

## Index

- Abbe, E., 35  
Acquired characteristics, 90-91  
Adaptor hypothesis, 280-282  
Adenine, 67, 80  
  discovery of, 58-61  
  hydrolysis to glycine, 153  
Adenosine-2', 3'-cyclic phosphate, 192-193  
Adenosine-2'-phosphate, 192-193  
Adenosine-3'-phosphate, 191-193  
Adenosine-5'-phosphate.  
  *See* AMP  
Adenosine-5'-triphosphate.  
  *See* ATP  
Adenylic acid, 61, 305. *See*  
  *also* AMP  
  from muscle, 191-193  
  from yeast, 191-193  
Admiralty Research Laboratory, 226  
ADP, synthesis of, 191, 278  
Albinism, 159  
Albumin, 26, 41  
Albuminous, 31, 41  
Alkaptonuria, 159  
Allantoin, 68  
Allele, 118  
Allelomorph. *See* Unit character  
  acter  
Allison, V. D., 141  
Alloway, L., 144-145, 147  
Alloxan, 68, 69  
 $\alpha$ -helix  
  discovery of, 224  
  in proteins, 222-224, 235,  
  264  
Altenburg, E., 133  
Altmann, R., 20-21, 27, 60,  
  107-108  
Alvarez, L., 285  
Amide bond, 222-224, 235,  
  257, 260, 265  
Amino acids  
  discovery of, 31  
  interaction with template,  
  274, 276, 285  
  racemization of, 58  
Aminoacyl synthetases, 281  
AMP, 186, 191, 278  
AMP, cyclic. *See* Cyclic AMP  
Anderson, T. F., 180-183  
Anfinsen, C. B., 276  
Antibodies, 140  
Aposhian, H. V., 314  
Arbogast, R., 175  
Arkwright, J. A., 137, 169  
Artificial pollination, 110-112  
*Ascaris megalocephala*. *See*  
  Horse threadworm  
Ascoli, A., 64  
Asilomar Conference (1975),  
  309  
Astbury, W. T., 217, 232,  
  238, 251, 263-264, 266  
  X-ray diffraction studies of  
  DNA, 87, 230-232  
  X-ray diffraction studies of  
  proteins, 211-214, 216-  
  217  
Astrachan, L., 277, 286  
Atherton, P. R., 190  
ATP, 273-274, 278, 305  
Auerbach, L., 43-44  
Austrian, R., 157  
Autocatalysis. *See* Genetic  
  material  
Avery, O. T., 84, 143, 145-  
  149, 153-154, 156, 249,  
  264, 274, 288  
  bacterial transformation  
  studies, 149-150, 157-  
  158, 178, 183, 185  
Avery, R., 153  
Bacteria  
  culture, 137  
  genetic transformation of,  
  141-145, 154, 178  
  lysis of, 180  
  mutation of, 178-179  
  RNA composition in, 278  
Bacteriophage. *See* Phage  
Baeyer, A. von, 69  
Bailey, L. H., 115  
Bailly, M. C., 193  
Baltimore, D., 320  
Bang, I., ix, 86  
Barbituric acid, 69  
Barger, G., 187  
Base pairing. *See* DNA,  
  base pairing in  
Bass, L. W., 77, 80, 200  
Bateson, W., 116-119, 159,  
  273  
Bausteine, 66  
Bawden, F. C., 174  
Beadle, G., 136, 154, 159,  
  162-167  
Beams, J. W., 87-88  
Behrend, R., 69  
Behringer, F., 66  
Beighton, E., 266  
Bell, F., 230, 264  
Bendich, A., 198  
Benison, S., xi  
Benzer, S., 301  
Benzyl groups, 191  
Bergmann, M., 194  
Bernal, H. D., 211, 217-220,  
  226, 232, 235-238, 252,  
  263, 266  
Beumer, J., 181  
Bioblasts, 107  
Biophors, 106-108, 307  
Birefringence, flow, 87  
Birkbeck College, University  
  of London, 219, 226,  
  263, 265  
Bisociation, 156, 265  
Biurct, 70, 150  
Boivin, A., 154-155, 157,  
  275  
Borodin, A., 74  
Borsook, H., 272, 277  
Boveri, T., 48, 121  
Brachet, J., 273  
*Brachystola magna*, 116  
Bragg, W. H., 207, 211  
Bragg, Sir W. L., 207, 211,  
  217-219, 224, 228, 238,  
  252, 260, 263  
Brahn, B., 71  
Breeding  
  animal, 110  
  plant, 110-115  
Brenner, S., 286-287  
Bridges, C. B., 121, 126  
Brigl, P., 187  
British Council, 232  
Britten, R., 307  
Brno, Natural Science So-  
  ciety of, 114-115  
Brno, Philosophical Insti-  
  tute of, 109-110  
Brooks, W. K., 120  
Brown, D. M., 193, 258  
Brugnatelli, G., 69  
Bunsen, R., 62  
Burnet, F. M., 181  
Butler, S., 94-95  
California Institute of Tech-  
  nology, 162, 167, 215,  
  220, 277, 311-312

