

Index

- Academic Assistance Council 107, 117, 118
- acausality (*see* causality)
- accelerator-induced nuclear disintegration 56, 242
- agriculture 22
- Allibone, Thomas E. 150
- alpha decay 45, 46
- alpha particle 45, 53, 54, 147, 148, 238
- alpha rays 147, 150
- aluminum 147, 149
- Amaldi, Edoardo 151
- Ambrosen, Johan 151, 153, 197, 218
- American Association for the Advancement of Science 111
- Ames, Joseph S. 135
- amplifier theory
Jordan 84, 86, 87, 93
Lillie 77
- Amsterdam 116, 117
- Anderson, Carl D. 57
- annus mirabilis (*see* nuclear physics: miraculous year of)
- anti-Americanism 14
- antisemitism 105, 106, 109, 113–116, 118, 121, 126, 128, 141, 239, 245, 248
- Arley, Niels 237
- Armstrong, Wallace D. 226
- Arnold, William A. 226, 227, 247
- Arosa 202
- artificial radioactivity (*see* induced radioactivity)
- astronomy 1, 177
- astrophysics 48
- Aten, A.H.W. 225
- atomic bomb 1, 2
- atomic model (*see* Bohr, Niels: atomic theory of)
- atomic theory (*see* Bohr, Niels: atomic theory of)
- Auer von Welsbach 144
- August Krogh Institute 225 (*see also* Zoophysiological Laboratory)
- autobiography
Bohr 69, 72
Born 132
Hevesy 144
Weaver 171
- Baden 126
- Bakerian Lecture 52, 148
- Baltimore 134, 135, 157
- Bangalore 145
- Barcroft, Joseph 75
- barium 245
- Beamtengesetz 106, 108, 114, 120, 121, 133
- Beck, Guido 64, 115–119
- Becker, Herbert 53
- Béla Kun 141
- Berkeley 217, 227, 239 (*see also* University of California)
- Berlème, Aage 24
- Berlin 53, 92, 94, 95, 108, 112, 118, 121, 130, 137, 234, 244, 245 (*see also* University of Berlin)
- Berlin Academy of Science 19
- beryllium (*see* radon–beryllium source; radium–beryllium source)
- beta decay 40, 45, 46, 48, 49, 54, 55, 57, 61, 63–65, 147, 151, 162, 232, 252
- beta particle 64
- Bethe, Hans 235
- Beutler, Hans 122
- big science 1
- Biochemical Institute, Lwów 224
- biochemistry 76, 181, 222
- Biological Society, Copenhagen 69
- biology 180
Bohr's continuing personal interest in 92, 94–99
Bohr's interest before redirection 38, 51, 68, 69, 72, 75, 77–80, 82, 83, 86–92, 99, 101, 103, 124, 166, 180, 191, 192, 198, 211, 253, 254, 257, 258
Danish institutions for 202, 205, 209, 211, 220, 224, 229

340 *Index*biology (*cont.*)

- Delbrück's interest in 94, 95, 102
- experimental (*see* Hevesy, George; Rockefeller Foundation)
- funded by the International Education Board 23
- in the Rockefeller Foundation's funding program 165, 174, 176, 177, 181
- institute conferences on 96, 223, 224, 235
- Jordan's interest in 82, 83, 86–90, 92–96, 101, 102
- Levi's interest in 225
- prehistory of Bohr's interest in 69, 72, 75–77, 100
- biomedicine 224
- biophysics 27, 32, 90, 198, 199, 204
- Birkbeck College 118
- Birmingham 140 (*see also* University of Birmingham)
- bismuth 143
- Bjerge, Torkild 150, 151, 230, 237
- Bjerrum, Niels 201
- Blackett, P.M.S. 57, 58, 118, 150
- bladder 192
- Bloch, Felix 121, 123, 124, 147
 - effect of Nazi regime on 114, 121, 122
 - opinion of Fermi's neutrino theory 65, 147, 162
 - relationship with Bohr 63
- Bohr Festspiele 132
- Bohr Scientific Correspondence 90, 115, 229
- Bohr, Christian (father) 20, 29, 69, 72, 73, 75, 86, 100
- Bohr, Christian (son) 152
- Bohr, Harald 35, 69, 115, 134, 135, 154
- Bohr, Niels 3, 32, 43, 44, 89, 260
 - activity in Danish Intellectual Workers Committee 115–119, 123, 162
 - advises the Radium Station 217, 218
 - aloofness toward social conflict at institute 163
 - and accelerator-induced nuclear disintegration 55, 56
 - and discovery of induced radioactivity 147, 148
 - and discovery of the neutron 52–55
 - and discovery of the positron 57–59
 - and liquid drop model 45
 - and neutrino concept 63–65, 147, 162, 233, 253
 - and relativistic quantum physics 45, 47, 49, 51, 65, 99, 229, 230
 - and the Carlsberg Foundation 17, 19, 20, 25, 35, 195, 199–202, 212, 213, 215, 217–220
 - and the Rask-Ørsted Foundation 25, 141
 - and younger collaborators 6, 7, 9, 11–16, 26, 36, 41, 89, 100, 108, 119, 123, 124, 131, 158–160, 162, 203, 221, 230, 234, 235, 238, 239, 247, 250, 252, 258, 259
 - applies spectroscopical equipment 17, 23, 27, 180
 - applies x-ray spectroscopy 142, 143
 - apprenticeship with Rutherford 6, 19, 39, 137, 138, 140
 - approach to publication 12, 61, 91, 137, 160, 234, 235
 - as fund raiser 4, 15–18, 20, 21, 34–38, 102, 103, 163, 164, 201, 212–215, 218, 220, 234, 248, 249, 253, 255, 256, 258, 259
 - as policy maker 4, 15, 16, 18, 26, 36, 37, 102, 107, 163, 201, 212, 213, 234, 248, 253, 256, 258, 259
 - at high school 24, 205
 - atomic theory of 18, 27, 39–41, 130, 131, 133, 139, 142
 - attends Copenhagen Unity of Science conference, 1936 96, 97, 235
 - attends Rome nuclear physics conference, 1931 49–51, 64, 101
 - attends Solvay Congress, 1933 63, 64, 128
 - attitude toward experiment 17, 18, 27, 39, 59, 66–68, 102, 103, 136, 147, 162–164, 193, 232, 233, 248–250, 254, 256, 258
 - becomes professor 31
 - biological interest, origins 68, 69, 100
 - Christian, oldest son, drowns in sailing accident 152
 - collaboration with Rosenfeld on measurement in quantum physics 61–63, 229, 230
 - communication problem with the Rockefeller Foundation 185, 198, 206, 211, 217
 - complementarity argument of 38, 41, 42, 50, 51, 64, 71, 76, 77, 79, 82, 86, 93, 94, 97, 99–102, 115, 235, 253
 - compound nucleus model of 3, 157, 231, 232, 234, 235, 238, 246, 247, 250, 256, 257
 - consolidates institute's redirection 213, 235, 237–239, 241, 242, 248, 249, 255
 - contrasts science and politics 88, 148, 155
 - correspondence principle of 62
 - corresponds with Jordan on biology 82, 83, 85–92, 101, 148

