Cambridge University Press & Assessment 978-0-521-51629-7 — Plasticity, Robustness, Development and Evolution Patrick Bateson, Peter Gluckman Index More Information

Index

accommodation, 32, 89 in early development, 34 in evolution, 103-4 in humans, 32 in new challenges, 44 acquired trait, 37 ACTH, see adrenocorticotropic hormone adaptability, 15 and evolution, 103-4, 121 adaptability driver, 110 model, 113 see also organic selection adaptation, 14 in known conditions, 44 adaptive immune system, 54 adaptive response, immediate birth weight, 70, 72 in early development, 66-67 predictive, 67-74 adrenocorticotropic hormone (ACTH), 37.59 antenatal environment effect, 74 antibodies, 42 generation, 42 anticipatory responses, 67, 89 adaptive advantage, 68 alternate forms, 68 Daphnia, 49 developmental decision, 68 to early life stress, 75 expression time lag, 92 fear. 69 in juvenile mortality, 74 maternal care, 69 to maternal nutrition, 70, 72-73 nutrition and health, 78 vitamin A and, 71 anti-predator behaviour, 71 apoptosis, 29 artificial selection, 116

asphyxia, 22 associative learning, 40, 43 atrophy, 31 attractors, 24, 25 auditory signals, 52 Baldwin effect, 109 see also adaptability driver; organic selection behaviour, 123 in accommodation, 32 plasticity in, 39-42 behavioural imprinting, 51, 75, 108 and evolution, 113 behavioural plasticity, 43, 53-54, 63 bet-hedging, 104 biological phenomenon assessment, 28 biology, 15 problem types, 17 brain abnormality, 33 of normal person, 33 perinatal injury, 22 of white-collar worker, 33 canalisation, 28 molecular basis, 29 Waddington's model, 28-29 cancer cells, 23 cancer inheritance, 87 cell surface glycoprotein, 87 cellular immune system, 54 character constancy, 21, 30 effect on evolution, 122 through natural selection, 15 see also robustness choices, 100 chromatin, 56 epigenetics on, 114 and transposable elements, 118

Cambridge University Press & Assessment 978-0-521-51629-7 — Plasticity, Robustness, Development and Evolution Patrick Bateson, Peter Gluckman Index

More Information

152 Index

classical conditioning, see Pavlovian conditioning comparative biology, 83 compensatory hypertrophy, 31 see also redundancy compensatory response, 33 see also accommodation; coping complex repair, 86 conflict principle, 74, 91 coping, 34 developmental disruption, 66 in evolution, 103-4 see also accommodation; compensatory response corticosterone, 37 corticotropin-releasing hormone (CRH), 59 cortisol, 37 CpG islands, 57 CpG sequence, 57 nutrition on methylation of, 61 CRH, see corticotropin-releasing hormone current utility, 63 Darwin, Charles differential survival, 124 evolution, 122 inherited behaviour, 124 de-differentiation, 23 see also complex repair delayed responses, 67 deoxyribonucleic acid (DNA), 5 grooves, 57 junk, 57 repair, 30 replication, 86 design, 15 intelligent, 16 natural, 16 determinant, 16 determination, chain-like, 17 development, 2 alternative phenotype, 30, 126 canalisation, 28 constraints, 23-24 disruption of, 64 dynamics of, 127-28 early experience on, 36-37, 50 embryonic stem cells, 23 environmental factors on, 17 and evolution, 3, 120, 122 external feedback, 27 homeorhesis, 27 in sexual reproduction, 64 individual's role, 127 integrated approach, 131-32 and maternal nutrition, 37-39

nutrition on, 23, 56, 65, 71 phenotypic, 58 plasticity, 5, 43, 48, 50, 93, 109 as plasticity and robustness, 128 robustness, 4 in sensitive period, 47, 50 social factors on, 130-31 vs. evolution, 3 sensitive period; and development, 50 developmental disruption and coping, 66 disruption and reorganisation, 105-8 modularity, 84 processes on evolution, 99 selection, 29 developmental origins of health and disease (DOHaD), 38 dysfunctional adaptation, 77-79 dichotomy, 1 differential survival, 29 differentiation, 23, 27, 58 diploidy, 30 dizygotic (DZ) twins, 61 DNA, see deoxyribonucleic acid DNA methylation (Me), 56 by DNMTs, 57 environmental toxins on, 61 in memory maintenance, 97 intragenic, 57 nutrition on, 60 region, 96 vinclozolin on, 116 DNA methyltransferase enzymes (DNMTs), 57 DNMTs, see DNA methyltransferase enzymes DOHaD, see developmental origins of health and disease dysfunctional adaptation, 77-79, 89, 91 elasticity, 24 see also plasticity embryonic malformations, 48 enhancers, 29 environment and epigenetic change, 127 on individual, 4-5 epigenesis, 123 see also epigenetics epigenetic landscape, 33 epigenetic marks, 11 cell differentiation, 58 in meiosis, 115 epigenetic silencing, 87 epigenetics, 11, 55 endocrine regulation, 107 gene dosage, 96

