

Index

- Acentric chromatid, 78
- Acentric fragment, 78
- Adaptability, hybrids, 99
- Adaptedness, upper attainable level, 219
- Adaptive evolutionary phenomenon, 173
- Additive gene effects, 168
- Additive genetic variance, 511
- Additivity of heterotic gene effects, 483
- Adenine relation to histidine synthesis, 278
- Adenine requirer, 278
- Agglutination titer, 280
- Albinism, 237
- Alcaptonuria, 237
- Alcohol dehydrogenase, 110
- Alfalfa cross- and self-fertilization, 81
- Alleles, 481
 - divergent, 173, 458
 - fortuitous, 322
 - interaction between, 229-30, 234
 - of intermediate productivity, 294
 - less favorable, role of, 323-24
 - pseudo and multiple, 254
 - relic, 322
- Allelic genes, 236, 240
- Allelism, multiple, 500
- Aluminum in hybrids, 106
- American Corn Belt dents, heterosis of, 138-46
- Anaphase, 75
- Anaphase I of cell illustrated, 67
- Anaphase I dyads, 73
- Anaphase II, 76, 77, 79
- Anaphase II of cell illustrated, 67
- Anaphase II monads, 73
- Angiosperm endosperm, 83
- Angiosperm ovule, 83
- Angiosperms
 - female gametophyte in, 83
 - fertilization, 83
 - mature ovules, 83
 - secondary fertilization, 84
 - seed, 82-85
 - seed coat, 83
 - seed development, 81
- Animal inbreeding, 5-7
- Anthocyanin, 237-38
- Antibiotic substances, 117
- Antigenic characters, 239, 240
- Antigenic complexes, 253
- Antigenic relationships, 244
- Antigenic specificity, alteration of, 278-80
- Antigenic variants induced by radiation, 279
- Antigens, 240, 242, 268
 - in cattle, 252-54
 - of pneumococci, 254
- Artificial hybrid, 424
- Artificial selection, 219-20
- Asexual reproduction, 47
- Autogenic growth inhibitors, 117
- Autonomous apomicts, 89
- Autonomous organelles of the yeast cell, 261-62
- Auxins, 112
- Auxotrophic mutants
 - biochemical studies, 275-78
 - Edwards technique of growing, 279
 - frequencies in *S. typhimurium*, 271
 - kinds in *S. typhimurium*, 272
 - methods of inducing, 269
 - from radiated lines, 269-70
 - of *S. typhimurium*, 281
- Auxotrophic organisms, 269
- Auxotrophs
 - determination of particular nutritive required, 270
 - utilization of sulphur compounds, 276
- Average dominance, estimate of, 497-99
- Average dominance of genes, estimation of, 494-516
- Average hybrid, 291
- Backcrosses, 423
- Backcrossing, 231, 379, 421
 - in maize, 235
- Bacterial genetics, 267
- Bacterial mutation, 267
- Balanced defective, 324
- Balanced euheterosis, 221-22
- Balanced lethal genes
 - in *Capsella grandiflora*, 46
 - in *Oenothera*, 46
- Balanced polymorphism, 221

- Barren stalks, 16
- Biochemical basis for sulfonamide-requiring character, 207-10
- Biochemical defects as gene markers, 256
- Biochemical deficiencies, 257
- Biochemical genetics, 256
- Biochemical models of heterosis in *Neurospora*, 199-217
- Biochemical reactions essential to growth in *Neurospora*, 208-9
- Biochemical studies of auxotrophic mutants, 275-78
- Biotypes, 20, 24
variation in, 26
- Bottleneck genes, 325, 327, 424, 428
- Bottleneck locus, 325
- Bottlenecks
environmental components of, 329
genetic-environmental, 325
physiological, 325, 326
- "Breaking of the types," 15
- Breeding, practical necessities, 140
- Breeding plans
reciprocal selection between two cross-breds, 457
selection in crossbred to homozygous tester, 457
- Breeding plot efficiency, 146
- Breeding procedures, improvement limits, 416
- Breeding records
of human beings, 2
of primitive deities, 2
- Breeding stations in Mexico, 426
- Breeding systems, 414
- Budding, 262-64
- Carboxylase, 110
- Catalase activity, 108
- Cattle cells, 252
- Causative genes
action of, 255
direct effect of, 239
- Cell membrane and cell wall, 262
- Cellular antigens in humans, 240-43
- Cellular characters within a species, 251-55
- Centrochromatin, 262
- Centromere region, 72, 74
- Centrosome, 261
- Character complexes, importance in maize breeding, 131
extrapolated correlates, 131
- Chemical analyses of genetic variations in flower color, 237
- Chemistry of A and B substances, 241
- Chiasmata formation among three chromosomes, 69
- Chlorophenoxyacetic acid, 117
ortho, para, and meta forms, 117
- Chlorophyll production in maize, 228-29
- Choline, 214
- Choosing testers, 449
- Chromatin bridge, 78
- Chromogenes and plasmagenes in heterosis, 224-35
- Chromomere pattern, 68
- Chromonemata, 74
- Chromosomal and cytoplasmic basis for hybrid vigor, 479-81
- Chromosomal deletions, 226
- Chromosomal effects, variance analysis of, 483
- Chromosomal fibers, 72, 74
formation, 75
- Chromosomal inheritance, 258-59
- Chromosomal rearrangements, 227
- Chromosome doubling, 390-92
- Chromosome knob number, 419
- Chromosome knobs
distribution in Northern Flints, Southern Dents, and Corn Belt inbreds, 130
significance, 185-86
- Chromosome length, effect on hybrid vigor, 484
- Chromosome maps of *Saccharomyces*, 258
- Chromosome mechanisms, 153
- Chromosome movement, 74
- Chromosome 10, 67, 69
abnormal, 68, 72
kinds, 66
- Chromosomes
block transfer, 187
breakage, 74
of maize and teosinte, 183
and nuclear membrane, 262
- Co-carboxylase, 110
- Colchicine, 397
- Combining ability, 62, 141, 148, 330-51,
386, 399, 408, 409, 431, 485
general, 328, 364
general and specific, 352-70, 485-90
and morphology, correlation of, 143-45
and morphology, experimental results, 143-45
specific, 352-53
testing for, 444
tests for, 449
- Commercial corn growing areas in Mexico, 426
- Commercial corn hybrids, 232
- Commercial corn production, 373