- Cambridge University, 190, 217-220, 224, 250, 286-288
- Cancer, 169, 320
- Capecchi, M., 301
- Capsule, bacterial, 146
- Carbohydrate, in nucleic acids, 60-61, 75-78, 80-82
- Carlisle, C. H., 236
- Carter, C. E., 192, 201
- Caspersson, T., 87-88, 155, 200, 230, 263, 273
- Castle, W., 118-119, 179  
gene linkage studies, 128-130
- Cavendish Laboratory, 219, 228, 250
- Cell-free systems, 282, 287-292
- Cells  
division of, 41  
lymph in, 10-11, 28  
performed, 18-19, 54-56
- Cellulose, 209
- Champe, S., 301
- Chargaff, E., xi, 89, 157, 198, 244, 249, 253, 256, 258-260, 263, 268, 296  
nucleic acid studies, 198-202
- Chase, M., 154, 157-158, 253, 264
- Chemical Society of London, 85-86, 88
- Chester Beatty Cancer Research Institute, 192
- Chicago, University of, 247
- Chittenden, R., 26
- Chromatin, 39, 84, 115. *See also* Nuclein  
composition of, 39-41  
function of, 47, 313-314  
and idioplasm, 98  
structure of, 313-314
- Chromatography  
ion-exchange, 192, 278  
paper, 192, 200  
two-dimensional, 307
- Chromatophore, 36
- Chromosomes  
centromeres of, 304  
chemical composition of, 31, 130-135, 152  
crossing over of, 122-125, 127-130  
division of, 47-49  
effects of radiation on, 132-133  
fragmentation of, 132-134  
function of, 115-117  
gene excision from, 308-309  
lampbrush, 48  
linkage in, 119-120, 122-124, 162, 179  
mapping of, 124-125, 127-130, 165  
and Mendelian genetics, 115-130  
number of, 46-49, 116, 121  
observation of, 31, 33-35, 37, 97  
persistence of, 48, 135  
replication of, 309  
separation of, 116-117, 122-123  
sex, 115-116, 122-124, 126-130, 162  
staining of, 40-42  
structure of, 122-125, 128-130, 134-135, 226, 313-314
- Clupein, 57
- Coburn, A., 153-154
- Cochran, W., 228, 240, 264
- Codon, 297, 299, 301
- Cohen, S., 156-157, 174-175, 180, 247-249
- Cohn, W., 192
- Cohnheim, O., 65
- Cold Spring Harbor Symposia, 134, 156, 174, 182-183, 230, 247-249, 253, 269
- Colloids, 86-88, 215
- Columbia University, 74, 121, 125, 140, 143-145, 198
- Complementary structures, 225, 252-253, 257-260, 269, 277-280, 311-313
- Conifers, 47
- Cook, W. H., 305
- Corey, R., 194, 222, 254, 263-264, 311-312
- Cornell University, 282
- Correns, C., 114-115, 119
- Coulson, C., 243
- Countercurrent distribution, 282
- Coupling. *See* Linkage
- Cortauld Laboratory, 224
- Covalent bonds, 86
- Crick, F. H. C., 156, 158, 185, 202, 226, 228, 240, 247, 250, 251, 266-271, 292, 296, 311-313  
adaptor hypothesis of, 280-281  
frame shift mutation studies, 301-302  
and J. D. Watson, 250, 256-260, 269-271  
and structure of DNA, 250-253, 256-260, 263-265  
views on molecular biology, 272, 317-321  
X-ray diffraction studies of proteins, 228
- Croonian lecture (1922), 130
- Cyclic adenosine monophosphate. *See* Cyclic AMP
- Cyclic AMP, 304-305
- Cyclol theory, 216
- Cystine, discovery of, 31
- Cystinuria, 159
- Cytidine, 232
- Cytidine diphosphoric acid, 80
- Cytidylic acid, 232
- Cytosine, 67, 69, 180  
discovery of, 60-61
- Dalgliesh, C., 275-276
- Darlington, C. D., 226
- Darwin, C., 94-95, 169, 307  
and theory of evolution, 117  
views on heredity, 90-93, 108
- Darwin, E., 90
- Darwin, Sir F., 95
- Dawson, M., 84, 143-145
- Deaminase, 191
- Degeneracy. *See* Genetic code, degeneracy in
- Delbrück, M., 107, 156, 171-175, 178-179, 182, 184, 215, 225, 249, 255, 260-262, 269, 311
- Demerec, M., 179, 249
- Deoxypentose. *See* Deoxyribose
- Deoxyribonuclease, 87, 147-150, 152-155, 292, 308