CAMBRIDGE

Cambridge University Press & Assessment 978-0-521-51629-7 — Plasticity, Robustness, Development and Evolution Patrick Bateson, Peter Gluckman Index More Information

Index

153

gene expression, 114 genomic change through, 117 histone modifications, 57 inheritance, 119 mechanism, 57-58 in multicellular organisms, 96 and mutations, 117 phenotypic difference, 58-62 regulation, 95 and regulatory genome, 116 transmission, 81 see also genetic accommodation equifinality, 25 see also redundancy erythropoietin, 84 evo-devo, 82, 120 evolution, 81 adaptability and, 103-4 adaptive modification, 104 and choices, 100, 101 competition and, 102 conventional model, 100 cultural environment and, 102 Darwinian, 122 and development, 104-6, 131-32 DNA significance, 86 epigenetics and, 114-17 gene duplication, 88, 119 and genetic consequences, 104-8 hypotheses, 82-84 integrated approach, 131-32 Lamarck's view, 99 for low oxygen, 83 models of change, 113-14 niche construction, 101-2 organism's role, 111-13 rate transition, 119 sexual selection in, 100 Spalding's driver of, 108 speciation and, 120-21 exaptation, 15 exonuclease, 86 external feedback, 27 feedback mechanisms, 17 FGF, see fibroblast growth factor

fibroblast growth factor (FGF), 86 filial imprinting, 52, 75 fitness, 11 bet-hedging, 104 *see also* mismatch gene, 10 and blueprint metaphor, 126 characters, 99 duplication 26, 88, 119

duplication, 26, 88, 119 and environment, 124–26 epigenetic regulation, 59

knockout and redundancy, 26 repression, 57 gene expression, 57 alteration of. 59 and developmental phenomena, 5 epigenetic effects, 5 epigenetic impact, 114 factors in, 55 GR, 60 histones, 96 gene-environment interaction, 47, 130 generalist species, 92 plasticity, 93 genetic accommodation, 105-8 through epigenetics, 116 and evolution, 110 see also polyphenisms genetic assimilation, 104–5 genomic imprinting, 9n1 genotype, 3 glucocorticoid receptors (GR), 37 expression, 60 gonadostat, 27 GR, see glucocorticoid receptors gross atypical morphologies, 20 habituation, 40 haemoglobin, 84 haploid, 30 heritability, 13 broad sense, 13 and environment, 14 estimation limitation, 14 histone, 56, 96 in memory formation, 97 homeorhesis, 27 HPA, see hypothalamicpituitary-adrenal humoral immune system, 54 hyperphagia, 70 hypertrophy, 31 hypothalamic-pituitary-adrenal (HPA), 37 hypothalamus, 50 IGF, see insulin-like growth factor immune system plasticity, 43 plasticity and robustness, 54 principle, 42 immunoglobulin, 42 immunological memory, 54 evolution of, 95 imprinting, 9n1, 75-77 and visual stimuli, 52

inclusive fitness, 12 information storage, 54 Cambridge University Press & Assessment 978-0-521-51629-7 — Plasticity, Robustness, Development and Evolution Patrick Bateson, Peter Gluckman Index More Information

154 Index

inheritance, 13 epigenetic, 115, 116 epigenetics, 117 syntactic knowledge, 125 transgenerational transmission, 81 inherited behaviour, 124 innate traits, 12 innateness, 12 insensitivity against nutritional change, 22 and robustness, 85 against thermal change, 22 see also robustness insight learning, 41 instinct behaviour pattern, 20-21 insulin-like growth factor (IGF), 88 intelligent design, 16 interfering RNA (RNAi), 59 intergenerational interactions, 72 kit paramutation, 115 kwashiorkor, 72, 92 lac operon, 96 learning, 53-54 associative, 43 categories, 41 evolution of, 94-95 imprinting, 75-77 information storage, 54 insight, 41 perceptual, 40, 54 phenotype complexity, 113 predisposition and, 52, 53 strength, 76 leptin treatment, 71 Lloyd Morgan's canon, 41 malleability, see plasticity marasmus, see kwashiorkor, 72 mate choice, 65 maternal care, 37, 60 constraint, 23-24 nutrition, 37-39, 72 stress, 36-37 MBPs, see methyl-binding proteins Me, see DNA methylation memory histone deacetylase, 96 immunological, 54, 95 see also DNA methylation metaphors, 7 and gene, 10, 126 methylated CpGs, 117 methyl-binding proteins (MBPs), 57 microRNA