Index

341

- corresponds with Rasmussen about
 - refugee problem 108, 110–112, 121
- criticizes Fermi's experiments 151, 152, 155, 156
- Delbrück as biological helper 94, 95, 198
- early exposure to intellectual
 - discussion 69, 100
- early job offers 19, 21
- emphasizes collaborative nature of science 3
- escapes from Denmark, 1943 248
- father's influence 72, 92, 98, 100
- fiftieth birthday of 214, 215, 227
- first formulation of experimental biology
 - project 191–193, 195, 197, 211, 212, 254, 255
- first response to refugee problem 105, 107, 108, 111, 112, 114, 118, 119, 123, 162, 253
- first response to the Rockefeller
 - Foundation's experimental biology program 111, 165, 166, 173, 174, 179, 182–188, 191, 211, 212, 254, 255
- gives "Light and Life" lecture 90–92, 94–97, 173
- inclination toward disinterested
 - discussion 15, 39, 49, 63, 65, 67–69, 99, 101–103, 108, 147, 162, 166, 183, 192, 228–230, 234, 235, 249, 250, 252, 253, 258, 259
- introduces neutron bombardment
 - project at the institute 149–152, 155, 163, 214
- meets Heisenberg 132
- miscellaneous scientific activities 37, 38, 65, 67, 103, 107, 248
- miscellaneous work in nuclear physics 238, 239, 248, 250, 256
- moves to the Carlsberg mansion 11, 67, 68, 249
- need for collaboration 11, 12, 102
- negotiates with the Rockefeller
 - Foundation to introduce experimental biology 166, 185, 195–200, 206–208, 210–212, 214, 222, 223, 258
- Nobel prize, 1922 19, 98, 139, 140, 142
- nuclear physics interest before
 - redirection 38–40, 48, 49, 51, 59, 64–66, 69, 78, 99, 101, 102, 147, 232, 252, 254, 257
- obtains experimental biology support 191, 210, 211, 213, 216
- obtains IEB support for institute's first
 - expansion, 1920s 21–25, 27, 31, 32, 36, 37, 173, 206, 253
- obtains refugees Franck and Hevesy for
 - the institute 105, 106, 126–129, 134, 135, 145, 162, 166, 186, 213, 254, 255, 258
- obtains traditional fellowships for the
 - refugees 118–123, 162
- opinion of Dirac's hole theory 48, 49, 59
- organizes biology conferences 95, 96, 223
- personal interest in biology 38, 51, 68–70, 75, 77–80, 88–90, 92, 93, 95–97, 99, 101, 166, 180, 193, 198, 205, 211, 223, 224, 253, 254, 258
- prestige 18–21, 28, 32–34, 174, 179, 184, 185, 188, 198, 201, 206, 211, 215, 217, 218, 235, 237, 253
- reception of his biological views 93, 94, 96–99
- redirects research at the institute 4, 15, 28, 37, 38, 68, 103–105, 124, 146, 147, 157, 158, 161–164, 166, 193, 200, 201, 211, 212, 221, 227–231, 250, 252, 254–258
- regard for Rutherford 39, 238
- relationship with Brønsted 28, 32, 33, 127, 129, 135, 141, 145
- relationship with brother Harald 35, 69, 115, 134
- relationship with Franck 126, 130, 132–134, 136, 154, 155, 158, 160
- relationship with Hevesy 130, 137–143, 145, 146, 153, 159, 160, 202, 203, 250, 258
- relationship with Høffding 69–71, 78, 78
- relationship with Krogh 29, 31, 193
- responds to fission 245–247
- responds to new funding policies, 1930s 28, 105, 252, 256, 257
- responds to Rockefeller Foundation
 - program to help refugees 124–129, 134, 161–163, 165, 179, 253
- returns after Second World War 248
- role in establishing quantum mechanics 3, 27, 41
- role of his institute 3, 122
- round-the-world trip, 1937 120, 184, 215, 217, 238
- shares facilities with new mathematics
 - institute 35, 126, 129, 130, 195
- shattered relations with Jordan 88, 89, 92, 94–96, 235
- similarity with Haldane's biological
 - views 92, 98
- Soviet Union, 1934 visit to 150
- submits experimental biology
 - application 185, 202–205
- teaching duties of 20
- United States, 1923 visit to 24, 31, 111

342 *Index*

- Bohr, Niels (*cont.*)
 United States, 1933 visit to 58, 111, 112, 124–126, 173, 179
 United States, 1939 visit to 246, 247
 view on energy conservation 13, 14, 42, 48–51, 54, 59, 63–65, 101, 162, 232, 233, 257
- Bohr–Kramers–Slater paper 14, 233
- bones 222
- Bonn 72
- Born, Max 82, 120
 effect of Nazi regime 106, 114
 reacts to Jordan's pro-Nazi publication 88
 relationship with Franck 132, 154–157, 191
- boron 147
- Bothe, Walther 53, 233
- brain 70, 78
- Bristol 95
- British Association for the Advancement of Science 54, 140, 144, 181, 182
- Brønsted, Johannes 186
 collaborates with Hevesy 141, 143
 joint application with Bohr to the Rockefeller Foundation 127, 129, 135, 145
 supported by the International Education Board 28, 32–34, 127
- Brussels 59, 116, 128
- Budapest 141, 223
- Bunsen Society for Applied Physical Chemistry 137
- calcium 209, 221
- California 27, 122
- California Institute of Technology 57, 58, 171, 178, 189
- Cambridge 126, 127 (*see also* Cambridge University)
- Cambridge University 47, 49, 120, 140, 150, 151, 155, 182
- cancer 143, 144, 149, 217, 239
- Cancer Society, Denmark 217, 218
- carbon 14 226
- carbon dioxide 72, 73
- Carlsberg Breweries 11, 214
- Carlsberg Foundation 32
 board of directors 20, 201
 Bohr's close relationship with 200, 201
 establishment of 17
 first support to Bohr 200
 supports Bohr in the 1920s 17, 20, 25
 supports Bohr in the 1930s 35, 196, 199–203, 205, 208–210, 212–215, 218–220, 239, 242
 supports new mathematics institute 35
 supports the institute's establishment 17
- Carlsberg Laboratory 222
- Carlsberg mansion 11, 67, 68, 201, 249
- Carnegie Institution 169
- Casimir, Hendrik B. 7
- causality 42, 50, 78, 79, 84, 85, 87, 91, 95–97, 101
- Cavendish Laboratory 46, 51, 53, 57, 59, 149, 150, 242
- cells 72, 192
- censorship 109
- Century of Progress (*see* World Exhibition, 1933)
- Chadwick, James
 confirms nuclear photoeffect 238
 discovers the neutron 52–54, 64
- Chemical Institute, Bangalore 145
- Chemical Society of London 49
- chemistry 1, 50, 72, 86, 98, 112, 120, 139–141, 143, 144, 151, 153, 165, 170, 173, 174, 176, 177, 179, 180–182, 186, 188, 201, 204, 207, 208, 220, 224, 225, 228, 244, 245, 254
 funded by the International Education Board 23
 molecular 14
 Nobel Prize in 140, 148
 organic 139
 physical (*see* physical chemistry)
 radiation 180
- Chicago 111 (*see also* University of Chicago)
- chick embryo 224
- Chievitz, Ole 205, 208, 209, 222, 224, 225, 227
- chlorine 141, 151
- Christiansen, Christian 69
- Christiansen, Jens A. 143
- civil service 133 (*see also* Beamtengesetz)
- classical electrodynamics 44
- Classical Greece 11
- classical physics 17, 28, 43, 62
- cloud chamber 57, 147
- Cockcroft, John D. 56, 196
- Cockcroft–Walton generator 56, 196, 199–203, 205, 239, 242, 247, 248
- Collège de France 216
- College of Dentistry, Copenhagen 224
- Columbia University 144, 189, 221
- Committee for Research in Problems of Sex (NRC) 178, 189
- Como 41, 42, 49, 77, 78
- complementarity (*see* Bohr, Niels: complementarity argument of)