- Deoxyribonucleic acid. *See* DNA
- Deoxyribose, 77, 80-82
- Deoxyribose nucleic acid.  
*See* DNA
- Desoxyribose-nucleic acid.  
*See* DNA
- Deutsch, A., 190-191
- De Vries, H., 99-102, 106-108, 114-115, 121, 128, 215, 280, 307
- Dhéré, C., 200
- d'Hérelle, F., 135, 169, 175, 181
- Dibenzyl phosphorochloridate, 187-191
- Dickinson, R. G., 220
- Dicyclohexylcarbodiimide, 195
- Dicbl, F., 110
- Dihydrouridine, 282
- Dinucleotides, 287, 298-299, 305, 308  
synthesis of, 193, 195
- Diphenyl phosphorochloridate, 187
- Diphtheria, 138
- Dische test for DNA, 150
- Discontinuous variation, 117-121
- DNA  
base pairing in, 202, 252-253, 258-260, 311-313  
base sequence in, 230, 279-280, 307  
chemical structure of, 193, 202  
in chromatin, 313-314  
discovery of, 15  
double-helical structure of, 156, 158, 202, 256-265, 269-271, 312-313  
double-stranded, 246, 253-255, 264, 314  
as drug, 29  
enzymatic modification of, 308-309  
fiber formation by, 238-240  
forms of, 244-246, 255, 263-264  
function of, 88, 154-155, 182-185, 230, 269, 272-276, 304, 312-314  
and genetic code. *See* Genetic code  
heavy-labeled, 314  
helix properties and, 232, 240, 244, 251, 260, 264  
hydrogen bonding and, 196-198, 202, 246, 257-262, 264  
hydrolysis of, 191, 193  
irradiation of, 175, 311  
nonrepetitive, 307  
phosphate-in models of, 251, 253-254, 256-257  
phosphate-out models of, 244-246, 256-258  
quantitation of bases in, 88, 155, 180, 196, 200-202, 253, 257-260, 263  
recombinant, 308-309  
repetitive, 307  
replication of, 260, 263, 269, 314-317  
satellite, 304  
single-stranded, 232, 235-236, 240, 264, 313  
size of, 87-89, 134, 178, 196, 230  
stability of, 193  
structural models of, 230, 232-235, 240, 244-246, 251, 253-254, 256-260, 312  
synthesis of, 181-183  
template for genetic code, 285  
template for RNA, 278-280  
from thymus gland, 60, 63, 152-153, 198  
as transforming substance, 84, 147-158, 309-311  
triple-stranded models of, 246, 251, 253-255, 260-262, 264  
ultracentrifugation of, 87-88, 150  
ultraviolet absorption by, 200-201  
viscosity of, 134, 196-197  
X-ray diffraction by, 230, 238-246, 255-258, 311-313
- DNA polymerases, 314-317
- Dochez, A. R., 137
- Dodge, B. O., 166
- Doermann, A. H., 182
- Dominant characteristic, 114, 132
- Doncaster, L., 120, 122
- Donohue, J., 257-258, 263-264, 312
- Dounce, A., 274-276, 281, 288
- Drosophila melanogaster*, 120, 122-133, 162-167, 247, 308
- Du Bois-Reymond, E., 9, 58
- Dubnoff, J., 272
- Dubos, R., 145, 157
- Dulbecco, R., 311
- East, E. M., 118
- E. coli*. *See* *Escherichia coli*
- Edinburgh, University of, 189-190,
- Egg, 26, 31, 56, 58-59  
fertilization of, 44-46, 48  
performed cells in, 18-19, 54, 94-95
- Eggleton, P., 190
- Ehrenberg, C. G., 31
- Ehrlich, P., 36
- Einstein, A., 62-63, 277
- Electron microscope. use in phage studies, 176, 181-182, 254
- Emmons, C. W., 133
- Emydin, 20
- Endoplast, 32
- Enzymes  
adaptation of, 279-280  
ligase, 309  
polymerases, 314-317  
relationship to genes, 159, 166-167, 273  
repair-replacement cycle of, 311  
restriction, 308  
reverse transcriptase, 320
- Ephrussi, B., 162-164, 226
- Ephrussi-Taylor, H., 157
- Epinephrine, 305
- Escherichia coli*, 154, 169, 301, 308-309, 317
- Evolution, theories of, 97, 117-118
- Ewald, P. P., 205
- Eye color in *Drosophila*, 162-166
- Eye disc, transplantation of, 164
- Fankuchen, I., 252
- Faraday Society, 236, 238

- Fell, Dame H., 226, 267  
 Felsenfeld, G., 314  
 Fenzl, E., 115  
 Ferno, O., 190  
 Fertilization, 41, 43, 50, 98-100, 107  
   of plants, 112-114  
   polyspermic, 45  
 Feulgen, R., ix, 85  
 Fiber length, 209  
 Fibrin, 26, 56  
 Finbak, C., 232  
 Fischer, E., 68-69, 75-76, 186, 194  
 Fixing techniques, 36-37  
 Flemming, W., 37, 45, 102  
 Flexner, S., 79  
 Flowering plants, 47  
 Fol, H., 43-45  
 Folkes, J., 287-288, 292  
 Fono, A., 193  
 Formyl-methionine, 300-301  
 Fornet, W., 138  
 Fourcroy, A., 68  
 Fourier analysis, 207  
 Fournau, E., 194  
 Fraenkel-Conrat, H., 272  
 Francis, T., Jr., 144  
 Franklin, R., 236, 240-243, 246-247, 253, 254-255, 266-268, 271  
   and J. D. Watson, 254-256, 262-263  
   and M. Wilkins, 243-244, 255, 266-268  
   and X-ray diffraction of DNA, 243-246, 251, 255-256, 263-265  
 Fraser, B., 251, 262  
 Frémy, E., 20  
 Friedrich, W., 205  
 Fruit fly. *See Drosophila melanogaster*  
 Fruton, J., 156, 267  
 Furberg, S., 232-236, 251, 263-264  
  
 Gale, E. F., 287-288, 292  
 Galton, F., 93  
 Gamow, G., 285-287, 300  
 Garrod, A., 136, 159-162, 166, 225  
 Garrod, A. B., 159  
 Gasser, H., 194-195  
 Gemmules, 92-94, 100, 307  
  
 Gene(s)  
   effects of radiation on, 132-133, 173  
   expression, 119, 159-167, 275, 279-280, 286, 313-314  
   inactivation of, 132  
   introduction of term, 118  
   isolation of, 308-309  
   and phage, 177-179  
   physical basis for theory of, 128-135  
   size of, 130, 178, 309  
   structure of, 152, 173, 249  
   synthesis of, 317  
   unit-character and, 127  
 Genetic code  
   amino acid assignments in, 286-287, 292-302  
   amino acid substitutions in, 296-297  
   binding studies of, 297-299  
   definition of, 272  
   degeneracy of, 295, 299  
   and DNA, 285  
   overlapping, 285-287  
   polarity of, 298  
   size of, 274, 297-299, 302  
   theories of, 285-288  
   triplet, 274, 292-300  
   universality of, 300  
 Genetic engineering, 308-309  
 Genetic material  
   autocatalysis of, 135, 167-168, 173, 175, 263, 314-317  
   continuity of, 46, 162, 180  
   physical studies on, 236, 238  
   stability of, 42-43, 155  
 Genetics, introduction of term, 118  
 Genotype, introduction of term, 118  
 German Agriculturalists and Foresters Congress (1840), 110  
 Glucagon, 305  
 Glucosazone, 77  
 Goldschmidt, R., 128, 308  
 Gosling, R., 238, 243-244, 251, 255, 263-264, 266  
 Grasshopper, *See Brachystola magna*  
 Gratia, A., 169, 175, 178  
  