- Commercial hybrids, 291
 origin of, 401
- Complementary genes, 48
- Compound genes and genes with multiple effects, 227-29
- Conidia, formation, 201
- Conidiophore, 201
- Constant parent regression, 287
- Controlled cross-pollination in breeding corn, 16
- Controlled parentage, 16
- Controlled self-pollination, 16
- Convergent improvement, 328
- Corn (*See also* Maize)
 grown in prehistoric times, 418
 improvement through breeding, 425-48
 inbred lines, 280
 selfing and crossing results, 36
- Corn Belt dents
 association of characters in
 inbreds, 131
 open-pollinated varieties, 131
 derived from hybridization between Southern Dents and Northern Flints, 132
 origin of, 124-48
 historical and archaeological evidence, 148
 taxonomically important differences, 132
 width of cross, 132-37
- Corn Belt inbreds, 147
 characteristics, 130
 distribution of chromosome knobs, 130
- Corn Belt maize
 archaeological record, 127
 Caribbean influence, 127
 cytology, 128-29
 description, 125
 historical record, 127
 origin, 127
 genetic evidence, 129-32
 and genetic significance, 124-48
 understanding variability in, 148
 variation, 146
- Corn belt of Mexico, 436
- Corn breeding
 history, 400-406
 pure line method, 28
 steps, 470
- Corn breeding methods
 ear-to-row, 400
 mass selection, 400
 selection within and among inbred lines, 401-2
 varietal hybridization, 400
- Corn evolution in Mexico, 419
- Corn hybrids, commercial, 232
- Corn improvement program of Mexico, 425
- Corn production, pure line method, 44
- Corn races in Mexico, 427
- Corn and swine inbreeding
 degree of heterozygosity, 338
 effectiveness of continued phenotypic selection, 338
- Corn, white dent, 21
- Cousin crosses, 31
- Cozymase, 110
- Cross-fertilization, 15, 16, 17, 45
 in alfalfa, 81
 in maize, 49
- Cross-fertilization versus self-fertilization, 20
- Cross performance, 347
 improvement, 351
 initial, 343, 351
 limits, 351
- Cross-pollinated and self-pollinated plants, comparison of methods, 55
- Cross-pollination, 15
- Crossbred performance, 402
- Crossbreeding, 171-73
 early ideas on, 1-13
 effect on seed collapse in *Medicago sativa*, 85-89
 effects on growth, 81
 and inbreeding effects, 331-32, 350
 livestock, 372
 in seed development, 81-97
 USDA experiments, 375
 University of Minnesota experiments, 371-76
- Crossbreeding, rotational
 advocation, 375
 farm applications, 377
 and heterosis, 371-77
 inbred lines, 376-77
 for swine, 375
 versus inbreeding, 7
- Crossbreeding swine, 371-76
 University of Minnesota experimental results, 373-74
- Crossing, 12, 139, 382
 advantageous effects, 23
- Crossing inbred lines of tomatoes, 307-10
- Crossing over, 68, 222
 in maize $\times$ teosinte, 187
- Cysteine requirers, 276
- Cytology and genetics of *Saccharomyces*, 256-66
- Cytoplasm, 261
 and genes, interaction, 232-33, 479
- Cytoplasmic inheritance, 266
- Dauermodifikation, 260-61
- Decarboxylating enzyme systems of the respiratory mechanism, 110
- Dehydrogenase enzymes, 110
- Deleterious dominant, 323
- Deleterious recessives, 220, 323

- Depletion mutation, 261
Detasseling, 15
Deterioration, 16
De Vries' mutation theory, 20
Diakinesis, 69
 in heterozygous plants, 68
Dianthus hybrid, 9
Dicentric chromatid, 77, 78
Differentiation, 260
Diploid behavior at meiosis, 500
Diploid heterozygote, 202
Diploids, 389
Direct tetrad analysis, 258-59
Disjoining monads, types, 76
Dispersed heterosis, 127
Divergent alleles, 173, 458
 cumulative action of, 282
 interaction between, 234
Divergent spindles, 74
Domestic fowl hybrids, 245-46
Dominance, 11, 100, 101, 167, 284, 332,
 338, 350, 353
 to account for heterosis, 350
 analysis of, 495
 complete, 288, 416, 497
 degree of, 336, 494
 as explanation of hybrid vigor, 65
 of growth factors, 60
 and heterosis, 307, 494-516
 incomplete, 416
 by interference, 458
 in maize $\times$ teosinte, 188-92
 and over dominance, 282-97
 partial, 65, 497
 phenotypic and genic, 318
 and scales of measurement, 306, 313
 in self-pollinated plants, 166
 of tomato hybrids, 308
Dominance of genes, estimation of, 494-516
Dominance and heterosis as expression of
 same physiological genetic phenomena,
 307, 309
Dominance hypothesis, 230, 284
 objections to, 285
Dominance of linked genes hypothesis, 282
Dominant alleles, 101
Dominant, deleterious, 323
Dominant favorable genes, 451
Dominant gene effects, 165
Dominant genes, 225-26
Dominant and recessive lethals, 160
Dominant unfavorable genes, 226-27
"Double-cross," 40, 42, 43, 166-68
Double cross hybrids, 433, 444
Double cross yields versus single cross
 yields, 58
Double fertilization, 9
 and embryo development, 87
 and endosperm development, 87
 and growth in the integuments, 87
Drosophila melanogaster
 hybrid vigor in, 474-93
 egg production, 474, 476
 egg production curve, 476
 lifetime daily egg production of different
 races, 477
 races, variation in egg production and
 duration of life, 476
Drought resistance, in maize $\times$ teosinte,
 196-97
Dwarf races, growth rates, 121
Dwarfs, 62
Dyads, 75
Early testing, 402-11
 limitations, 406-11
 as a measure of combining ability, 410
Early testing and recurrent selection, 400-
 417
 results, 403-6
 as a tool in a breeding program, 406
Ear-row planting, 22
Ear-row selection, 456
Edwards technique of growing auxotrophic
 mutants, 279
Effective factor, 298
Egg production, 478
 distribution of variance, 486
 range, 485
Eight-way combinations, 44
Elementary strains, 24
Elite germ plasm hypothesis, 138-39
Embryo development, 104
Embryo growth, lag phase, 82
Embryo and seed development, 103-5
Embryo size as related to seed size and
 heterosis, 103-4
Embryos
 artificial methods of cultivating, 95
 of barley, 97
 development in inbred and hybrid corn,
 104
 early growth in relation to endosperm
 size, 91
 frequency of formation, 95-96
 growing small excised, 96
 growth rates, 87
 vigor, 94
Endogamy, 5
Endosperm, 81
 genetic characteristics of triploid condi-
 tion of the nuclei, 84
 growth rates, 87
 heterozygosis, 84
 hybrid vigor, 85

