INDEX

Acetabularia mediterranea, protein synthesis in, 195, 203 ACTH, 115, 116 Activation of amino acids for protein synthesis, 205, 206 "Active centers," chemical nature of, 208 Adrenocorticotropic hormone, active degradation products of, 129 Adrenocorticotropin, structure of, 115, 116 Adrenocorticotropins, species differences in, 152 Alkaline phosphatase, genetic determination of, 182 Allelic genes, 16 Allometric change, 10 Amino acid activation, 205, 207 Amino acid analogues, incorporation into proteins, 190 Amino acid sequences, repetition of in proteins, 207-209 Amino acids, abbreviations for, 105 Aristogenesis, 6, 13 Bacteriophage, plaque morphology of, 67-71 r-mutants of, 68-71 Bacteriophage proteins, fractionation of, 179, 182, 183 Bacteriophages, chemistry and enzymology of, 71 life cycle and biosynthesis of, 81

morphology of T group, 75-77, 180,

Carbobenzoxylated polypeptide chains, trypsin digestion of, 108, 109 Carboxypeptidase, use of in protein structure studies, 107 Centromeres, 19, 21, 22, 33, 35 Chiasmata, 21, 23 Chromatography, ion exchange, 109, 110 Chromosome, organization of, 59-61 Chromosomes, 19, 21, 24, 26-28 Cis-trans test, 29, 30, 88, 89 applied to host range function, 177 Cistron, 29, 30, 89, 93 Code, "commaless," 63, 64 "Codes," genetic, 62-65 Collagen, characteristics of in relation to hydroxyproline content, 215 species differences in, 215, 216 structure of, 214, 215 Configurational isomerism in proteins, 186 a-Corticotropin, porcine, structure of, 130 Cytochrome c, species differences in, 157 Cytoplasmic heredity, 222 Denaturation, 127 Deoxyribonucleic acid, chemical structure of, 44-56 conservation of during cell replication, 41, 57-60 in chromosomes, 39-41, 44 molecular dimensions of, 49-51,

78–81 synthesis of, 55, 56 X-ray diffraction analysis of, 49 Deuterium exchange, 123–125

INDEX

181

Biochemical evolution, 213

Biosynthesis of proteins, 195

Differentiation, of teeth, 10 reptilian jaw, 13 Di-isopropylfluorophosphate, 208 Dinitrophenylation, 106, 107 Diploid cells, 21 Disulfide bridges, location of in proteins, 113, 114

Elan vital, 6, 13
Endoplasmic reticulum, 196, 197, 199
Entelechy, 6, 13
Enzymatic digestion of polypeptide chains, 106–111, 113
Ergastoplasm, 196
Evolution, rate of, 218

"Fingerprinting" technique for peptides, 144

Gamete, 21 Genes, 15, 16 analogous, 142 determinants of protein structure, 164 dominant, 16 homologous, 142 linked, 22, 23 molecular size of, 27, 28 recessive, 16 substructure of, 67 Genetic codes, 62-65 Genetic fine structure, 173 Genetic maps, 24, 25, 26 fine structure, 86, 88-95, 173 in bacteriophage, 84, 173-176 Genetic recombination, 16 Genetics of host range in bacteriophage, 173 Genotype, 15 Growth hormones, species differences in, 158 Gryphaea, evolution of, 7-10

Haploid cells, 21
α-Helical coiling in globular proteins, 118, 119
Helical coiling in proteins, 100, 101
α-Helix, 100–102 dimensions of, 101

abnormal, structural differences in, 169-171 species differences in, 158, 160, 161 Heredity, cytoplasmic, 222 Heterozygote, 16 Homozygote, 16 Horses, evolution of, 10-12 Host range genetics in bacteriophage, 173 Hypertensins, species differences in, 155. 157 Immunochemical comparisons of serum proteins, 162, 163 Independent assortment, law of, 18, 19 Insulin, active degradation product of, 128 structure of, 122 Insulins, species difference in, 154, 155 Law of independent assortment, 18, 19 Law of segregation, 16, 17 Linkage, 22, 23 Linkage groups, 23, 26 Linkage map, for histidine biosynthesis in Salmonella, 221, 222 of T4 bacteriophage, 90, 92 Lozenge genes, 28, 29 Lysozyme, of bacteriophage, 73-75, 183, 212 specificity of, 74 Macroevolution, 7, 9, 10 Maps, genetic, in bacteriophage, 84, 173-176 Megaevolution, 7, 9, Meiosis, 19, 21, 22 stages in, 22 Melanotropins, species differences in, 154 structures of, 153 Membrane, cytoplasmic, 196-199 Mendelian genetics, 16-19 Microevolution, 7 "Microheterogeneity," 187 Mitosis, 19, 20 stages in, 20 Mutagenesis, chemical, 40 Mutants, deletion, 86, 89, 91 Mutation, 27