 Greenstein, J., 134  
 Griffith, F., 84, 141, 146, 252, 265  
   discovers bacterial transformation, 141-143, 157  
 Griffith, J., 252  
 Gros, F., 287  
 Grunberg-Manago, M., 277-278  
 Guanine, 58-59, 67, 80  
 Guanylic acid, 61  
 Gulland, J. M., 85, 88, 196-198, 244, 264  
 Gynandromorph, 162  
  
 Haeckel, E., 10, 33, 44, 46, 94-95, 102  
 Haier, F., 79  
 Haldane, J. B. S., 273  
 Hall, B. D., 279  
 Hall, R., 304  
 Halogeno-phosphates, 190  
 Hamilton, L. D., 312  
 Hammarsten, E., 85-88, 198, 230  
 Hammersten, O., 61, 76, 85  
 Hanson, J., 267  
 Harris, I. F., 67, 80  
 Harrison, R. G., 125  
 Harvey lectures, 66, 75  
 Hassel, O., 232  
 Haurowitz, F., 216, 247  
 Hawkseed. *See Hieracium*  
 Heidelberg, University of, 62-63  
 Heidelberger, M., 140  
 Helix, X-ray diffraction of, 226-228, 240, 256, 264  
 Helmholtz, H. von, 62  
 Hemoglobin, 10, 17, 135, 222-225, 228, 314  
 Henking, H., 49, 115  
 Heppel, L., 292, 305  
 Heredity, nineteenth-century views on, 90-108  
 Hermaphrodite, 46  
 Herriott, R., 181-182  
 Hershey, A. D., 154, 157-158, 171-174, 178-179, 182-185, 253, 264, 277  
 Hershey-Chase experiment, 177, 182-184, 276  
 Herter lectures, 65-66, 75  
 Hertwig, O., 43-45, 94, 98, 133  
 Herzog, R. O., 207-209

- Hexose, 76-77, 80  
*Hieracium*, 114  
 His, W., 6, 8, 9, 18, 19, 21, 23, 26, 27, 94, 102  
 Histidine, discovery of, 57  
 Histones, 41, 66, 132, 313  
 Hodgkin, D., 216, 219, 267  
 Hofmeister, W., 31  
 Hogg, J. F., 291  
 Hollaender, A., 133-134  
 Holley, R., 282-285, 295  
 Homogenate, 291  
 Homogentisic acid, 159  
 Hoogsteen, K., 312  
 Hoppe-Seyler, F., 9, 10, 21, 51-53, 293  
   correspondence with F. Miescher, 16-18  
 Horse threadworm, 46, 48  
 Hotchkiss, R., 151, 153-154, 156-157, 200  
 Huggins, M. L., 224  
 Hussain, F., 267-268  
 Hutchinson, A., 217  
 Huxley, T. H., 32  
 Hybridization, 279, 307  
 Hybrids, formation of, 110-116  
 Hydrogen bonds, 198, 216, 246, 252, 257-262, 264-265, 279-281, 300, 311-313  
 Hypoxanthine, 53-56, 58-59, 68, 79  
  
 Ichthin, 20  
 Idioplasm, 97-99, 108  
 Inborn errors of metabolism, 159-162, 166  
 Indiana, University of, 247  
 Inducers, 279-280  
 Infrared spectroscopy, 312  
 Inosine, 77, 79  
 Inosinic acid, 79-80, 187, 191  
 Institut de Biologie Physico-chimique, 164  
 Insulin, 219  
 Interference, viral, 177  
 International Congress of Biochemistry, 292, 298  
 Intracellular pangenesis, 99-102, 106-108  
 Ionization constant, 195  
  
 Jachimowitz, T., 186  
 Jacob, F., 279-280, 286  
 Jacobs, W. A., 74, 76-77, 79-80  
 Jahnke, W., 207  
 Janssen, F. A., 122  
 Janssen, Z., 35  
 Jenrette, N. Y., 134  
 Johannsen, W., 118  
 Johns Hopkins University, 65, 78, 86, 120  
 Johnson, T. B., 67, 69, 198  
 Jones, W., 2, 77, 78, 80  
 Jordan, D. O., 232  
  
 Kaiser-Wilhelm Institute for the Chemistry of Fibers, 208  
 Kaji, A., 298  
 Kalckar, H., 247-249  
 Karolinska Institute, 86, 200  
 Karyogen, 26, 51  
 Keighley, G. L., 272  
 Keller, E., 282  
 Kelner, A., 311  
 Kendrew, J., 215, 220, 224, 228, 250-251, 260, 264  
 Kennaway, Sir E., 64  
 Keratin, 212-213, 222, 228, 238, 266  
 Khorana, H. G., 195, 317  
 King's College, London University, 236, 240-244, 251-252, 262, 265, 267-268, 311  
 Kit, S., 304  
 Klampenborg Conference (1938), 226  
 Klug, A., 265  
 Knight, C. A., 135  
 Knipping, P., 205  
 Koestler, A., 156, 264  
 Kossel, A., 18, 51, 62, 64-67, 75-76, 89, 304  
   quantitation of bases in nucleic acids, 80  
   wins Nobel Prize, 63, 65  
 Kraus, R., 137  
 Kühne, F. W., 9, 62  
 Kutscher, F., 57  
 Kynurenine, 165-166  
  
