate, 53
- Predictability, of environmental cues, see Cues, reliability
- Predictability, of habitats, see Habitats
- Preparation, terminology, 10
- Prepupa, as characteristic diapause stage, 66-68
- Prey
 - as a cue for predators, 125, 169
 - for post-diapause development, 158
- Proctodone, 263
- Prolonged diapause, see Diapause, prolonged
- Prospective dormancy, terminology, 8
- Protective structures for diapause, 35, 36
- Proteins, 33, 49, 150, 260, 270
- Prothoracicotrophic hormone, 256, 257-258, 259
- Proximate factors, 46, 283
- Pterobilin, 241
- Pupal diapause, see Diapause, pupal
- Quiescence
 - control of life cycle by, 54, 55
 - terminology, 7, 8, 9, 18
- Radiation
 - atomic, 42-43
 - solar, 98, 237
- Rainfall, 97-98, 102, 156, 157, 223, 292
- Rate of development, see Growth-rate
- Reactivation, terminology, 10; see also Diapause development
- Reciprocity failure, 231
- Re-entry into diapause, see Diapause, re-entry
- Regional differences
 - in diapause response, 160-173, 267, 291-292
 - in direct development, 58, 171
 - in environmental factors, 83-103
- Regrowth, see Growth, reverse
- Regulators of development, 46, 47, 216
- Replicates, 277
- Reporting of diapause responses, 272-276
- Required day number, see Photoperiod, number of cycles . . .
- Resource allocation, 289
- Respiration, cyclical, 31-32
- Respiratory rates, 27-32, 139, 270
- Response curves, see Photoperiod, Temperature, Thermoperiod
- Response switch, 144, 158, 209
- Responsive stage
 - for control of growth, 207
 - for diapause, 60-82
 - regional differences in, 162
 - terminology, 10, 11

- Retromoult, see Growth, reverse
 Reverse growth, see Growth, reverse
 Risk spreading, 192, 196, 282, 289
- Seasonal change in responsiveness to cues, see Cues
 Seasonal development, synchronization and timing by direct environmental effects, 54–56
 Seasonal forms or morphs, 1, 37–39; and see Polymorphism
 Seasonality, terrestrial, 83–85
 Selection for
 diapause, 283–295
 by food, 78, 284–285
 by interspecific competition, 286–287
 by physical factors, 283–284
 by predators and parasitoids, 285–286
 in laboratory, 185, 190, 192–196, 278
 developmental rate, 58
 dormant stage, 78–79
 life cycle, 79, 218
 sensitive stage, 80–81
 Sensitive stage
 for diapause, 60–82
 regional differences in, 162
 Sex linkage, 199–200
 Sex ratio, 174, 215
 Sexual differences
 in diapause intensity, 170, 175
 in metabolism, 27
 in post-diapause development, 175, 178
 in tendency to diapause, 43, 174–175
 Shocks, environmental, effects on development, 47, 119, 155
 Size
 for metamorphosis, 128, 190
 geographic clines in, 172
 of dormant individuals, 26, 40, 176, 186
 seasonal variations in, 57, 212–216
 Skeleton photoperiods, 245–246
 Social insects, 77, 122–123, 128, 175
 Soil temperatures, 92, 94, 95, 118, 159
 Solstice, 83, 84, 87, 89, 91, 143
 Sorbitol, 20, 33, 263
 Speciation, 294–295
 Spectral sensitivity of photoperiodic response, 235–241, 245, 247
 Spermatogenesis, 24, 37
 Spring, resumption of development in, 55, 159, 178, 185–186, 224, 287
 Stages for dormancy, see Diapause, stages of; and see names of stages
 Starlight, 90, 243
 Stemmata, 20
 Stimuli, 133, 157, 212
 environmental, 47
 Strain differences in diapause response, 160–173
 Successive dormancies, 220, 221, 224; see also Diapause, re-entry into
 Summer diapause, 63, 106, 142, 155, 159, 168, 191, 284, 285, 286
 terminology, 14
- Sunshine, 86, 98, 99
 Supergene, 198
 Superpause, terminology, 12, 13, 14; see also Diapause, prolonged
 Sympatric speciation, 294–295
 Synchronized development, 55–56, 224–225, 286–287
- Tachytelic processes, 16, 138
 Teleodiapause, terminology, 10, 13, 14
 Temperature
 as a cue, 86
 direct effects on development, 47–49, 50–59, 156
 effects on reproduction, 213, 215
 effects on size, 213
 in control of growth-rate, 210
 in diapause development, 140–142, 146–152, 158–159, 222
 in experiments, 269–270, 273
 in induction of diapause, 114–122, 130, 168, 221
 in post-diapause development, 156
 influence on diapause intensity, 137–138
 optimum, 48, 266
 reception of cues, 96, 97, 241–242
 response curves, 116, 273
 responses to changing, 119–120, 150–151
 responses to levels of, 117–119
 seasonal and geographic patterns of, 92–96
 summary of effects, 216–217
 Temperature–photoperiod interactions
 environmental, 101–102
 in diapause development, 140–142, 151–152, 279
 in induction, 114–117, 168, 279
 Termination, terminology, 11, 12
 Tetrodotoxin, 255
 Thermal constant, 50–51
 Thermoperiod
 daily pattern, 92–96
 in control of cold-hardiness, 41
 in diapause development, 151
 in induction of diapause, 120–122, 130
 response curves, 120–121
 temperature thresholds, 121, 122
 Thermoregulation, 39
 Thigmotaxis, 34
 Threshold
 developmental, 47, 96
 light intensity for photoperiodic response, 231–235, 243
 Tides, 91
 Timers, 244–253
 Token stimulus, 1, 59; and see Cues
 Toxic substances
 effects during diapause, 32
 to end diapause, 155
 Tropical diapause, terminology, 14
 Tropical insects, 9, 24, 34, 48, 55, 62–63, 106, 111, 117, 123, 129, 130, 148, 157, 160, 161, 168, 174, 191, 219, 226, 227, 292, 293
 20-hydroxyecdysone, see Moulting hormone
 Twilight, 18, 88, 91, 235, 269, 282

Two-stage responses, 71, 73, 144-145, 150, 187, 249, 262, 280

Ultimate factors, 46, 283; see also Selection

Ultrastructure, 20, 150

Variation

individual, 55-56, 57, 173-192, 200, 201, 210, 226-227, 268, 282, 286, 288-289, 293, 296

measurement of, 277

regional or geographical, 58, 160-173

Viruses, 138

Vitellogenesis, 111, 144, 145, 224, 249, 258, 260-262, 270

Voltinism, 16, 26, 57, 106, 160, 161, 172, 173, 201, 208, 213, 216, 220, 221, 222, 225, 226, 228, 284, 285, 290, 293, 296

Voucher specimens, 266-267

Water, see Moisture

Water content, 32, 156

Wavelength, see Light

Wax layer on cuticle, 23, 24, 35

Weight, see Size, Fat, reserves for diapause

Wind, 86, 98, 100

Zeitgeber, 245, 246, 250