- nature, 9
- nutritive functions, 97
- Environment-genotype interaction in heterosis, 488-91, 493
- Environmental variances, 169
- Enzyme system, 103
- Enzymes, 112, 115, 256
 - alpha methyl glucosidase, 257
 - galactase, 257
 - maltase, 257
 - melibiase, 257
 - sucrase, 257
- Epistasis, 330, 331, 334, 353, 402, 458, 465, 486, 500, 501, 502
 - biases resulting from, 515
 - in corn yields, 286
 - graphic transformation removal, 465
- Epistatic effects, 168
- Equilibrium factor, 103
- Equilibrium frequencies, 346
 - of genes, 446-67
- Equilibrium gene frequency with overdominance, 463-64
- Essential metabolite, 115, 116, 117
 - relation to growth, 115-17
- Euchlaena (*See* Teosinte)
- Euheterosis, 218-23, 296
 - balanced, 221-22
 - mutational, 218-20
- Evening primroses, 20
- Evolution (*See also* Introgression)
 - of maize, 176
- Evolution of corn in Mexico, 425
 - factors involved, 419
- Excised tomato roots, 116
 - heterotic vigor in, 122
- Exogamy, 4
- Experimental designs, 494-96
- Experimental procedures used at North Carolina Experiment Station, 494-96
 - analysis of data, 496-97
 - experimental designs, 494-96
- Extrachromosomal inheritance, 260-61, 264-66
- Extrapolated correlates, method of, 130, 148
- Female gametophyte, 90
- Fertilization
 - in the angiosperms, 83
 - in the gymnosperms, 83
- First generation hybrids, 165-66, 174
- First generation intervarietal hybrids, 172
- First generation selfed lines, 448
- Flagellar antigens, 268
- Flint corn, 24
- Flint-Dent ancestry in corn breeding, significance, 146-48
- Flour corns, 420
- Fodder, maize $\times$ teosinte, 187-88
- Forssman antigen, 250
- "Four-way" crosses, 40, 42, 43
- Frequency distribution of two types of samplings, 404
- Fruit, weight of and its component characters, 306-7
- Fungi growth, 115
- Galtonian regression, 23
- Gamete selection, 60, 61, 382-86, 399
 - method, 387
 - sources of
 - synthetic varieties, 378
 - single or more complex crosses, 378
 - inbred lines, 378
 - for specific combining ability, 378-88
- Gamete selection program, feasibility of, 388
- Gene action, 326
 - and overdominance, 294-96
 - types of, 225
- Gene combinations, 420-23
- Gene-controlled characteristics
 - chlorophyll deficiencies, 102
 - flowering pattern, 102
 - leaf form and pigmentation, 102
 - stalk abnormalities, 102
 - time of flowering, 102
- Gene division, 259
- Gene dosage, 237
- Gene effects, 154
 - in a series of reactions, 237-39
 - specificity of, 236-55
- Gene frequency, 341
 - equilibrium, 336
- Gene interaction, 245, 330
 - in heterosis, 320-29
- Gene pairs differentiating parents, 310-14
- Gene recombination and heterosis, 298-319
- Gene specificity, 237, 325
- Genes, 265
 - accumulation of favorable dominant effects and general physiological interaction, 235
 - affected by environment, 62
 - complementary, 48
 - compound and with multiple effects, 227-29
 - controlling growth, 230-32
 - and cytoplasm, interaction, 232-33, 480
 - direct effects, 239-40
 - without dominance, 227
 - dominant and recessive, 225-26
 - equilibrium frequencies, 446-67
 - estimation of dominance, 494-516

Genes—*Continued*

- interallelic interactions, 319
- manifest effects of, 340–41
- pairing of, 371
- in the synthesis of arginine, 239
- transferred to a native population, 421
- General combining ability, 352, 487–91
 - definition, 454
 - recurrent selection for, 470
- General and specific combining ability, 352–70, 487
- General and specific combinability, relative importance of, 451, 487
- Genetic correlations, negative, between components of total performance, 337–38
- Genetic implications of mutations in *S. typhimurium*, 267–81
- Genetic intermediates, 332, 334
 - optimum, 331
- Genetic interpretation of regressions, 462–65
- Genetic interpretations of components of variance between progenies, 503–9
- Genetic mechanisms and heterosis, 100–103
- Genetic nature of components of progeny, variance, 498
- Genetic and phenotypic covariances and correlations, 515
- Genetic structure of natural populations, 152
- Genetic variability, 331
 - in economic characters of swine, summary, 350
- Genetic variation in economic traits, nature of, 330–41
- Genetical combination, 31
- Genetics and cytology of *Saccharomyces*, 256–66
- Genic inheritance, 266
- Genome components, effect on hybrid vigor, 482
- Genome contributions to hybrid vigor, 484–88
- Genotype-to-background relationship, 104
- Genotypes, 219, 336, 344, 425
- Genotypes of inbred races for viable, lethal, and recessive visible alleles, 481
- Germ plasma, inbreeding effect on, 454
- Glutamic dehydrogenase, 110
- Golden Queen Dent, 131
- Gourdseed Dents, explanation of name, 129
- Governing genes, 428
- Graphic transformations to remove epistasis, 465
- Growth affected by deficiencies for essential metabolites, 116
- Growth curves of heterocaryons, 211
- Growth of heterotic hybrid, determination, 123
- Growth-limitation, 114
- Growth in plants
 - abnormal, 118
 - modifying amount and nature, 117
- Growth rates of dwarf races, 121
- Growth rates of hybrids, 105
- Growth requirements for hybrids, 121
- Growth responses with thiamin, pyridoxine, and niacin, 109
- Guatemalan flints, 127
- Gymnosperms
 - female gametophyte in, 83
 - fertilization in, 83
 - mature ovules of, 83
 - seed in, 82–85
 - seed coat in, 83
 - seed development in, 81
- Gymnosperm ovule, 83
- Haploid, 389
- Haploid organism, 199, 389
- Haploid sporophytes, 389
- Hemizygote, 226
- Heritabilities, 350
- Heritability, 161, 174, 460
 - estimates of, 335–37, 352–70
 - for individual components, 335
 - for total performance, 335
- Heritability and gain, 170–71
- Heritability of specific combinability, 451
- Heritable variance, 168
- Heterocaryon formation, 200
- Heterocaryons
 - characteristics of, 199–202
 - controlled production, 200
 - growth curves of, 211, 216
 - heterosis in, 202
 - model, 210–12
 - between sulfonamide-requiring mutant and its double mutants, 212
 - vigor in, 120–23
- Heterocaryons of *Neurospora*, 110, 199–217
- Heterocaryosis in *Neurospora*, 120
- Heterocaryotic suppression of sulfonamide-requiring character, 203–7
- Heterocaryotic vigor, 202
- Heterochromatic knobs, 136
- Heterochromatin, 80
- Heteromorphic chromosomes, 79
- Heterosis, 14–48, 282, 425, 454
 - of American Corn Belt dents, 138–46
 - amount, 31
 - applicability, 217