 Lamarck, J. B. de, 92, 104  
 Latarjet, R., 180, 311  
 Laue, M. von, 205  
 Lecithin, 15, 25  
  
 Leder, I., 300  
 Leder, P., 298-299  
 Lederberg, J., 155  
 Leeds University, 207, 211, 214  
 Leuckart, R., 102  
 Levene, P. A. T., 2, 61, 74-75, 78-79, 193, 194, 200, 263  
   scientific contributions, 89  
   studies nucleic acid structure, 80-82, 84, 153  
   synthesis of nucleotides, 186-187  
 Levinthal, W., 143  
 Levulinic acid, 60, 76  
 Liebig, J., 68-69  
 Linkage, in chromosomes, 119-120, 122-124, 162, 179  
 Lipkin, D., 305  
 Lipmann, F., 273-274, 281  
 Lister, J., 9  
 Lister, J. J., 35  
 Lister Institute, 137, 187  
 Loeb, J., 49  
 Loew, O., 26  
 Lonsdale, Dame K., 267  
 Lubavin, N., 26, 52-53  
 Ludwig, C., 16, 21, 29-30  
 Luria, S., 156, 171, 174, 177-180, 184, 247, 250, 253, 311  
 Lynch, C. J., 124  
 Lynen, F., 293-295  
 Iysenko, T. D., 126  
  
 Maaløe, O., 247  
 McCarty, M., 84, 146-152, 157-158  
 McCombie, H., 190  
 McDonald, M., 183  
 McKinney, H. H., 177  
 MacLeod, C., 84, 146-152, 157-158  
 Macromolecules, 86, 209, 225  
 Makytta, T., 109  
 Malthus, T., 117  
 Manchester University, 187  
 Mandel, J. A., 80  
 Marcet, A., 54  
 Marcker, K., 300  
 Mark, H., 209  
 Markham, R., 251, 305  
 Martin, A., 192

- Massachusetts Institute of Technology, 313  
 Matthaci, H., 287-292  
 Mazia, D., 135  
 Medawar, P. B., 265-266  
 Medical Research Council, 220, 226-228, 247, 256  
 Meiosis, 49, 116, 122  
 Mendel, G.  
   education, 109-112  
   plant breeding experiments, 112-114  
   rediscovery of, 114-115  
   theories of heredity, 99, 114, 119, 159  
 Meselson, M., 308, 314  
 Messenger RNA. *See* RNA, messenger  
 Methionine, 300-301  
 Methylation, 308  
 5-Methylcytosine, 202  
 Meyer, H. K., 209  
 Meyerhof, O., 293  
 Micellae, 97-98  
 Michelson, M., 193  
 Microscope  
   development on, 35, 176  
   nuclein studies with, 13  
 Microsomal fraction, 281, 291  
 Miescher, F., 6-9, 21, 23-24, 26-29, 293  
   correspondence with F. Hoppe-Seyler, 16-18  
   discovery of DNA, 10-15  
   staining of nuclein, 35-36  
   views on fertilization, 26, 50  
   views on heredity, 107  
 Miescher, J. F., 3  
 Millikan, G., 219  
 Million test for protein, 150-151  
 Mirsky, A., 135, 150-152, 178, 225  
 Mitosis, 37, 39, 41, 47, 115  
 Mnemonic theory, 94-95  
 Model building, 204, 232, 236, 251, 256-260, 267, 268, 271  
 Molecular basis of disease, 225  
 Molecular biology  
   central dogma of, 317-320  
   origins of, 98-99, 105-108, 214-216  
 Monera, 33  
 Monod, J., 279-280, 286  
 Morgan, T. H., 120-121, 167, 179, 277, 308  
   *Drosophila* studies, 121-132  
 Morowitz, H., 300  
 Moths, 120, 122  
 MRC. *See* Medical Research Council  
 mRNA. *See* RNA, messenger  
 Mulder, G. J., 13, 31  
 Muller, H., 187  
 Muller, H. J., 125, 167, 178, 247  
   *Drosophila* studies, 124-128, 132-133  
 Müller, J., 3  
 Müller, W., 17, 18  
 Mutagens, 301-302  
 Mutation(s)  
   amber, 301  
   chemical, 296  
   frame shift, 301-302  
   in hemoglobin, 225  
   ochre, 301  
   reversal of, 132-133  
   theory of, 99, 119, 121-122, 125, 132-133  
 Myoglobin, 224, 251  
 Myosin, 13, 213, 222  
 Nägeli, K. W. von, 26, 31, 114-115, 214  
   views on heredity, 97-99, 108  
 Napp, F. C., 110  
 National Institutes of Health, 291-292, 298  
 National Science Foundation, 282  
 Natural selection, 117  
 Nerve gases, 190  
 Neuberg, C., 71  
 Neufeld, F., 143  
 Neumann, A., 59-61, 76, 80  
*Neurospora*, 136, 166-167  
 NIH. *See* National Institutes of Health  
 Nilsson-Ehle, H., 118  
 Nirenberg, M., 287-295  
   genetic code studies, 291-300  
 Nitrous acid, 296-297  
 Nobel, A., 63  
 Nondisjunction, 126  
 Northrop, J. H., 175  
 Notani, N. K., 309  
 Nottingham, University of, 232  
 Noyes, A. A., 220  
 Nu-bodies, 313-314  
 Nuclear magnetic resonance, 312  
 Nucleases, 86  
 Nucleic acid(s)  
   base composition of, 60  
   carbohydrate in, 75-78, 80-82  
   chemical hydrolysis of, 76-77, 82  
   definition of, 60  
   degradation of, 60  
   distinction between plant and animal, 63, 77-78  
   enzymatic hydrolysis of, 77  
   functions of, 41-42, 66, 84, 153, 182, 192, 226, 230, 247  
   internucleotide linkage in, 82, 202, 258  
   and nuclein, 21, 27, 60  
   in the nucleus, 155  
   pancreas, 61  
   phosphorus content of, 60, 135  
   plant, 67  
   quantitation of bases in, 80, 200-202  
   and transformation, 143  
   ultraviolet absorbance of, 132-134, 155, 238, 282  
   wheat, 67  
   X-ray diffraction studies of, 254  
   yeast, 76  
 Nuclein  
   carbohydrate component, 60  
   components of, 21, 26, 40-42, 51-57  
   discovery of, 15  
   egg, 18-19  
   function of, 15, 40-41, 53-56, 58-59  
   isolation of, 12-15, 28  
   staining, 35-36  
   thymus, 64  
   yeast, 53, 58-59, 64  
 Nucleinic acid. *See* Nucleic acid