THE MOLECULAR BASIS OF EVOLUTION

Hemoglobins, 167-171

Mutations, effects on protein structure, 166 Muton, 93 Myoglobin, structure of, 98 Natural selection, 11, 15 Neurospora, 31–38 nutritional mutants of, 31, 32, 34, 36, 37 Neurospora crassa, life cycle of, 32 Nucleus, composition of, 40 "One gene-one enzyme" hypothesis, 36 Opsins, species variations in, 216-218 Optical rotation of proteins, 118, 119 Ostrea, evolution of, 7 Oxidation of disulfide groups in proteins, 107, 108 Papain, active degradation products of, 130, 131 Paper chromatography, of amino acids, 150, 151 of peptides, 145, 146 Paper electrophoresis of peptides, 145, 146 Peptide "fingerprints," 144 Peptide patterns as "fingerprints" of proteins, 144 Peptide separation on paper, 144-146 Phenotype, 15 Phosphoserine, in proteins, 208 Phylogenetic relationships, 3-6 Polypeptide chain, dimensions of, 100 Preadaptation, 13 Prolactins, species differences in, 158, 160 Protamines, conjugation of with DNA, 200, 201 Protein biosynthesis, 195 in Acetabularia mediterranea, 195, 203 in ruptured-cell preparations, 205 Protein structure, configurational isomerism in, 186 sequential isomerism in, 186 species variation in, 142 Proteins, bacteriophage, fractionation of, 179, 182, 183 biological activity of, in relation to structure, 126

Proteins, heterogeneity of, 185 Pseudoalleles, 28, 29

"Quantum evolution," 11

Radiation, adaptive, 10 mutational effect of, 28, 29 Recombination frequency, 23 Recombination units, 25 Recon, 30, 93 Replication, and structure of deoxyribonucleic acid, 55 "copy-choice," 86, 87 Reversible denaturation, of papain, 131 of ribonuclease, 136, 137 Ribonuclease, action of, 103, 104 composition of, 104, 105 partial reduction with retention of activity, 134, 135 pepsin digestion of, 133, 135, 137, 138 peptide "fingerprint" of, 144, 146. 148-151 photooxidation of, 132, 133 reduction of, 133-135 reversible denaturation of, 136, 137 structure-function relationships, 131 structure of, 112, 115 subtilisin digestion of, 132, 135, 137 - 140synthetic substrate for, 104 Ribonucleases, beef and sheep, compositions of, 147 species differences in structures of, 149 Ribonucleic acid, chemical structure of, 45, 46 nuclear, turnover of, 201, 202 role in protein synthesis, 203, 204, 207 Salmonella, chemical genetics of, 221, 222Saltation, 7 Secondary structure, 117 "Segregation, law of," 16, 17 Sequential isomerism in proteins, 186 Serum albumin, absence from sera of certain individuals, 220 Scrum proteins, species differences in,

161 - 163

Species variation in protein structure, 142 Spectroscopic properties of proteins, 119 Structure, of proteins, 99 in relation to function, 126 primary, 99 secondary, 99–102 tertiary, 99, 102

Teeth, differentiation of, 10 Tertiary structure, 117 Three-factor cross, 175 Transduction, 95 Transformation, by DNA, 41-44 of linked genes, 44 Tyrosine, anomolous light absorption of, in proteins, 119, 120 -carboxylate interactions, 120, 121

Urea, effect of on protein structure, 120, 124

Visual pigments, species differences in, 216-218

Zygote, 21, 32, 33, 35