- under asexual propagation, 320
- biochemical models in *Neurospora*, 199–217
- breeding for in cross-pollinated plants, 55, 400–417
- breeding methods, 52–61, 400–417
- breeding for in self-pollinated plants, 55
- breeding for in vegetatively propagated plants, 56
 - and chromosomes, 492
 - in component traits, 303, 492
 - and cytoplasm, 492
 - development of concept, 49–65
 - dispersed, 127
 - and dominance, 224–35, 307, 494–516
 - and *Drosophila*, 111, 475
 - and early growth, 105
 - environment-genotype interaction in, 488–91
 - evaluation of, 329
 - example of utilization, 66
 - experiments with, 154–57
 - as explained genetically, 173
 - expression of, 224–25
 - first use of term, 50
 - gene interaction in, 320–29
 - genetic basis, 100, 101
 - genetic concepts, 61–65
 - and genetic mechanisms, 100–103
 - in heterocaryons, 202
 - due to heterozygosity at one locus, 203–15
 - heterozygosity concept, 101
 - importance of internal factors, 123
 - inbreeding effects as related to defective genes, 481
 - and interracial and intra specific hybridization, 198
 - and later growth, 106
 - and linkage, 224–35, 285
 - in maize, 1, 53
 - in maize variety hybrids, 182
 - in maize $\times$ teosinte, 183–84
 - measures of, 479–81
 - Mexican corns, 418–50
 - in native open-pollinated varieties, 419–25
 - natural mechanisms for maintaining advantages of, 46–47
 - nature and origin, 218–23
 - in a new population, 418–49
 - as observed in pre-Mendelian research, 1–14
 - physiological basis of, 111–13
 - physiological mechanism of, 112
 - plasmagenes and chromogenes in, 224–35
 - in polygenic characters, 159
 - in population genetics, 149–60
 - potential, 140
 - potential maximum, 340
 - practical use of, 44
 - as related to embryo and seed size, 103–4
 - as related to heterozygosity, 103
 - resulting from degenerative changes, 102
 - reversed or negative, 225
 - and rotational crossbreeding, 371–77
 - scientific basis of, 1–2
 - in self-pollinated plants, 52
 - single locus, 102
 - stimulus of heterozygosis, 49
 - in sugar cane, 322
 - in tomato root cultures, 109
 - as tool of the animal breeder, 151
 - usage, 98
 - use of in
 - farm crops, 51
 - horticultural crops, 51
 - silkworms, 51
 - livestock, 51
 - vegetatively propagated plants, 51
 - utilization, 50–51, 55, 56
- Heterosis concept, 16, 17, 18
 - beginnings of, 14–48
 - defined, 48
 - in work with hybrid corn, 14
- Heterosis development
 - as affected by nutritional factors, 111
 - as affected by water absorption factors, 111
- Heterosis and dominance, as expression of same physiological genetic phenomena, 307, 309
- Heterosis and gene recombination, 298–319
- Heterosis, maximum, 326–37
 - with the dominance hypothesis, 287–91
 - methods of selection for, 350–51
- Heterosis and morphology, 141–46
- Heterosis in *Neurospora*, biochemical models of, 203
- Heterosis principle, 20
- Heterosis reserves, 140–41
- Heterosis, single gene, 155
- Heterosis tests, inbred lines, 330–51
- Heterosis theories
 - genetic explanation, 62
 - interallelic action, 62
- Heterotic locus, 328
- Heterotic hybrid, determination of growth, 123
- Heterotic hybrids, 119
- Heterotic hybrids and inbreds, structural differences, 112
- Heterotic tomato hybrid, 123
- Heterotic vigor in excised tomato roots, 122
- Heterozygosis, 49, 152, 454
 - stimulus of, 224, 229, 282
- Heterozygosity, 100, 102, 332, 373
 - degree of, 350
 - enforced in maize, 180–81, 193–96
 - range in degree of, 342
 - related to heterosis, 103
 - single locus, 199

- Heterozygosity and inbreeding depression, linearity of, 459-60
- Heterozygote
 basis for superiority of, 158-60
 physiological superiority of, 158
 selective advantage of, 467
- Heterozygote advantage, 347, 349, 350
 for single loci and chromosome segments, 340-41
- Heterozygote, diploid, 202
- Heterozygous combinations, adaptive significance, 173
- Heterozygous condition, effects in, 187-91
- Heterozygous inversions, 154
- Heterozygous loci, 341
- Heterozygous populations, variance, 297
- Hexaploid, 389
- Histidine, 278
- Histidine synthesis relation to adenine, 278
- Homocysteine, 215
- Homozygosis, 49, 151
- Homozygosity, 290, 403
- Homozygotes, recurrent selection among, 470
- Homozygous abnormal 10 plants, 73
- Homozygous condition, effects in, 191-97
- Homozygous diploid dent, 398
- Homozygous diploid lines, 399
- Homozygous diploids, 390
- Homozygous gene arrangements, 153
- Homozygous lines, 448
- Homozygous mutant, 157
- Homozygous normal allele, 157
- Homozygous tester versus reciprocal selection, 342-47
- Homozygous tester lines, 347
- Human endogamy, 2-4
 Athenians, 3-4
 Greeks, 3
 Hebrews, 2-3
 Nordics, 4
- Human inbreeding, 2-5
- Hybrid advantage, 105
 potential, 339
- Hybrid, average, 291
- Hybrid, commercial, 291
- Hybrid combinations, selection, 27
- Hybrid corn, 15, 16, 118
 and Darwin's influence on W. J. Beal, 10
 development of embryos, 104
 double hybrid, 373
 early explanations, 451-53
 single cross, 373
 vegetative habits of, 30
- "Hybrid-corn makers," 15
- Hybrid embryos, 96
- Hybrid growth, 114
- Hybrid and inbred corn grains, growth-promoting activities of extracts from, 109
- Hybrid nutritional requirements, 114-23
- Hybrid plants, analyses of starch content of leaves and stems, 108
- Hybrid, reconstructing, 449
- Hybrid results, 433
- Hybrid substance, 243-51
 fractions of, 247
 in species hybrids, 243-51
 tests for, 247
 tests for similarities and differences, 248
- Hybrid vigor, 14, 15, 98, 108, 112, 118-23, 127, 218, 224, 282, 424, 492
 in advanced generations, 180-83
 in artificial plant hybrids, 49
 as associated with high embryo weight, 104
 cause of, 13
 chromosomal and cytoplasmic basis for, 479-81
 from crossing inbred lines of maize, 50
 definition, 474
 discovery by Mendel, 7
 in *Drosophila*, 474-93
 effect of chromosome length, 484
 effect of genome components, 482
 of egg yields, 483
 in the endosperm, 85
 as evolutionary accident, 173
 explained by dominance or partial dominance, 65
 explanation of, 478-79
 factors effecting, 475
 in field corn, 51
 first described, 7
 genome contributions to, 484-88
 hypotheses to account for, 282, 481, 492
 in maize, 142
 necessary preliminary to, 4
 in production of geniuses, 4
 in plants, 2, 7-8
 as result of allelic interaction, 103
 summary of early knowledge, 13
 in sweet corn, 51
 in *Zea mays*, 10
- Hybrid vigor development, relation of phosphorus and nitrogen nutrition 106
- Hybrid weakness, 225
- Hybridity
 mechanisms which promote, 152-54, 476
 optimum, 152
- Hybridization, 423-25
 ancient, 185
 natural, maize $\times$ teosinte, 183-84
 present-day, 183-85
 of Southern Dents and Northern Flints, 132-33