- Nucleolus, 42  
 Nucleoprotein  
 and immune response, 140  
 and transformation, 143, 151  
 Nucleosides, ix, 79-80, 89, 200, 232  
 minor, 304  
 Nucleotides, ix, 80, 89, 232  
 chemical synthesis of, 186-191  
 di-phospho-pyrimidine, 82  
 minor, 282  
 order of components of, 79-80  
 Nucleus  
 division of, 32, 37, 47  
 fragmentation of, 31, 107  
 fusion in, 43-46, 49, 100  
 importance of, 10, 32-33, 99-100, 106-107, 274, 285  
 nucleic acids in, 155  
 nuclein in, 14-15, 58-59  
 preformed, 58-59  
 proteins in, 134-135  
 separation of, 14-15  
 size of, 49  
 Oak Ridge Laboratories, 192, 201  
 Ochoa, S., 277-278, 293, 295, 297, 300  
 One gene-one enzyme hypothesis, 159, 184  
 Openshaw, H. T., 190  
 Orcinol test for RNA, 150  
 Osborne, T. B., 67, 80  
 Oslo, University of, 232, 236  
 Oster, G., 238, 239  
 Oxidative phosphorylation, 277-278  
 Pangenesis, 90, 117-118, 125, 169  
 Pangens, 99-102, 106, 108, 118, 307  
 Paraheredity, 169  
 Parker, J., 140  
 Parthenogenesis, 49  
 Pasteur, L., 9, 33  
 Pauling, L., 194, 215, 220-222, 225, 226, 228, 235, 250, 253, 255, 267, 271, 311-312  
 and DNA structure, 253-254, 263-266  
 and protein structure and function, 222-226  
 Pauling, P., 253  
 Pavlov, I., 79  
 Pea plants, 112-115, 119-120  
 Penswick, J., 282  
 Pentose, 61, 67, 76  
 Pentosuria, 159  
 Pepsin, 14, 39, 42  
 Peptones, 165  
 Periodicity. *See* DNA, quantitation of bases in  
 Periplast, 32  
 Perutz, M., 220, 224, 228, 250, 256, 260, 264  
 Phage, 155, 167-185. *See also* Viruses  
 attachment of, 180-183  
 bacterial resistance to, 169  
 composition of, 171  
 genes of, 177-179, 301, 311  
 immunology of, 176, 181  
 inactivation by irradiation, 175, 180-181, 247  
 latent period of, 180-181  
 linkage in, 179  
 osmotic sensitivity of, 181  
 quantitation of, 175  
 replication of, 185, 247-249, 314-317  
 T2 and T4, 174, 181, 279, 301  
 T6, 181  
 template for, 277  
 "Phage group," 171-173, 177, 184, 247-249  
 Phenotype, and unit character, 118-119, 126-127  
 Philpot, J., 219  
 Phosphate ionizations, 195-196, 244-246  
 Phosphoramidate bond, 71  
 Phosphorus  
 in nuclein, 15, 52-56, 60  
 in transforming substance, 150  
 Phosphorylation, 186-191, 195  
 Phosphoryl chloride, 186-187  
 Phosphoryl group migration, 193  
 Photoreactivation, 311  
 Physics, relationship to biology, 215, 226, 236, 249, 285-286  
 Physiological chemistry, 9  
 Physiological Congress, First International, 27  
 Piccard, J., 18, 20  
 Pickels, E. G., 87  
 Piloty, O., 76  
 Pinner, A., 69  
 Plaque, 175  
 Plasmid, 307-309  
 Pneumococci, 137-150, 152  
 forms of, 137, 141-143  
 types of, 137, 140-145  
 Pneumonia, 137, 141  
 Polanyi, M., 207  
 Pollock, M. R., 143  
 Polymers, 86, 295-297  
 Polynucleotide phosphorylase, 277-278, 292, 295, 297  
 Polynucleotides  
 and genetic code, 292-298  
 structure of, 312-313  
 synthesis of, 195  
 Polypeptides, 211-213, 222-224. *See also* Proteins  
 Polyphosphate, 74  
 Poly (U), 292-295, 297-298  
 Polyuridylic acid. *See* Poly (U)  
 Prematurity, 156-158  
 Protamines, 19, 24, 41, 53, 56-57, 66, 132  
 Proteins  
 $\alpha$ -fold in, 213, 222-224  
 $\alpha$ -helix in, 222-224  
 amino acid linkage in, 57, 276  
 in chromatin, 313-314  
 denaturation of, 213, 225  
 discovery of, 13, 31  
 effects of radiation on, 133-134  
 fibrous, 212-213, 222, 230  
 in genetic material, 88, 130-135, 152, 174, 182-184, 230, 247, 273  
 globular, 213, 228  
 and idioplasm theory, 97-98  
 importance of, 21, 31, 66, 84  
 in nuclein, 21, 40-42