Index

343

- completeness of quantum theory (*see* Einstein, Albert)
- compound nucleus 3, 157, 235, 238, 246, 247, 250, 257
- Compton effect 232
- Compton, Karl T. 135
- Conant, James B. 181
- Condon, Edward 45
- conferences, informal, at the institute 260
1929, first 44
1931 83
1932, on the neutron 53, 120
1933, on the positron 59, 116
1934, canceled 152
1935, postponed 235
1936, on nuclear physics 89, 235
- conjugate quantities 41
- Copenhagen
as international science center 33
Bohr's 1929 lecture in 79, 89
International Light Congress in 90
newspapers in 131
provides land for the institute 24
streets of 11
Unity of Science conference in 96, 97, 235
- Copenhagen interpretation 3, 38, 41, 77, 80, 82, 83, 85
- Copenhagen spirit 27, 260
as broadness of approach 6, 51, 99, 223, 229
as communication with Bohr 9, 11, 105, 119, 234
as informal atmosphere 7, 235
as open attitude 48, 67, 183, 260
as regressive force 103, 258
as research freedom 6, 15
at work 39, 49, 68, 69, 82, 99, 103, 234, 247, 250, 259
Bohr's commitment to 26, 165, 253, 259
challenge to 105, 158, 165
Franck's problem with 159
funding conditions for 15, 26, 27, 165, 182, 191, 253
Heisenberg's introduction of term 6
Hevesy's distance from 143, 160, 250
insulation of 100, 123, 246, 247
reinforced by refugee problem 124
requires young physicists 118, 159
resilience of 161, 212, 213, 228, 234, 235, 250, 259
- Copenhagen University 24
350th anniversary of 80
Aage Friis as president of 115
- applies for mathematics institute 35
Bohr's education at 69, 137
Bohr's institute at 3
Bohr's salary from 19
first professorship in physical chemistry at 32
frees Bohr from administration 20
frees Krogh from teaching 206
Fricke's education at 180
funded by Rockefeller philanthropies, 1920s 28, 32, 167, 180
medical faculty of 32, 224
physiology chair at 75
science faculty of 17, 29, 32
- Cornell University 144, 155, 170
- correspondence principle 62
- cosmic rays 57
- cost-of-living index 25, 220
- Coster, Dirk 27, 142, 153
- Council for the Extension of Research and Scientific Investigations, Spain 26
- Courant, Richard 106, 154
- Curie, Irène 53, 57, 147, 148, 254
- Curie, Marie 148
- cyclotron 196, 203, 205, 210, 214–217, 227, 228, 239, 241, 242, 248, 255
- Czechoslovakia 116
- Danish Committee for the Support of Refugee Intellectual Workers 115–117, 119, 123, 124, 127, 148, 162
- Danish government 17, 20, 21, 24, 25, 32, 35, 207, 218, 219, 220
- Danish Ministry of Education 20
- Danish State (*see* Danish government)
- Danish State Farm 224
- Danish–German relations 115
- Delbrück, Max 234
contributes to biology 95, 223
motivation for biological work of 94, 95, 97
reacts to Bohr's written formulations 234, 235
succeeds Jordan as Bohr's helper in biology 94, 95, 98, 102, 198
- Denmark
Bohr's attachment to 19
economic situation in 18, 24, 25
German occupation of 4, 115, 217, 220, 248
- dermatology 91, 143
- determinism 70, 72, 77, 78, 82
- deuterium 144, 203, 209, 221, 226, 227 (*see also* heavy hydrogen)
- deuterium oxide 145
- Diabetes Hospital, Copenhagen 224

344 *Index*

- diffusion
 gas exchange in the lungs as 72, 73, 75
 Dirac equation 43, 117
 Dirac, P.A.M. 120
 and quantum field theory 44, 47
 hole theory of 43, 44, 48, 49, 52,
 57–59, 117, 147
 reacts to compound nucleus 234
 relationship with Bohr 48–50, 102,
 123, 223
 view on energy conservation 48, 51,
 233
- division of labor
 between Bohr and collaborators 253,
 256, 258
 between Danish government and private
 funding agencies 21, 218
- doctorates
 Bloch 121
 Bohr 137
 Frisch 118
 Hevesy 137
 Jacobsen 66
 Jones 173
 Jordan 82
 Levi 122, 123, 149
 Mason 168
 Miller 197
 O'Brien 182
 Planck 78
 Teller 120
 Tisdale 182
 Weisskopf 120
- Donnan, George F. 120
 Dreimännerarbeit 95
 duality 70, 85 (*see also* wave–particle
 duality)
- earth science 177, 178, 189 (*see also*
 geophysics)
- East Asian Company, Denmark 214
 Eddington, Arthur 51, 94
 Edsall, David 188
- education
 Bohr's 17
 discussed in reorganization of
 Rockefeller philanthropies 167, 176
 in Nazi Germany 113
 in policy of International Education
 Board 22–24, 176, 190
- Ehrenhaft, Felix, 116
 Einstein Laboratory 110
 Einstein, Albert 19, 110, 115, 245
 corresponds with Jordan on quantum
 mechanics 82, 83
 questions quantum theory's
 completeness 230, 235
- electrochemistry 138, 170
 electromagnet 214, 215, 242
 electromagnetic field 43, 44, 62, 63
Electromagnetic Field, The (monograph
 by Mason and Weaver) 171
 electromagnetic radiation 17, 23, 45
 electron theory 147 (*see also* Dirac,
 P.A.M.: hole theory of)
- electrons 56, 57, 82, 83, 85, 232
 as fundamental particles 52
 atomic 39, 42, 48, 53, 130, 199, 231,
 232
 discovery of 140
 in beta decay 46, 57, 64, 65
 nuclear 45–48, 52–57, 61–63, 65, 252
 relativistic 43, 44, 47, 55, 117
- electrostatic generator (*see* Van de Graaff
 generator)
- elitism 14
 Ellis, Charles D. 46, 59
 Emergency Committee in Aid of
 Displaced German Scholars, U.S.A.
 107, 125, 135
- endocrinology 181, 189, 204
 energy conservation 44, 46, 54, 55,
 63–65, 232, 233 (*see also* Bohr, Niels:
 view on energy conservation)
- energy spectrum 46
 energy state 17, 42, 43
 epistemology 77, 80, 87, 88, 93
Erkenntnis 92, 93
 Eukem, Arnold 120
- Europe
 approach to refugees in 124, 253
 as natural science center 22
 fellowship system for 22, 23, 169,
 189
 first cyclotrons in 242
 political situation in 122, 248
 relief committees in (*see* national relief
 committees)
 Rose's tour of, 1923 24
 share of experimental biology grants
 to 191
 Weaver's tour of, 1932 173, 174
 Weaver's tour of, 1933 111, 126
- evolution 80
 exclusion principle 43
 experimental biology (*see* Hevesy,
 George; Rockefeller Foundation)
- expertise 23, 181, 188, 190, 195, 198, 217,
 230
- external history 2, 164, 256, 257
 eye 79, 91
 Faber, Knud 24
 Faraday Lecture 49