- Hybridization in evolution of maize, 175-98
discussion, 197-98
summary, 198
- Hybridization and inbreeding, effects of, 294
- Hybridization in maize, 9
- Hybridization tests on corn, 429-47
- Hybridized seed corn, 42
- Hybridizing maize and teosinte, effects of, 186-87
- Hybrids, 424
adaptability of, 99-100
barley, 301
differences in water requirements, 106
first generation, 165-66, 174
first generation intervarietal, 172
growth rates, 105
growth requirements, 121
intervarietal, 161
physiology of gene action, 98-113
pre-Mendelian, 11
presence of iron and aluminum, 106
response to soil conditions, 106
- Hybrids and inbreds
correlation between, 294
gene determination of variation, 292-94
- Hybrids, second-cycle, 453-54
- Hybrids and synthetics developed from Celaya lines, 442
- Hypoxanthine, 109, 119
- Inbred corn, development of embryos, 104
- Inbred and hybrid corn grains, growth-promoting activities of extracts from, 109
- "Inbred Index," 142
- Inbred lines, 386, 401, 403
of corn, 230
formation of, 427-31
for heterosis tests, 330-51
methods of improving, 57
in reciprocal selection, 347
recovering of, to retain advantage attributable to heterosis, 310-18
of tomatoes, crossing of, 307-10
undesirable characters, 57
- Inbred parents, partial regression of yield on yield of, 460-62
- Inbred races, genotypes for viable, lethal, and recessive visible alleles, 481
- Inbred selection, 140, 163, 170
- Inbreds
crossed, 34
residual heterozygosity in, 31
selfed, 34
- Inbreds and heterotic hybrids, structural differences between, 112
- Inbreds and hybrids
correlation between, 294
gene determination of variation, 292-94
- Inbreeding, 161, 414
dangers of, 18
degree of, 23
deterioration incident to, 44
different generations of, 63
early ideas on, 1-13
effect on growth, 81
effect on seed collapse in *Medicago sativa*, 85-89
to improve cattle breeds, 6
injurious effects of, 17
reciprocal recurrent selection with, 457
records of, 5
results with corn and swine, 338-40
in seed development, 81-97
too-close, 2
- Inbreeding, animal, 5-7
- Inbreeding versus crossbreeding, 7
- Inbreeding and crossbreeding effects, 81-97, 331-32, 350
- Inbreeding and crossbreeding maize, 12
- Inbreeding decline, 332, 341, 350
- Inbreeding depression, 297, 349
effect, 86
and heterozygosity, linearity of, 459-60
- Inbreeding effect
on germ plasm, 454
on heterosis as related to defective genes, 481
- Inbreeding experiments of swine, results, 331-32
- Inbreeding, human, 2-5
- Inbreeding and hybridization, effects, 294
- Induction of polygenic mutations, 160
- Inheritance of quantitative characters, 327
- Insect galls, 118
- Interaction between alleles, 229-30
- Interaction of genes, 245
and cytoplasm, 232-33
- Interallelic association, 330
- Interallelic gene interaction, 63, 319, 353
- Interallelic and intraallelic interactions and pleiotropy, 317-19
- Intercrossing, 420
- Intergroup selection, 151
- Interracial hybridization in maize, 176-83
- Interspecific hybridization of maize and teosinte, 183-97
- Interspecific hybrids, 95
- Intervarietal hybridization, selection, and inbreeding, 172
- Intervarietal hybrids, 161
potence in, 166
- Intraallelic association, 330
- Intraallelic gene interaction, 353
- Intraallelic and interallelic interactions and pleiotropy, 317-19

- Intra-breed linecrosses, comparison with representative purebreds, 333
- Introgression, 419, 421
of genes, 422
teosinte $\times$ maize, 185
- Inversion, 77, 222
- Iron in hybrids, 106
- Irregular Mendelian segregation, 259
- Iterative crosses, 40, 42
- "Junk" inbred, importance of, 139
- Kalanchoe plants, 117
- Kinetic theory of position effect, 78
- Knob number, 129
- Knobbed chromosomes, 75
- Knobless chromosome 9, 70
- Kynurenine, 238
- Lancaster Surecrop, 140
- Leaming Dent, 17
- Leaves and stems of hybrid plants, analyses of starch content, 108
- Lethal genes, 229, 476
- Lethals, incompletely recessive, 289
- Linear heterogeneity, 265
- Linearity of inbreeding depression and heterozygosity, 459-60
- Line cross tests, selection for general combining ability, maternal ability, and specific ability, 364-68
- Lines selfed once versus lines selfed more than once in hybrid formation, 444-48
- Linkage, 327, 402
effect of, 501
and gene recombination, 314
and heterosis, 285
multiple factor, 130
role of, 502-3
- Linkage and marker genes in barley, 298-302
- Linkage and pleiotropy, 317-18
- Linkage relations, 314-17
- Linkage systems, 139
- Locus, heterotic, 328
- Luxuriance, 22-23, 224, 291, 296
- Main and component characters of tomatoes, 305-10
- Maize
archaeology, 175, 185
backcrossing in, 235
breeding, importance of character complexes, 131
chlorophyll production in, 228-29
chromosomes, 185-87
chromosomes, localized centromeres of, 77
- cross- and self-fertilization in, 49
- heterosis in, 53
- history, 176
- hybrid vigor in, 142
- hybridization, 9
- hybridization in evolution of, 197-98
- interbreeding and cross breeding, 12
- interracial hybridization in, 176-83
- introgression with teosinte, 185
- male inflorescence of, 133
- Mexican races, origin of, 176-80
- monoploids in, 389-99
- plants, comparison of fertility and sterility, 234
- pod corn, 175, 176
- pop corn, 175, 176
- preferential segregation in, 66-80
- races, 148
- races, crossed, 177, 178, 182
- and teosinte hybridization, effects of 186-87
- and teosinte hybrids, 183-84
- and teosinte interspecific hybridization, 183-97
- and *Tripsacum*, relation between, 138
- white dent, 29, 35, 38
- Male inflorescence of maize, modification by condensation, 133
- Malic dehydrogenase, 110
- Manifold effects, 350
- Marker genes and linkage in barley, 298-302
- Mass matings, 257
- Maternal ability, 352
- Maternal effects, 352, 499-500
- Maternal monoploids, 393
- "Mating systems," 152
- Mating types of spores, 257
- Maximum yields from crossing high by low combinations, 465-66
- Mechanical picking, breeding for, 146
- Mechanisms which promote hybridity, 152-54
- Megasporogenesis, 79
- occurrence of preferential segregation, 66, 68
- Meiosis, 390
- diploid behavior at, 500
- mechanics of, in maize monoploids, 393
- Meiotic divisions, 72
- Mendelian ratios, 11
- Mendelian sampling, 353, 365
- Mendelian segregation, 19
- irregular, 259
- Mendelian theory, direct tests of, 259
- Mendel's first law, 70
- Mendel's Laws, rediscovery of, 49
- Mendel's laws of segregation and recombination, 66