- Proteins (*continued*)  
   sequencing of, 307  
   structure of, 194, 213, 216-224, 228  
   turnover of, 272  
   ultracentrifugation of, 87  
   and xanthine bases, 20, 54  
   X-ray crystallography of, 217-224, 238  
 Protein synthesis  
   in cell-free systems, 282, 287-292  
   energy requirements of, 273-274, 281  
   and enzymes, 272-274  
   initiation of, 300-301  
   polynucleotide template for, 292-297  
   RNA template for, 273-281  
   termination of, 301  
 Prout, W., 68  
 Punnett, R., 119  
 Purines, 61, 66, 69, 80, 200-202, 252, 307, 312  
 Purpuric acid, 68  
 Pus, 10, 12-15  
 Putnam, F. W., 182  
 Pyrimidines, 64, 66, 80, 200-202, 252, 307, 312  
  
 Rabl, K., 45-46  
 Radioactive isotopes, 182-183, 247, 272, 287, 296, 298  
 Rall, T. W., 305  
 Randall, J. T., 236, 243, 256, 263  
 Ratner, S., 272  
 Raymond, A. L., 193  
 Raynor, G., 120, 122  
 Recessive characteristics, 114, 128, 132, 162  
 Reichert, K. B., 31  
 Reimann, H., 143  
 Remsen, I., 65  
 Repressors, 279-280  
 Ribonuclease, 86-87, 282, 296  
 Ribonucleic acid. *See* RNA  
 Ribose, 76  
 Ribose phosphate, 79  
 Ribosomes. *See* RNA, ribosomal  
 Rich, A., 278, 311, 313  
 Riley, D. P., 240  
 Ris, H., 152  
  
 Rittenberg, D., 272  
 RNA  
   adaptor. *See* RNA, transfer base analogs of, 277  
   base sequence in, 279, 282, 297, 299, 307  
   and genetic transformation, 84  
   hydrolysis of, 191, 193  
   messenger, 100, 279-280, 286, 291, 296  
   ribosomal, 279, 286, 291, 297-298  
   structure of, 193, 254, 282, 311, 313  
   synthesis of, 181  
   template, 273-281, 291-292, 296-297, 320  
   template synthesis of, 277-279  
   transfer, 282-285, 291, 295-296, 298-301, 313  
   yeast, 63  
 Robert Koch Institute, 143  
 Robinson, Sir R., 187  
 Rockefeller Foundation, 211  
 Rockefeller Institute for Medical Research, 75, 79, 84, 87, 137, 145, 150-151, 156, 194, 200  
 Roeder, G., 69  
 Roentgen, W., 204-205  
 Romanes, G. J., 94  
 Rotman, R., 179  
 Rous, P., 169  
 Roux, W., 47-48  
 Royal Institution, 211, 217, 220, 240  
 Royal Society, 253  
 Russow, E., 37  
 Rutherford, E., 219  
  
 St. Andrew's University, 236  
 St. Bartholemew's Hospital, 159  
 Salamander, 37, 46  
 Salmon, 19, 24-25  
 Salomon, G., 26, 56  
 Sanger, F., 300, 307  
 Saunders, B., 190  
 Saunders, E., 119  
 Sayre, A., 266-268  
 Scheele, C., 54  
 Scherer, J., 68  
 Schleiden, M., 33, 97, 110  
 Schlesinger, M., 169, 181  
  
 Schmidt, G., 87-88  
 Schneider, A., 37  
 Schoenheimer, R., 272  
 Schott, O., 35  
 Schreiber, J., 109  
 Schrödinger, E., 215, 226, 236, 247  
 Schultz, J., 134  
 Schwann, T., 3, 33, 110  
 Science  
   discovery in, 14-16, 185, 205, 264-266, 288  
   history of, ix, 158  
   organized, xi  
   schools of, 225  
   women in, 267  
 Scientists, competition among, 16, 18, 266, 293-294  
 Sea urchin, 44, 48, 121  
 Seeds, W. E., 251  
 Segregation, principle of, 114  
 Sertic, V., 177  
 Setlow, J. K., 309  
 Shaefer, H., 62  
 Shultze, M., 10  
 Sia, R., 144  
 Sickle cell anemia, 225  
 Signer, R., 87, 230, 238, 240, 244  
 Simpson, R., 313  
 Singer, M., 292-293  
 Sonneborn, T. S., 154, 247  
 Soret, J. L., 200  
 Spaulding, M., 300  
 Specific soluble substance of  
   bacteria, 137-140  
   antibodies against, 138-140  
   carbohydrate, 140-141  
   protein, 143-145  
 Spencer, H., 214  
 Sperm. *See* Spermatozoa  
 Spermatozoa, 25, 26, 41, 66  
   fertilization by, 31, 44-45  
   function of, 94  
   as source of nuclein, 19, 24  
   X-ray diffraction of, 238, 244  
   X-ray treatment of, 132  
 Spiegelman, S., 279  
 Spontaneous generation, 9, 97  
 sRNA. *See* RNA, transfer  
 Stacey, G. J., 190