Index

345

- Fermi, Enrico 65, 118, 122, 155, 245
 disagrees with Bohr on neutron capture 151, 155, 232
 hosts pioneering 1931 Rome nuclear physics conference 49, 64, 152
 neutrino theory of 55, 63–65, 147, 162, 232, 233, 252
 neutron bombardment program of 148–151, 244, 254
 predicts transuraniums 244, 245
 requests rare earths from Hevesy 153, 154, 191, 221, 222, 230
- Finland 237
- Finsen Hospital 224
- Finsen Institute 204, 205, 209
- First World War 19, 106, 112, 130, 141
- fission 3, 247, 248, 250
- Flexner, Abraham 24, 33
- Flexner, Simon 33
- fluorescence 149, 154
- fluorine 149
- Forman, Paul 107, 110
- Fosdick, Raymond B. 167, 179, 181, 188, 190, 216
- Fowler, Ralph 53, 155
- France 216
- Franck, James 123, 221
 approach to research 130, 133, 136, 137, 146, 159
 earlier career 130–134, 146
 effect of Nazi regime 106, 112, 114, 119, 127, 133, 134
 first meeting with Bohr 130
 first stay at the institute 27, 130, 131
 introduces nuclear physics research at the institute 149–152, 154–158, 162–164, 191, 193, 200, 212, 230, 254–256, 258
 Nobel Prize, 1926 133
 prospects in Copenhagen 136, 146
 relationship with Bohr 130–134, 136, 137, 150, 158–160
 relationship with Born 88, 132, 154–157, 191
 relationship with Hevesy 145, 150, 160
 research on fluorescence 149, 154
 Rockefeller Foundation supports
 second stay at the institute for 105, 126, 127, 129, 134–136, 146, 149, 166, 178, 183, 186, 191, 220, 254, 255
 special role as senior scientist 106, 162, 254, 258
 takes on Levi as assistant 122, 123, 149
 U.S. prospects and move 135, 136, 149, 155, 163, 217, 221, 239
- Frank, Philipp 115
 helps refugee Guido Beck 116, 117
 reacts to Bohr's views 96, 97
 reacts to Jordan's views 93, 96
- Franklin Institute, Philadelphia 21
- free will 7, 70, 71, 77–79, 83, 85, 86, 93, 96
- Freiburg University 126, 137, 144–146, 150, 152, 153, 170, 186–188, 209, 221
- Freud, Sigmund 93
- Freundlich, Erwin 110
- Fricke, Hugo 180
- Friis, Aage 115, 148
- Frisch, Otto R.
 and Academic Assistance Council 118, 119
 and Rockefeller fellowship program 112, 117–120
 comes to the institute 118, 119, 149–151, 230
 effect of Nazi regime 117, 118
 explains nuclear fission 3, 242, 245–247, 250
 involvement in introduction of nuclear physics at the institute 155, 157, 163
 nuclear physics work at the institute of 230, 238, 239
 remembers the institute 7, 9, 11
 subsequent career 230, 231
- Fürth, Reinhold 116, 117
 gamma decay 45, 46
 gamma rays 58, 147, 151
- Gamow, George 7, 26, 121
 and nuclear electrons 45–47
 contributes further to nuclear theory 66, 230
 explains alpha decay 45, 46, 66
 proposes liquid drop model 45, 246
 relationship with Bohr 152, 234
- Geiger counters 226
- Geiger, Hans 64, 233
- General Education Board 22, 24
- genetics 189, 223
- geology (*see* earth science)
- geophysics 143
- George Fisher Baker Lectures 170
- George Washington University 121
- German Alps 203
- German government 106, 108, 110, 112, 113
- German University, Prague 115
- Germany
 censorship of letters in 89
 occupies Denmark 217, 220
 occupies the institute 248
 publication of Bohr's booklet in 89

346 *Index*

- Germany (*cont.*)
 purge of scientists in 105–108,
 110–114, 116, 118, 120–122, 124–126,
 135, 155, 179, 245, 253, 254
- Glasson, J.L. 52
- Göteborg 245
- Göttingen University 26, 45, 82, 108,
 112, 120, 129, 131–136, 154, 168
 as center for atomic physics 26, 132
 effect of Nazi regime 106, 114, 119,
 120, 127, 133
 Institute for Theoretical Physics
 at 106, 160
 mathematics institute at 26
 Second Physical Institute at 106
- goldfish 145
- Goldhaber, Maurice 238
- Gordon, Walter 117, 118
- Goudsmit, Samuel 26, 55, 64
- Guest Book (at Bohr's institute) 122
- guinea pigs 143
- Gurney, Ronald 45
- Haber, Fritz 112, 113, 130, 134
- hafnium 142, 153
- Halban, Hans von 238
- Haldane, John S. 75–77, 86, 92, 98, 183
- half-life 46
 of phosphorus 151
- Hamburg 7 (*see also* University of
 Hamburg)
- Hansen, H.M. 24, 27, 32, 90, 91
- Hartmann, Max 94, 95
- Harvard Medical School 188
- Harvard University 13, 14, 135, 181, 223
- heavy hydrogen 144, 187, 189, 192 (*see
 also* deuterium)
- heavy water 193, 208, 209, 221
- Heidelberg 138, 224, 233 (*see also*
 Heidelberg University)
- Heidelberg University 132
- Heilbron, John S. 45, 51, 88, 100
- Heisenberg, Werner 26, 41, 46, 53, 58,
 59, 62, 80, 112, 115, 120, 121, 149, 152,
 229
 and quantum field theory 44, 47
 develops uncertainty principle 41
 first nuclear theory of 54, 55
 first visit to the institute 132
 introduces quantum mechanics 27, 41
 introduces term “Copenhagen spirit”
 6
 reacts to refugee problem 114, 116,
 121
 relationship with Bohr 11, 27, 41, 63,
 102, 123, 124, 203, 234
- helium nucleus (*see* alpha particle)
- Helsingør 90
- Helsinki 237
- Henriques, Valdemar 20, 75, 201
- Hertz, Gustav 130, 133
- Hevesy, George 160, 203, 204, 210, 211,
 221, 223, 225
 and Copenhagen experimental biology
 conference, 1938 223, 224
 and Fermi's request for rare earths
 153, 154, 191, 221
 and rare earths 144, 153, 221, 222
 applies for experimental biology
 support 202, 203, 205, 206
 applies heavy hydrogen as indicator
 144, 145, 187, 193, 209, 221
 applies phosphorus as indicator 197,
 198, 222, 223, 227
 approach to research 130, 137–144,
 146, 159, 160, 163, 187, 228
 as pioneer 227, 249
 at Freiburg University 126, 144, 145,
 170
 at Manchester 137, 138
 benefits from the Rockefeller
 Foundation's turnabout 206
 biological work before redirection
 143–145, 170, 202, 205
 collaborates at the institute 225, 226,
 249
 collaborates internationally 224, 225
 collaborates with other Copenhagen
 institutions 205, 209, 223–225, 249
 delivers experimental biology
 application 203–206
 discovers hafnium 142, 153
 earlier career 137–146
 effect of First World War 141
 effect of Nazi regime 126
 experimental biology project of 4, 5,
 213, 215, 220, 221–228, 238, 249, 258
 first meeting with Bohr 137
 first stay at the institute 66, 141–144
 insufficient status of 187, 188
 introduces experimental biology at the
 institute 148, 166, 187, 192, 193, 195,
 197, 198, 202, 203, 205, 212, 255
 introduces nuclear physics research at
 the institute 150, 152–155, 158, 162–
 164, 191, 193, 200, 212, 221, 222, 227,
 230, 231, 238, 239, 254–256, 258
 invents radioactive indicator technique
 139, 140, 153
 Levi's assistantship for 153, 221, 225
 marriage of 146
 Nobel Prize, 1943 140
 obtains radium gift 214, 215
 prospects in Copenhagen 145, 146,
 186, 187
 receives experimental biology support
 210