- Mendel's second law, deviations from, 70
 Meristematic growth, 102, 108
 Metabolic activity in enzyme systems, 110
 Metabolic reactions, 214
 Metabolites, essential, 115, 116, 117
 Metaphase I, 78
 Metaphase I with eleven dyads, 67
 Metaphase II, 74, 75, 76, 78, 79
 Metaphase II dyads, 73
 Metaxenia, 10
 Methionine requirers, 276
 Mexican commercial corn growing areas, 426
 Mexican breeding stations, 426
 Mexican corns, 175-98, 418-50
 Bolita, 427, 443, 449
 Cacahuacintle, 420, 423
 Celaya, 427, 436, 437, 438, 440, 441, 442, 443, 444, 446
 crosses between Cónico Norteño and Tabloncillo, 438
 hybrids and synthetics developed from, 442
 origin of, 436
 Celita, 444
 Chalco, 433, 434
 Chalqueño, 418, 423, 424, 427, 431, 433, 434, 446, 449
 Cónico, 420, 423, 424, 427, 435
 Cónico Norteño, 427, 435, 436, 438, 439, 443, 444
 probable origin of, 421
 Leon Criollo, 429
 Olotillo, 420, 423
 Palomero Toluqueño, 420, 423
 Tabloncillo, 427, 438, 443
 Tepecintle, 420, 432
 Tuxpeño, 420, 423, 424, 427, 442, 444
 Urquiza, 429, 430, 433, 434
 Vandefío, 427, 444, 449
 probable origin of, 422
 Mexican corn belt, 436
 Mexican corn, evolution of, 419, 424, 425
 Mexican corn improvement program, 425
 Mexican corn program, 428, 448
 Mexican corn races, 427
 Mexican open-pollinated varieties, 419
 Mexican races of maize, origin of, 176-80
 Mitochondria, 261
 Model heterocaryons, 210-12
 Modifying genes in maize $\times$ teosinte, 191-92
 Monoploid sporophyte, 389, 398, 399
 Monoploids
 distribution, 396
 fertility, 393, 398
 frequency of occurrence, 394-95
 in maize, 389-99
 method of isolating, 392
 origin, 389
 reproduction, 390
 study of
 in the agronomic field, 390
 in the cytological field, 390
 in the genetic field, 390
 Morphological characters as related to heterosis, 141-46
 Morphology of inbreds, technique of studying, 141
 Mosaic dominance, 295
 Multiform genus, 321
 Multiple alleles, 102, 228, 254
 Multiple allelism, 500
 Mutant genes, survival and growth, 235
 Mutant strains, 214
 Mutant, superior, 323
 Mutants, 218
 in *S. typhimurium*, 281
 Mutation, 103
 Mutation frequency and X-ray dosage, 271-74
 Mutation, random, 323
 Mutation theory, De Vries, 20
 Mutational euheterosis, 218-20
 Mutations
 deleterious character of, 219
 genetic implications in *S. typhimurium*, 267-81
 Mutations isolated and X-ray dosage, relation between, 273
 Native open-pollinated varieties, utilization of, 426-27
 Natural populations, genetic structure of, 152
 Natural selection, 15, 151, 157, 219-20
 Negative heterosis, 225
 Neo-centric activity, 75, 77
 Neo-centric fibers, 75
 Neo-centric regions, 72, 74
 formation of, 77
 Neo-centromeres, arising from chromosome ends, 80
 Neomorphs, 295
 Neurospora
 biochemical models of heterosis, 199-217
 biochemical reactions essential to growth, 120, 208-9
 cells of, 199-201
 and higher organisms, differences between, 201-2
 Nicking, 353, 451
 Nicotiana hybrids, 14

- Nicotiana rustica*
 experimental results, 162-71
 experiments with, 161-62
 fixing transgressive vigor in, 161-74
 plants of, 163
- Nitrogen metabolism
 of corn and tomato, 107
 of the plant, 110
- Nitrogen nutrition
 relation of hybrid vigor development, 106
 use by hybrids and inbreds, 106
- Non-allelic interactions, 164, 174
- Non-heritable variability, 162
- Non-random segregation at megasporogenesis, 70
- Normal segregation, 70
- Northeastern Flint corn of Guatemalan origin, 129
- Northern Flints, 127, 129, 131
 characteristics of, 136
 distribution of chromosome knobs, 130
 historical record, 128
 kernel of, 133
 pairing of rows, 133
 seeds of, 134
 shanks of, 134
 and Southern Dents, crosses between, 137
 and Southern Dents, differences between, 136
 typical ears of, 134
 typical plants, tassels, and staminate spikelets of, 135
- Nuclear membrane and chromosomes, 262
- Nucleotide cozymase, 110
- Oenothera, 20
- One gene heterosis, 203-15, 217
- One gene-one enzyme hypothesis, 268, 276
- Open-pollinated varieties, continuing importance in inbreeding program, 140
- Outcrossing, 406
- Overdominance, 221, 229, 282, 323, 330, 338, 416, 451-73, 492, 497
 in cattle, 467
 equilibrium gene frequency with, 463-64
 physiological nature of, 457
 in tomato hybrids, 319
 in yield of corn, 469
- Overdominance and dominance, 282-97
- Overdominance and gene action, 294-96
- Overdominance and recurrent selection, 451-73
- Overdominant loci, 291
- Overepistasis, 458
- Para-aminobenzoic acid, 111, 207, 210, 214
- Parthenogenesis, 47, 389, 394-99
 artificial induction, 396
 effect of male parent, 394
 effect of seed parent, 395
 in monoploid derivatives, 397
- Partial dominance as explanation of hybrid vigor, 65
- Partitioning phenotypic variance, 161
- Partitioning phenotypic variance, heritability, and number of effective factors, 168-70
- Paternal monoploids, 393
- Penicillin, 269
- Penicillin screening, 272-74
- Performance index, 382, 386
- Performance indices, 284-85
- Permanently viable pure lines, 16
- Phenotype, 336, 344, 463
- Phenotype-genotype relations, 162-65
- Phenotypic and genetic covariances and correlations, 515
- Phenotypic and genic dominance, 318
- Phenotypic variance, partitioning, 161
- Phosphorus-absorbing capacity in corn, 107
- Phosphorus nutrition
 relation of hybrid vigor development, 106
 use by hybrids and inbreds, 106
- Photosynthesis, 327
- Physical vigor, 34
- "Physiological key" substances, 112
- Physiological mechanism of heterosis, 112
- Physiological mosaic dominance, 295
- Physiological nature of overdominance, 457
- Physiological superiority of heterozygote, 158
- Physiology of gene action in hybrids, 98-113
- Pigeon-dove hybrids, 243-45
- Plant breeding, selection, 15
- Plant hybridization, 9
 first record of, 9
- Plant hybrids, 7-13
- Plasmagenes and chromogenes, 233-34
 in heterosis, 224-35
- Pleiotropy and interallelic and intraallelic interactions, 317-19
- Pleiotropy and linkage, 317-18
- Pneumococcal types, specificities of, 254
- Pneumococci, antigens of, 254
- Pod corn, 418
- Podophyllin, 397
- Pollen abortion, 74
- Polycross trials, 56
- Polycrosses, forage yields compared to top crosses of the same clones, 57
- Polygenes, 173