epigenetic inheritance, 115 morphogens, 27 transgenerational genetic effects, 115 mismatch, 71, 77-79 repair, 87 see also exonuclease Modern Synthesis, 81 see also evolution modularity, 84-85 molecular plasticity, 42, 43 monozygotic (MZ) twins, 61 morph, 17, 31 in delayed response, 67 morphogens, 27 mutation DNA sequence effect, 118 epimutations into, 118 evolution, 119 hotspots, 117 myopia, 77 natural design, 16 natural selection, 81 nature, 124 nature and nurture, 124 nature/nurture dichotomy, 2-3 ncRNA, see non-coding RNAs negative feedback glucocorticoid receptors in, 37 gonadostat, 27 stress response, 60 neo-Darwinianism, 111 neural plasticity, 39, 43 sensitive period, 51 niche construction, 47, 101-2, 130 and evolution, 113 niche picking, 47, 130 non-coding RNAs (ncRNA), 56 non-genomic inheritance, 5, 37 see also epigenetics ontogeny, 9 organic selection, 108-11 organism-environment interactions, 46-47, 48, 50 see also niche picking organism classification approaches, 21 parental investment, 91 see also maternal care pathogens, 42 Pavlovian conditioning, 40 perceptual learning, 40, 54 phenocopies, 111, 121 phenotype, 3, 9, 12 alternative, 126

CAMBRIDGE

Cambridge University Press & Assessment 978-0-521-51629-7 — Plasticity, Robustness, Development and Evolution Patrick Bateson, Peter Gluckman Index More Information

Index 155

development, 123 difference mechanism, 58-62 differences, 55 robust, 125 phenotypic accommodation, 32, 34, 48, 121 phenylketonuria, 46 phenylpyruvate, 47 phylogenetic relationships cephalopod eye, 83 fish gill arches, 83 Neanderthal genome, 83 physiological set-point, 27 plasticity, 1, 5, 8, 31, 125, 130 and adaptability driver, 110 alternative forms, 68 anticipatory response, 67 in behaviour, 39-42 benefit durability, 76 in biological perspective, 5 continuous trait variation, 67 environment on, 89, 95 evolution of, 88-93 functional significance, 63-66 immunological, 42-43 in immune system, 54 at molecular level, 95-97 morphs, 67 in multicellular organism, 23 nature, 43-44 neural, 39 perspectives of, 44 of phenotype, 39 phenotypic robustness, 51 by predisposition, 51-53 sensitisation, 94 see also elasticity; learning, robustness pleiotropy, 117 see also artificial selection polyphenisms, 31, 43, 93 speciation, 120 see also genetic accommodation predisposition, 46, 51-53 in evolution, 109 preformationist notion, 11 progestins, 48 programming, 36, 72 psychological phenomenon assessment, 28 reaction norms, 3, 32, 43 adaptive, 44 to temperature, 107 redundancy, 25

and gene knockout, 26 in mammals, 25 robustness, 86 see also evolution regeneration, 26 regulatory factors, 58 reinforcer, see reward repair, 26 reproductive success, 65 resistance, 20, 21 see also robustness retrotransposon, 87 retroviruses, 87 reverse transcriptase, 87 reward, 41 rheostasis, 27 ribonucleic acid (RNA), 10 editing, 58 non-coding, 57, 58 RNA, see ribonucleic acid RNAi, see interfering RNA robustness, 1, 8, 29, 130 and attractor, 24 in biological perspective, 5 canalisation, 88 during development, 30 evolution of, 85-86 feedback loop, 27 form maintenance, 63-66 gene duplication, 88 in immune system, 54 against maternal cortisol, 22 mechanism, 29 at molecular level, 86-88 nature of, 126 against nutritional change, 22 plasticity generated, 34 redundancy, 86 against thermal change, 22 see also plasticity; regeneration; repair; stability segregation of characteristics, 84 sensitisation, 40, 94 see also classical conditioning sensitive period, 47 extended, 75 factors in. 50 sexual differentiation, 23 sexual imprinting factors, 51 social learning, 95 Spalding's driver, 108 spandrels, 19

specialist species, 92 speciation, 120–21 stability, 27 stimulus, 40 strange attractors, 24

as accommodation, 127

and gene duplication, 26

Cambridge University Press & Assessment 978-0-521-51629-7 — Plasticity, Robustness, Development and Evolution Patrick Bateson, Peter Gluckman Index <u>More Information</u>

156 Index

syntactic knowledge, 125 systems theory, 24

tactile stimulation, 60 teratogen, 32 TF, *see* transcription factors tissue vulnerability, 48 transcription factors (TF), 56 transgenerational transmission, 81 transmeiotic passage, 115 transposable elements, 87, 118 epigenetic silencing, 87 evolutionary effects, 87 transposon silencing, 96

vinclozolin, 115 visual stimuli, 52

Waddington's model, 28-29