Index

347

- relationship with Bohr 130, 137, 140, 146, 159, 160, 255, 258
 relationship with Franck 145, 160
 relationship with Krogh 193, 209, 210, 224
 relationship with physicists at the institute 228, 250
 Rockefeller Foundation misunderstands telegram from 207–210
 Rockefeller Foundation supports
 Freiburg institute of 170, 171, 186–188
 Rockefeller Foundation supports second stay at institute for 105, 126, 127, 129, 135, 145, 146, 166, 178, 220, 254
 self-promotion of 140, 141, 223
 special role as senior scientist 106, 162, 258
 subsequent career 250
 work on x-ray spectroscopy 142–144, 187
 High-Tension Laboratory 55 (*see also* Cavendish Laboratory)
 high-voltage equipment 150, 192, 195, 196, 218, 239 (*see also* Cockcroft-Walton generator; Van de Graaff generator)
 Hilbert, David 168
 Hill, A.V. 180, 181
 Hillerød 224
 Hippel, Arthur von 239
 historians 1, 5, 39, 49, 51, 52, 177
 Hitler, Adolf 108, 112, 116, 122, 158, 253
 Hjelmslev, Johannes 20, 201
 Høffding, Harald 67, 69–72, 78, 85
 Hofer, Erich 145, 221
 Holland 26
 Holst, Johannes J. 224
 hookworm disease 22
 Hopkins, B. Smith 153
 Hopkins, Frederick G. 181, 182
 horse bean (*see* *Vicia Faba*)
 Horthy, Miklós 141
 Hoskins, Roy G. 181
 Houston, William 234
 Hungary 120, 137, 141, 146
 Soviet republic of 141
 Huxley, Julian S. 181
 hydrogen 127, 139, 209 (*see also* heavy hydrogen)
 hyperfine structure 64
 identity hypothesis 70, 71, 78
 Illinois (*see also* University of Illinois)
 India 145, 146
 induced radioactivity
 discovery of 148, 152, 162, 187
 Fermi's project of 148, 153, 155, 244
 Hevesy's biological use of 192, 195–197, 203, 205, 215, 222
 institute's project of 150, 151, 153, 155, 221, 222, 230, 231, 238
 industry 110, 144, 215
 Institute for Physical Chemistry
 at Freiburg 170 (*see also* Hevesy)
 at Göttingen 120
 at the Sorbonne 216
 in Copenhagen 28, 32, 127, 145 (*see also* Brønsted)
 Institute for Theoretical Physics, Copenhagen 7, 166, 202 (*see also* Bohr, Niels)
 appointments at 20, 21, 24, 25, 105, 218, 219
 as historical case 3–5, 257, 259, 260
 establishment of 17, 24, 25, 36, 66, 123, 131, 139, 163, 200, 249, 258
 experimental tradition at (*see* spectroscopy)
 German occupation of (*see* Germany: occupies the institute)
 informal conferences at (*see* conferences, informal)
 number of researchers at 23, 25, 36
 publications from 4, 5, 36, 66, 228, 230, 231, 248
 Institute of Mathematics, Copenhagen 35, 126, 129, 130, 195
 Institute of Plant Physiology, Copenhagen 143
 International Education Board 26, 34, 36, 126, 169, 171, 173
 best science policy of 23, 27, 28, 32–34, 36, 103, 170, 175, 206, 253, 254
 demise of 165–167, 169
 fellowships of 23, 25, 26, 34, 36, 37, 82, 103, 107, 169, 182
 origins of 22, 23
 Paris office of 23, 33, 126, 182
 supports Copenhagen physical chemistry 28, 32–34, 127
 supports Copenhagen physiology 28, 31, 32
 supports the institute, 1920s 21–28, 253, 255
 International Federation of University Women 122
 International Health Board 22
 International Light Congress, Copenhagen, 1932 90, 91, 173
 International People's College, Helsingør 90
 interviews
 by Rockefeller philanthropies 24, 33, 185–187, 191, 193, 195, 199
 for jobs 171

348 *Index*

- interviews (*cont.*)
 oral history 13, 15, 102, 132, 158, 160, 164, 259
 Iowa (*see* University of Iowa)
 isotopes
 as security risk 250
 clarification of concept 139
 of carbon 226
 of hydrogen 144
 of lead 140, 143, 223
 of phosphorus 151, 197, 198, 222, 227
 of potassium 222, 227
 production of 147, 148, 205, 250
 radioactive 139, 141, 144, 187, 203, 205, 209, 227
 separation of 141
 Italy 41
 Ithaca 170, 171 (*see also* Cornell University)
 Jacobsen, J.C. 25, 27, 66, 145, 147, 233
 Jacobsen, Jacob C. (brewer) 11, 17
 Japan 184
 Jeans, James 19
 Jesus 11
 Johannesburg 144
 Johns Hopkins Hospital 182
 Johns Hopkins University 134–136, 182, 217
 Joliot, Frédéric 53, 57, 147, 148, 216, 241, 242, 245, 254
 Jones, Lauder W. 126–129, 134, 170, 173, 186
 Jordan, Pascual 26, 82, 87, 88, 114
 corresponds with Bohr on biology 82–87, 89–92, 101, 102, 148
 corresponds with Einstein 82
 earlier career 82
 literary slip 88, 89
 promotes views associated with Bohr 88, 89, 92–96
 shattered relations with Bohr 88, 89, 94, 96, 235
 Kaiser Wilhelm Institute 129
 for Biology 94, 95
 for Chemistry 128
 for Medical Research 233
 for Physical Chemistry 109, 112, 122, 130, 132, 134
 Kaiser Wilhelm Society 109, 114, 129, 134
 Kalckar, Fritz 230, 234, 237, 238
 Kamen, Martin 226
 Karlsruhe 137
 Kármán, Theodore von 137
 Kissmeyer, Arne H. 91
 Klein, Oskar 11, 58, 59, 91, 117, 131, 234
 Klein–Gordon equation 117
 Koch and Sterzel 239
 Koch, Jørgen 238
 Kohler, Robert E. 190
Kopenhagener Geist (*see* Copenhagen spirit)
 Kopfermann, Hans 66, 112–114, 230
 Kramers, Hendrik A. 11, 13, 14, 20, 121, 124
 Krogh, August 187, 208, 223–225, 250
 declining role in experimental biology project 197, 198, 202–205
 disagrees with Christian Bohr 72, 73, 75
 earlier career 28, 29, 31
 experimental biology work of 221, 224, 227
 Nobel Prize, 1920 31
 origins of experimental biology interest 193
 provides policy advice to the Rockefeller Foundation 180, 181, 186
 relationship with Bohr 31, 193, 258
 relationship with Hevesy 193, 209, 221, 224
 requests to be freed from teaching 185, 197, 206–208
 Rockefeller Foundation takes interest in 188, 192, 193, 195–197, 204, 255
 Rockefeller Foundation's early lack of interest in 185
 submits explanatory letter to the Rockefeller Foundation 209, 210
 supported by Rockefeller philanthropies, 1920s 28, 31, 32, 167
 supported by the Rockefeller Foundation, 1930s 28, 210, 211
 Kronig, Ralph de Laer 46
 Laboratory of Public Health, Rome 149
 Ladenburg, Rudolf 109, 110, 132
 Landau, Lev 7, 61–63
 Langer, Rudolph M. 58
 Laslett, Lawrence J. 242
 Laue, Max von 113, 114
 Lauritsen, Charles 239
 Lauritsen, Thomas 217, 239, 242, 248
 Lawrence, Ernest O. 196, 204, 217, 227, 239, 241, 242
 lead 139, 140, 143, 223
 lead intoxication 143
 leaves 149, 222
 Leipzig (*see* University of Leipzig)
 Leningrad 242
 Levi, Hilde 250
 assistantship with Franck 149, 221
 assistantship with Hevesy 153, 221, 225
 effect of Nazi regime 122, 123