- Polygenic characters
 - heterosis in, 159
 - selective advantage of, 158
- Polygenic inheritance, 153
- Polygenic mutations, induction of, 160
- Polymorphism, 154
- Polyploid series, 257
- Polyploids, 321, 389
- Pop corn, 418
- Population
 - adaptation to environment, 151
 - definition, 149
 - evolutionary factors responsible, 150-52
 - genetic structure, 150
 - as natural unit, 150
- Population genetics of heterosis, 149-60
- Population variance, 292-94
- Populations, natural, genetic structure, 152
- Position effect, kinetic theory of, 78
- Postgermination growth in plants, 105
- Potassium availability, studies on tomato
 - inbreds and hybrids, 107-8
- Potence in intervarietal hybrids, 166
- Potence in maize $\times$ teosinte, 188-91
- Potential heterosis, 140
- Prolificacy, 335
- Predicting combining ability, 59
- Preferential segregation
 - factors responsible, 68
 - and neo-centric activity, 78
- Preferential segregation in maize, 66-81
- Pre-Mendelian hybrids, 11
- Prepotency, 451
- Post-Mendelian investigations, 2
- Proembryo, 87
- Progeny variance, genetic nature of components, 498
- Progressive evolution, 265
- Propagation, vegetative, 12, 13
- Prophase II, early, 74
- Prophase II, late, 74
- Prototrophic organisms, 269
- Pseudo-alleles, 254, 295
- Pseudoheterosis, 223
- Pseudo-overdominance effect, 325, 458, 501
- Pure lines and their hybrids, relationship between, 28
- Pure line method in corn breeding, 28
- Pure line method of corn production, 44
- Pure strains, 24
- Pyridoxal phosphate, 110
- Pyrimidineless mutant plus suppressor allows growth, 217
- Pyruvate carboxylase, 110
- Quadruple crosses, 44
- Quantitative inheritance, role of limiting factors, 324-27
- Random mating, 432
- Recessive characters, deleterious, 100, 323
- Recessive and dominant lethals, 160, 480
- Recessive genes, 225-26
- Recessiveness and deleterious effect, correlation between, 284
- Recessives, 11
- Reciprocal cross, 28
- Reciprocal effects, 487
- Reciprocal recurrent selection, 415-17
 - with inbreeding, 457
- Reciprocal selection, 351
- Reciprocal testing, method of, 443
- Recombination, 267
- Recombination tests in Salmonella, 274-75
- Reconstructing a hybrid, 449
- Recurrent selection, 351, 411-12, 451-73
 - effectiveness of, 467-70
 - for general combinability, 470
 - among homozygotes, 470
 - meaning, 452
 - as a method for modifying chemical composition, 411
 - as a method for modifying combining ability, 411
 - in modifying combining ability, 415
 - for specific combinability, 454-57, 470-73
- Recurrent series, 412
- Recurrent selection and early testing, 400-417
- Recurrent selection and inbreeding in modifying oil percentage in corn, 411-12
- Recurrent selection and overdominance, 451-73
- Red blood cells, 239
- Regression, partial, offspring on parents, 463
- Regression trends, 461
- Regressions, genetic interpretation, 462-65
- Relic genes, 424
- Reproduction, asexual, 47
- Repulsion linkages, 502
- Reversed heterosis, 225
- Residual heterozygosity in inbreds, 31
- Rh substance, 242
- Root cultures, 109-10
- Root growth pattern, relation to heterosis, 106
- Rotational crossbreeding, 374-77
 - and heterosis, 371-77
- Rust, 424