- Stahl, F. W., 314  
 Staining techniques, 35-36  
 Stanley, W. M., 135, 171, 238  
 Staudinger, H., 86, 209  
 Stent, G., 151, 156, 184  
 Stetten, D., Jr., 291  
 Steudal, H., 63, 69, 71, 80  
 Stiller, E. T., 186  
 Stokes, A., 240, 246, 263-264  
 Strasburger, E., 46-47, 98  
 Strecker, A., 20, 58  
 Structure determination  
   of purines, 67-69  
   of pyrimidines, 69-70  
 Sturtevant, A. H., 121, 124, 126, 162  
 Sugar. *See* Carbohydrate  
 Sulfathiazole, 146  
 Superhelix, 313  
 Suppression, 301  
 Suter, F., 28  
 Sutherland, E., 305  
 Sutton, W. S., 115-116, 127-128  
 Svedberg, T., 87  
 Syngé, R., 192
- Takahashi, H., 84  
 Target theory, 173  
 Tatum, E. L., 136, 159-162, 165-167  
 Tautomerism, 196, 257, 264  
 Teller, E., 286  
 Temin, H., 320  
 Template, 185, 260, 269, 273, 278, 288  
 Tetanus, 138  
 Tetranucleotide(s)  
   cyclic structure of, 84  
   hypothesis, 80, 82-84, 88-89, 132, 194-197, 305-307  
   polymer of, 88, 178  
   size of, 87-88  
   structure of, 80-82  
 Texas, University of, 125  
 Thymidine, 82  
 Thymidine dimer, 311  
 Thymidine diphosphoric acid, 80  
 Thymine, 59-61, 64, 70  
 Thymus  
   DNA from, 152-153  
   nuclein from, 59-61
- Thymus nucleic acid, 61  
 Timofeyev-Ressovsky, N. W., 173-174, 226  
 Tipson, S., 78, 82, 187, 193-194  
 Tissières, A., 292  
 TMV. *See* Tobacco mosaic virus  
 Tobacco mosaic virus, 135, 171, 174, 252, 263, 265, 273, 296-297  
 Todd, Lord, 82, 89, 187, 194-195, 224, 258, 260, 263  
   nucleotide synthesis studies, 190-191, 193-195  
 Toxins, 138  
 Transformation, genetic significance of, 143, 147, 309-311  
 Transforming substance  
   controversy over identification of, 151-158  
   enzyme inactivation of, 147, 152  
   identification of, 147-150  
   and protein, 151-155  
   purification of, 144-145, 147-153  
   and RNA, 150  
 Trinucleotides, 287, 298-299  
 Triplet code, 274, 292-300  
 Triticonucleic acid, 67, 80  
 tRNA. *See* RNA, transfer  
 Troland, L. T., 215  
 Tryptophan, 165, 181  
 Tschermak, E. von, 114-115  
 Tswett, M., 192  
 Tuberculosis, 140  
 Tübingen, University of, 9, 21, 23  
 Twort, F. W., 135, 169  
 Typhoid fever, 138, 169
- Ultracentrifugation, 87  
 Ultraviolet light  
   absorption of, 200  
   effects on genetic material, 133-134  
 Union Medical College, Peeking, 143, 144  
 Unit cell, 209  
 Unit character, 116-120, 126-127  
 Unger, F., 110-112, 115  
 Unger, J., 68
- Uracil, 67, 69, 80, 292, 296-297  
   discovery of, 63  
 Urea, 68  
   synthesis of, 67  
 Uric acid, 68  
   discovery of, 54  
 uridine-5'-phosphate, 187
- Vaccines, 144  
 Valenciennes, A., 20  
 Van Beneden, E., 46, 49  
 Vand, V., 228, 240, 264  
 Van der Waals forces, 225  
 Vendrely, R., 275  
 Vienna, University of, 110  
 Virchow, R., 3, 10  
 Virginia, University of, 87  
 Virus(es). *See also* Phage;  
   Tobacco mosaic virus  
   chemical composition of, 135, 174-175  
   discovery of, 135, 169-171  
   mutation of, 174-175, 177-179, 184-185  
   recombination of, 177  
   relationship to gene, 135, 153  
   turnip yellow mosaic, 174  
 Vischer, E., 200  
 Vogel, H. J., 279-280  
 Volkin, E., 277, 286
- Waddington, C. H., ix, 226  
 Wallace, A. R., 95  
 Watson, J. D., 156, 158, 182, 185, 202, 247-251, 268-271, 292, 311  
   and F. H. C. Crick, 250, 256-260, 269-271  
   and R. Franklin, 254-256, 262-263, 266-267  
   and structure of DNA, 249-252, 255-260  
 Watson-Crick structure, 255, 258-265, 269, 276  
   confirmation of, 311-314  
 Wecheslas, R., 291  
 Weisblum, B., 295  
 Weismann, A., 49, 98, 102  
   views on heredity, 102-108, 215, 307  
 Welch, W., 65  
 Wheeler, H. L., 67, 69  
 Wilkins, M., 230, 236-238, 247-249, 254, 260-264, 267, 271

- Wilkins (*continued*)  
and R. Franklin, 243-246,  
255, 266-268  
and X-ray diffraction of  
DNA, 238-240, 251, 311-  
313
- Wille, F., 29
- Williams, R., 254
- Wilson, E. B., 41, 115, 121,  
125, 215
- Wilson, H. R., 263
- Wobble hypothesis, 299-300
- Woese, C. R., 299-300
- Wöhler, R., 6, 67
- Wollman, E., 169
- World War I, 62-63, 207
- World War II, 63, 141, 156,  
171, 190, 226, 236, 268,  
293
- Wrinch, D., 216-217
- Wyatt, G., 201, 263
- Wyatt, H. V., 156
- Xanthine, 19-20, 53-56, 58-  
59, 67-68
- X-ray crystallography, 204-  
207, 267
- X-ray diffraction, 204-207  
of fibers, 87, 207-214, 217  
symmetry of, 256-258
- X-rays, effects on genetic  
material, 132-133
- X-ray scattering, 313
- Yčas, M., 286
- Yuan, R., 308
- Zacharias, E., 39, 42
- Zamenhof, S., 157, 174, 200
- Zervas, L., 187
- Zimmer, K. G., 173
- Zinsser, H., 140
- Zoological Station, Naples,  
243-244, 249