Index

349

- relationship with Bohr 221, 247, 259
subsequent career 225
life science (*see* biology)
- light
in biology 90
perception of 83
wave-particle duality of 13, 14, 41, 85
- Light and Life lecture (*see* Bohr, Niels: gives "Light and Life" lecture)
- Light Congress (*see* International Light Congress)
- light quantum (*see* photon)
- Lillie, Frank R. 178
- Lillie, Ralph S. 77, 78, 83, 178
- Linderstrøm-Lang, Kaj U. 222–224
- linguistics 69
- liquid air 127, 129, 196
- liquid drop model 245, 246
- Lister Institute of Preventive Medicine 224
- Lomholt, Svend 143, 205
- London 7, 112, 120, 150, 152, 239 (*see also* University of London)
- London, Fritz 120
- low-temperature physics 26 (*see also* liquid air)
- Ludwig, Carl 72, 75
- Lundsgaard, Christen 24
- Lungsgaard, Einar 224
- lung tissue 72
- lungs 72, 73, 75
- Lwów 224
- Mach, Ernst 92
- magnesium 147
- Maier-Leibnitz, Hermann 233
- Manchester (*see* University of Manchester)
- Manchester Guardian Weekly* 107
- Mason, Max 111, 112, 124, 125, 168, 169, 171, 175–179, 189
- Massachusetts Institute of Technology 135
- mathematics 20, 75, 106, 134
funded by the International Education Board 23
in physics 35, 168, 219, 231
in the Rockefeller Foundation's funding policy 165, 174, 176, 179, 181, 182, 184, 188, 254
- Mayo Clinic 216
- medicine 24, 204
application of physics in 205, 218
Nobel Prize in 31, 98, 180
radioactive indicators in 143, 224, 225
Rockefeller Foundation's work in 167, 188
- Meitner, Lise 64
Bohr obtains Rockefeller Foundation grant for stay at institute 128, 129
dispute with Ellis about beta decay 46
effect of Nazi regime 128, 129, 245
explains nuclear fission 3, 244–247, 250
offers position to Delbrück 95
membranes 192, 209
mercury 141
metabolism 209, 215, 222–224, 227
metals 138, 187, 215
Metropolitan-Vickers Company 150, 193, 195, 239
- Meyer, Stefan 139
- Meyerhof, Otto 94, 98, 180, 224
- Michigan (*see* University of Michigan)
- Miller, Harry M. 112, 118, 135, 197–199, 222
- Millikan, Robert A. 57, 171
- mineral analysis 143
- miraculous year (*see* nuclear physics: miraculous year of)
- Møller, Christian 7, 102, 164, 237
- Mohr, Otto Lous 99
- molecules 130, 133, 136, 149, 246
- Morgan, Thomas H. 178, 183, 184
- Mount Palomar 27
- Muller, Hermann, J. 98
- Munich 14, 132
- mutation 95, 223
- Mysovskii, L.V. 242
- mysticism 96
- national relief committees for the refugees 116, 119, 253
Britain (*see* Academic Assistance Council)
Czechoslovakia 116
Denmark (*see* Danish Committee for the Support of Refugee Intellectual Workers)
Holland 116
Sweden 117
United States (*see* Emergency Committee in Aid of Displaced German Scholars)
- National Research Council 22, 178, 182, 189
- Nature* 48, 61, 97, 157, 222, 223, 231, 233, 234
- Naturens Verden* 223
- Naturwissenschaften, Die* 87, 98, 234
- Needham, Dorothy 223
- Needham, Joseph 76, 77, 98
- Nernst, Hermann W. 133
- Neumann, John von 137
- Neurath, Otto 93
- neutrino 55, 64, 65, 232, 233, 254

350 *Index*

- neutron
 as composite 52–55
 discovery of 52, 53, 57, 64
 discussed at 1932 informal conference 53
 first name for neutrino 64
 in Heisenberg's nuclear theory 54
 prediction of 52
 produced with Copenhagen cyclotron 242
 produces fission 245, 247
 produces radioactive isotopes 148, 149, 151, 153, 155, 244, 245
 role in nuclear reactions 151, 152, 155, 156, 231, 232, 238, 246
- New York
 Bohr visits, 1933 111, 124–126
 Bohr visits, 1937 216
 Hevesy visits, 1930 170
 Rockefeller Foundation's trustee meeting 1935 in 202
- New York Times Magazine* 181
- Niels Bohr Institute (*see* Institute for Theoretical Physics)
- Nishina, Yoshio 26, 242
- nitrogen 147
- nitrogen 14 46, 54
- Nobel Committee 110
- Nobel Institute 245
- Nobel Prizes
 Bohr 139, 140, 142
 Fermi 244
 Franck and Hertz 133
 Hevesy 140
 Hill 180
 Joliot-Curie 148
 Meyerhof 98, 180
 Morgan 184
 Pauling 14
- Noether, Emmy 106
- Nordic Insulin Foundation 214
- Nordic Insulin Laboratory 214
- Norway 26, 80, 131, 237
- Notgemeinschaft der deutschen Wissenschaft 110, 115
- nuclear electrons (*see* electrons: nuclear)
- nuclear magnetic moment 46, 66
- nuclear photoeffect 238, 250
- nuclear physics 66, 237
 1930s transition to 2, 3, 39, 43, 51, 146, 147, 149, 260
 1930s transition to, at the institute 4, 5, 15, 28, 106, 130, 147, 150–152, 154, 155, 157, 158, 161–164, 166, 191, 193, 199–201, 212, 221, 227, 230, 231, 252, 254–256
 1931 Rome conference on 49, 50, 64, 101
 1933 Solvay conference on 59
 1934 London conference on 152
 and Bohr's complementarity
 argument 64, 68, 78, 101, 102, 253
 becomes autonomous 51, 52, 54, 57, 252, 253
 beginnings with Rutherford 39, 52, 148, 238
 Bohr's contributions up to 1934 48–50, 53, 54, 59, 78, 99, 232, 238
 Bohr's early discrimination of 40
 Bohr's influence on 231, 237
 consolidation of, at the institute 212, 213, 215, 219, 220, 228, 229, 231–235, 237–239, 242, 245–250, 256, 259
 early problems of 45–47, 52, 54–56, 64, 65
 experiments at the institute before redirection 66, 147
 Franck's earlier contributions to 133, 136
 Heisenberg's first contribution to 54, 55
 Hevesy's earlier contributions to 143, 146, 170
 interacts with experimental biology 5, 166, 187, 193, 196, 201, 212, 247, 249, 254, 255, 257, 258
 interacts with external developments 2, 4, 15, 28, 106, 124, 161, 164, 256, 257
 miraculous year of 3, 4, 39, 51, 52, 55, 56, 59, 63, 146, 252
 origins of 45
 origins of, at the institute 38, 39, 63, 65–69, 99, 101, 104, 124, 163, 252, 254
 seen as part of relativistic quantum physics 43, 47–49, 52, 54–57, 59, 65, 68, 99
- nuclear spin 46, 54, 64
- O'Brien, D.P. 182–187, 191, 195
- Occhialini, Paulo S. 57, 58
- Oliphant, Mark 231
- Olsen, Carsten 222, 223
- Onnes, Heike K. 26
- Order and Life* (monograph by Needham, J.) 98
- organicism 76
- Ornstein, Leonard S. 114
- Osterhout, W.J.V. 180, 181
- Owens, Robert B. 21
- oxides 170
- oxygen 72, 73, 75
- Paneth, Fritz 139, 140, 153, 224
- paraffin 155
- parapsychology 89, 93
- Paris
 Bloch lectures in 114, 122