- Saccharomyces*
 chromosome maps of, 258
 genetics and cytology of, 256-66
- Salmonella*
 advantages for genetic studies, 268
 recombination tests, 274-75
- S. typhimurium*, genetic implications of mutations in, 267-81
- Scales of measurement as related to dominance, 313
- Scaling tests, 162, 164, 174
- Second-cycle hybrids, 453-54
- Secondary fertilization, 82, 90, 93
 in angiosperms, 84
 in flowering plants, 95
- Seed development, 104
 in angiosperms and gymnosperms, 81
 early stages of, 96
 without fertilization, 89-93
 grade and embryo growth potentialities, 93-97
 inbreeding and crossbreeding in, 81-97
- Seed in gymnosperms and angiosperms, 82-85
- Seed and embryo development, 103-5
- Seed size as related to embryo size and heterosis, 103-4
- Seedling growth, 105
 and heterosis, 105
- Seeds, number in maize $\times$ teosinte, 196
- Segregating factors, number of, 174
- Segregation, 24
- Segregation for yield factors, 382
- Segregations, irregular, 258
- Selecting for maximum heterosis, effectiveness of methods, 339-51
- Selection, 14, 161, 341, 406, 414
 for additive effects in normal distribution, 355
 for additive genetic values in individuals, 359-61
 for cross performance, 349
 against a dominant deleterious mutant, 220
 effectiveness of, 333, 335
 effectiveness of within inbred lines, 332-34
 as an estimation problem, 354-58
 when form of distribution is unspecified, 355-58
 for general and specific combining ability, 353-54
 for general combining ability, maternal ability, and specific ability in line cross tests, 364-68
 for general combining ability in topcross tests, 361-64
 homozygous tester versus reciprocal, 343-47
 index method, 355, 356
 on individual performance, 349
 ineffectiveness of, 335, 350
 by maximum likelihood estimates, 358-59
 natural and artificial, 219-20
 natural, for heterozygosity, 180-81
 performance levels attainable by, 341
 reciprocal or homozygous tester method, 349
 results of, 170
 for specific combinability, 454
 on test-cross, 349
 with unknown variances and covariances, 358-59
 use of all records in, 359
- Selection experiments, 156
 controlled, 334-35
 with swine, 350
- Selection for general and specific combining ability, need for additional research, 369-70
- Selection within and among inbred progenies, 401-2
- Selection of inbreds on performance, 140
- Selection index, 354
 modified, 356
- Selection for maximum heterosis, methods of, 350-51
- Selection, reciprocal, 351
- Selection, recurrent, 351
 and early testing, 400-417
 for maximum heterosis, 341-42
 and overdominance, 451-73
- Selective advantage of a heterozygote, 467
- Selective advantage of polygenic characters, 158
- Self-fertilization, 16, 17, 45, 48, 139
 in alfalfa, 81
 versus cross-fertilization, 20
 in maize, 49
- Self-fertilized populations, 322
- Self-pollinated plants, 161
- Self-pollinated and cross-pollinated plants, comparison of methods, 55
- Selfed lines, first generation, 448
- Selging, 12, 16, 23, 173-74, 379, 382, 390, 402, 406, 409
- Selging and crossing corn, results, 36
- Selging and loss of vigor, 13
- Selging series, 412-15
- Selging and sibcrossing, comparison between, 41
- Semi-inbred lines in synthetics and hybrids, utilization of, 431
- Senility, 14
- Sequential testing, 361
- Shank, importance in modern corn breeding, 146-47

- Sib crosses, advantage over self-fertilization, 29
- Sicklelema, 295
- Single cross
 - distribution, 145
 - estimation of the value of, 367
- Single cross yields versus double cross, 58
- Single gene heterosis, 155, 282
- Single locus heterosis, 102
- Somatic antigens, 268
- Southern Dents, 127, 129, 131
 - characteristics of, 136
 - distribution of chromosome knobs, 130
 - ear of, 133
 - historical record, 128
 - kernel of, 133
 - and Northern Flints, crosses between, 137
 - and Northern Flints, differences between, 136
 - seeds of, 134
 - shanks of, 134
 - typical ears of, 134
 - typical plants, tassels, and staminate spikelets of, 135
- Species specific, 254
- Specific combinability, 452
 - heritability of, 451
 - recurrent selection for, 454-57, 470-73
 - working definition, 454
- Specific combining ability, 352-53, 487-91
 - gamete selection for, 378-88
- Specific and general combinability, relative importance, 451
- Specific and general combining ability, 352-70
- Specificity of gene effects, 236-55
- Spindle, 74
- Spores, mating types, 257
- Sporophyte, 389
- Standard inbreds, 233
 - conversion, 233
- Statistics, role in genetical research, 494
- Sugar cane
 - cross-fertilization in, 320
 - male sterility in, 320
 - propagated asexually, 320
 - reaction toward inbreeding and outcrossing, 320
 - self-pollination in, 320
- Sulfonamide-requiring character
 - biochemical basis for, 207-10
 - heterocaryotic suppression of, 203-7
- Sulfonamide-requiring strain, 212, 215
- Sulfonamides, 111
- Sulphur compounds, utilization by various auxotrophs, 276
- Sulphur containing compounds, reactions, 277
- Super-dominance, 282
- Superior mutant, 323
- Supernumerary chromosomal fibers, 72
 - unorthodox formation, 72
- Suppressor heterocaryosis, 212-15
- Suppressor genes and sulfonamide utilization, 213
- Suppressor mutant strains, growth curves, 214
- Suppressor mutants, 203
- Swine and corn inbreeding
 - degree of heterozygosity, 338
 - effectiveness of continued phenotypic selection, 338
- Swine, heterozygote advantage for single loci and chromosome segments, 340-41
- Swine inbreeding experiments, results, 331-32
- Synapsis, 69, 115
- Synthetic varieties, 432
 - formation, 433
- Synthetics, 448
 - estimating number of lines to use, 432
 - propagated through open-pollination, 426
- Teosinte (*See also* Maize)
 - ecology, 183
 - variation, 184-85
- Teosinte germplasm, 419
- Terminal chiasmata, 68
- Test crosses, 408
- Tester lines, partially inbred, use of, 347-48
- Tetrad analysis, 258
- Thiamin pyrophosphate, 110
- Thiamine, 118
- "Three-way" crosses, 40, 42
- Tobacco, crosses between varieties and species, 49
- Tomato hybrids
 - number of fruit that ripens, 309
 - weight per fruit, 309
 - yield of ripe fruit, 309
- Tomatoes, main and component characters, 305-10
- Tomato roots, 116
- Topcross combining ability, 406
- Transgressive characteristics, 172
- Transgressive inbred, 161
- Translocation point, 68
- Triphosphopyridine nucleotide, 110
- Triploids, 389
- Tripsacum, 419
- Tripsacum hypothesis, 138
- Trivalent associations, 69
- Univalents, 69

552 INDEX

- Ustilago maydis*, 24
- Variability, 49
- Variance components, estimating, 368
- Variance components, genetic interpretations, 503
- Variances of general, maternal, and specific effects, estimation of, 368-69
- Variety crossing, 16
- Variety testing, 426
- Vascular organization, 108
- Vegetative propagation, 12, 13
- Viability, 335
- Vigor
- hypotheses for difference in, 300-302
 - loss of and selfing, 13
 - reestablished by outcrossing, 7
- Vigor in original plant as measure of number of favorable yield genes, 428
- Vigorous hybrid and weak inbred, difference between, 327
- Virulence, 279
- Water requirements of hybrids, 106
- Waxy gene, 239
- Weak inbred and vigorous hybrid, difference between, 327
- White dent corn, 32
- frequency curve of grain rows, 21
- White dent maize, 29
- average grain-row numbers, 38
 - average values in the families of, 35
 - yields per acre, 38
- Xenia, 8, 9
- history of, 10
 - in maize, 10
- X-ray dosage and mutation frequency, 271-74
- Yeast genetics, 257
- Yeast, advantages for biochemical genetics, 257
- Yield loss from one generation to the next, 42
- Yield of seed, prediction of, 302
- Yielding ability, correlations indicative of, 54
- Zea (*See* Maize)
- Zea mays*
- double crosses, 378
 - gamete selection for specific combining ability, 378-88
 - single cross performance data, 378
 - test crosses, 379
- Zygote, 371