Index

351

- Hevesy visits, 1934 126
 Hevesy visits, 1935 203, 206
 Joliot-Curies' work in 53, 57, 147, 149,
 152, 162, 254
 Parnas, Jakub K. 224
 particle creation 57, 65
 Pasadena 57, 58, 217 (*see also* California
 Institute of Technology)
 Paschen, Friedrich 108, 110, 111
 Pauli, Wolfgang 26, 61, 117, 120, 121,
 124
 and quantum field theory 44, 47
 formulates exclusion principle 43
 proposes neutrino 63, 64, 162, 232, 233
 relationship with Bohr 26, 63, 123, 147
 view on energy conservation 48
 Pauling, Linus 14, 189
 Paxton, Hugh C. 242
 Pearce, Richard M. 31, 167
 Pedersen, Johannes 201
 Peierls, Rudolf 61–63
 perception 42, 79, 83
 periodic law (*see* periodic system)
 periodic system 138, 140, 142, 149, 244,
 245
 periodic table (*see* periodic system)
 permeability 192, 193, 197, 198, 203, 209,
 221, 227
 Pflüger, Eduard 72
 Philadelphia 21
 philanthropy 2, 177, 259 (*see also*
 individual philanthropies)
 philology 201
 philosophers 1
 philosophy 22, 69, 87, 91, 98
 Bohr's 69, 71, 92, 94, 96–101, 164, 166,
 192, 198, 211, 253, 254, 257, 258
 Haldane's 75, 76
 Jordan's 82, 87, 92, 94
 of physics 51
 phosphorus 147, 150
 Ambrosen's work with 151, 153
 as biological indicator 4, 197, 209, 222,
 224–228
 photometer 127
 photon 14, 79, 91, 232, 238
 photooxidation 217
 photosynthesis 217
 physical chemistry
 at Göttingen 129
 Bronsted–Hevesy collaboration in
 141
 Budapest chair for Hevesy in 141
 Freiburg chair for Hevesy in 144
 Hevesy's work in 4, 126, 139, 258
 Physics Society, Copenhagen 59
 Physikalisch-Technische
 Reichsanstalt 108–111
 physiology 20, 28, 69, 72, 77, 95, 139,
 169
 at Copenhagen University 28, 29, 31,
 32, 75, 167, 180, 185, 224, 225
 Christian Bohr's 72, 75, 100
 Haldane's 75, 76
 Høffding's view on 71
 Jordan's view on 83, 85
 Krogh's 75, 185, 204, 255, 258
 Niels Bohr's view on 78, 79, 89, 92
 Nobel Prize in 31, 98, 180
 Rockefeller Foundation's program
 in 189, 197, 214
 ping-pong 7
 Planck, Max 19, 78, 114, 129
 Planck's constant 41, 42 (*see also*
 quantum of action)
 Platonic dialogue 11
 Poland 6, 224
 polonium 147, 148
 positive electron (*see* positron)
 positivism 87, 92, 93, 96, 97
 positron 56–59, 116, 147
 potassium 170, 221, 222, 227
 Potsdam 110
 Prague 93, 115–117
 Princeton 230, 235, 247 (*see also*
 Princeton University)
 Princeton University 45, 135, 169, 173
 Pringsheim, Peter 111
 Privatdozent 118, 121
 probability theory 174
 proton
 as fundamental particle 45, 52
 as positive electron in Dirac's theory
 43, 44, 52, 57
 disintegrates nuclei 56, 149
 in the neutron 52–54
 in the nuclear photoeffect 238
 in the nucleus 45, 53
 Prussian Ministry of Education 106
 psychic phenomena (*see* psychology)
 psycho-physical identity (*see* identity
 hypothesis)
 psycho-physical parallelism 70, 85,
 98
 psychology 70, 75, 85, 92, 93
 Bohr's views on 78–80, 83, 85–87, 90,
 92, 96
 in the Rockefeller Foundation's funding
 program 174, 176
 quantum mechanics
 applied to the nucleus 45, 46, 54, 66,
 232
 development of 3, 26, 28, 38, 41–44,
 82, 102
 experiments in 66, 102, 164
 generalization of 43, 47

352 *Index*

- quantum mechanics (*cont.*)
 interpretation of 38, 41, 42, 51, 77–80, 82, 83, 85, 86–88, 90, 92–94, 96, 101
 reestablishes energy conservation 48
 quantum of action 92, 98 (*see also* Planck's constant)
- quantum theory
 and biology 77, 79, 80, 82, 83
 Einstein questions 230
 Heisenberg's textbook on 6
 Mason and Weaver's rejection of 171
- rabbits 143
- Rabinowitch, Eugene 119, 120, 123
- race
 biology of 96
 in the Rockefeller Foundation's funding program 174
- radar 1
- Radiation Laboratory, Berkeley 217
- radioactive indicators 144
 biological application before 1934 143, 144
 Copenhagen physicists' view on 250
 discussed at 1938 conference 223
 importance of induced radioactivity for 148
 in biology 221
 in biology at the institute after 1934 187, 198, 203, 205, 209, 210, 215, 216, 220, 222–224, 227, 228, 249, 255
 invention of technique 140, 153
 limited application before 1934 141, 143, 208
 naming of 138
 non-biological application before 1934 140, 141, 143, 144
 promotion of technique 140, 144, 223, 228, 249
- radioactive tracers (*see* radioactive indicators)
- radioactivity
 artificial (*see* induced radioactivity)
 as nuclear phenomenon 40, 46
 beta decay phenomenon of 46, 64
 early experiments at the institute 27, 66
 Gamow's theory of 45, 46
 Hevesy's applications of (*see* Hevesy, George)
 induced (*see* induced radioactivity)
 Manchester contributions to 138–140
 produced by neutron bombardment (*see* Fermi, Enrico: neutron bombardment program of)
 program at the institute (*see* Bohr, Niels: introduces neutron bombardment project at the institute)
- radiochemistry 139
- radium 242, 244, 245
 radium D 139, 140
 Radium Foundation 217
 radium gift 214, 215, 227, 247
 Radium Institute
 Leningrad 242
 Paris 216
 Vienna 139, 140
 Radium Station, Copenhagen 149, 192, 203, 209, 214, 217, 218, 227
 radium–beryllium source 247
 radon 149, 227
 radon–beryllium source 149, 227
 Raman, Chandrasekhara V. 145, 146
 rare earths 142, 144, 153, 170, 191, 221, 222, 230
- Rask-Ørsted Foundation
 establishment of 25
 fellowships of 25, 26, 37, 118–121, 123, 141, 225, 230
 refuses to support Danish Intellectual Workers Committee 119
 suggested role in helping refugees 110
 supports annual conferences at the institute 25
 supports Franck and Hevesy 127, 129
- Rasmussen, Ebbe
 advances to permanent assistant 218
 experimental nuclear physics involvement of 237, 239
 informs Bohr about situation during first year of Nazi regime 108–113, 121
 moves into Bohr's former home at the institute 68
- rats 222
- Rayleigh, Lord 68
- reaction rate 53
- Rebbe, Otto 225
- recollections
 of Bohr and the institute 5, 13–16, 26, 36, 94, 103, 132, 159, 221, 258, 259
- Reddemann, Hermann 234
- Rehberg, Paul Brandt 185, 206, 207, 250
- Reichenbach, Hans 87, 92–94
- Reichenheim, Otto 110
- relativistic quantum physics 66
 and Bohr's complementarity argument 51, 78
 Bohr and Rosenfeld's contribution to 61–63, 229
 Bohr's interest in 42, 43, 45, 47, 49, 51, 55, 56, 59, 63, 65, 68, 99, 230, 232, 238, 249, 257, 259
 Dirac's hole theory of 43
 electromagnetic field theory of 44, 47
 incorporates the nucleus 47–49, 51, 52, 54–57, 65, 99, 232, 238, 253, 257
 relativity, general theory of 110

Index

353

- religion 75
- reminiscences (*see* recollections)
- respiration 75, 76
- Ricerca Scientifica* 149
- Richardson, Owen 54
- Riis, Pia 146
- Roberts, J. K. 52
- Rochester (*see* University of Rochester)
- Rockefeller family 2, 167
- Rockefeller Foundation 22, 97, 129, 135, 154, 167, 212, 214, 218, 226
- agrees to support Meitner's stay at the institute, 1933 128, 129
- and Bohr's relationship with the Carlsberg Foundation 200, 201
- annual reports of 174, 177, 189, 191, 216
- attempts to secure Bohr for program 179, 183–185, 254, 255
- Copenhagen visit, April 1934 182–188
- Copenhagen visit, October 1934 191–193, 195
- Division of Humanities 168, 174
- Division of Medical Education 31, 166, 167, 182
- Division of Medical Sciences 167, 174, 176, 188, 216
- Division of Natural Sciences 167–170, 174, 176, 188, 216
- Division of Social Sciences 168, 174, 176
- fellowships of 66, 108, 112, 114, 117, 118, 120–123, 226
- financial crisis of 190, 216
- handles Bohr's application for experimental biology support 202–211
- launches experimental biology program 165, 166, 171, 173–175, 177–179, 181, 182, 188, 189, 191
- negotiates experimental biology project with Bohr 195, 196–200, 214, 220, 222, 225, 255
- New York office of 170, 171, 173, 210
- Paris office of 108, 112, 118, 127–129, 169–171, 173, 182, 188, 195–197, 208, 209
- pays for NRC fellowships 22
- plea for concentration 169, 175, 211
- project orientation of 23, 32, 167, 175, 213, 217, 228
- provides additional support for Copenhagen project 216, 241, 242
- provides equipment for the institute, early 1934 126, 128, 129, 195
- refugee program of (*see* Special Research Aid Fund for European Scholars)
- reluctance to support Hevesy in Copenhagen 187, 188
- requires permanent position for fellows 110–112, 119, 121, 123
- responds to Bohr's turnabout 191–193, 195, 211, 212, 255
- supports biology conferences at the institute 223, 224, 235
- supports Copenhagen experimental biology 28, 210, 211, 213–215, 218, 220–222, 225, 228, 230, 239, 250
- supports Copenhagen physiology, 1920s 31, 32, 166, 180, 185
- supports Hevesy's Freiburg institute 170, 186
- supports other experimental biology projects 178, 189, 216, 217, 221, 241
- supports refugees Franck and Hevesy to work at the institute 127–129, 135, 136, 145, 220
- takes responsibility for basic science funding, c. 1930 32, 126, 167, 169–171
- trustees of 167, 169, 175, 177, 179, 188, 202, 205, 210
- Weaver's directorship of Natural Sciences (*see* Weaver, Warren)
- Rockefeller Institute of Medical Research 24, 33, 177, 179–181, 186
- Rockefeller philanthropies 2, 22, 24, 28, 32, 105, 111, 127, 165–167, 173, 175, 176, 182, 190, 211, 252, 253, 257 (*see also* names of individual agencies)
- Rome 118, 155
- Bloch's fellowship in 122, 147, 162
- Fermi's work in 148, 149, 151–153, 155, 162, 254
- nuclear physics conference in, 1931 49, 55, 56, 59, 64, 101, 152
- Rose, Wickliffe
- demise of 167, 182, 190
- directs the International Education Board 22–24, 31–33, 166, 167, 170, 173, 175–177, 182
- earlier career 22
- Rosenfeld, Léon
- answers Delbrück's outburst 234, 235
- collaborates with Bohr on measurement in quantum theory 61–63, 229, 230, 234
- relationship with Bohr 11, 12, 102
- travels with Bohr to the United States 246
- Rosseland, Svein 131
- Rostock 112, 114
- Rowland grating 111

354 *Index*

- Royal Danish Academy of Sciences and Letters 67, 201, 231, 249
 Gold Medal of 137
 Royal Society of Edinburgh 80
 Royal Society of London 19–21, 52, 54, 182
 Rozental, Stefan 6, 12
 Ruben, Samuel 227
 Rubens, Heinrich 132
 rubidium 170
 Rubin, Edgar 70
 Rutherford, Ernest 46, 51, 53, 139, 140, 145, 147, 150
 Academic Assistance Council, presidency of 107
 as Bohr's mentor in Manchester 6, 19, 39, 137, 140
 comments on celebrating scientists' achievements 215
 dies 224, 238
 offers Bohr job in Manchester 19
 postulates nuclear atom 39
 proposes an electrically neutral nuclear constituent 52, 148
 receives Bohr's criticism of Fermi's work 151, 152, 156
 reports accelerator-induced nuclear disintegration 55, 56
 views neutron as composite 53, 54
 wants Bohr at the Cavendish 19
 samarium 144
 Scandinavian Meeting of Natural Scientists
 Copenhagen, 1929 79
 Helsinki, 1936 237
 scandium 153, 221
 Scarsdale 216
 Schlick, Moritz 92, 93
 Schönheimer Rudolf 221
 School Law 113
 Schrödinger, Erwin 41, 120
Science Service 58
 Scott Lectures 49
 Second World War 1–4, 6, 16, 160, 191, 212, 217, 221, 225, 228, 242, 249, 256, 260
 secretion 75, 76
 Segrè, Emilio 151, 155
 Shankland, Robert 232, 233
 Siegbahn, Manne 142, 245
 silicon 147
 Silliman Lectures 24, 31, 76
 Slater, John C. 13, 14
 Smedley-MacLean, Ida 224
 social science 175 (*see also* Rockefeller Foundation)
 Society for Empirical Philosophy, Berlin 94
 sociology 1, 256
 Socrates 11
 Soddy, Frederick 139
 sodium 150
 sodium chloride 192
 Solvay Congress, 1933 59, 63–65, 116, 128, 152
 Sommerfeld, Arnold 14, 132
 Sorbonne 216
 South Africa 144
 space–time localization 97
 Spain 26
 Spanish Civil War 26
 Special Research Aid Fund for European Scholars (Rockefeller Foundation) 105, 124, 125, 127–129, 161, 165, 178, 190, 213, 252
 spectroscopy
 at the PTR 108, 111
 equipment for 17, 23, 199, 200, 255
 hyperfine structure in 64
 Levi's dissertation on 122, 149
 of beta decay 46, 65
 of x rays 142–144, 187, 223
 tradition for at the institute 27, 65, 66, 102, 139, 164, 180, 200, 239
 Speyer Lectures 134
 spiritualism 94, 96
 Spoehr, Herman A. 169–171
 St. Louis 197
 stability
 of atoms 42, 50, 86, 98, 101
 of living organisms 88
 of nuclei 50, 101, 170, 187, 245
 Stanford 169
 Stanford University 122, 135
 Stark, Johannes 108, 111
 stars 48
 statistics 174
 atomic 83, 84
 nuclear 46
 Stern, Otto 111, 118
 Stockholm 58, 117, 160, 184, 195, 245, 250
 Strassmann, Fritz 244
 Stuewer, Roger H. 245, 246
 style
 Bohr's 98, 235
 Jordan's 85
 of research 6, 51, 234
 subject–object problem 42, 70, 78, 79, 98
 sulfur 151
 summer house
 Bohr's 9, 91, 150
 Slater's landlady's 14
 summer school
 Cornell University 155
 University of Michigan 55

Index

355

- Support Committee for German Scholars (Holland) 116
- surface tension 137, 245
- Sweden 3, 131, 142, 189, 199, 237, 245, 248
- Switzerland 122, 202, 206
- syphilis 205
- Tate, John T. 216
- Technical University, Copenhagen 150
- teeth 224, 226
- telescope 27
- Teller, Edward 112, 120, 121
- theoretical physics 26, 41, 43, 58, 102, 104, 106, 115, 132, 160 (*see also* nuclear physics).
- and experimental biology 183, 192, 202, 209, 251
- Bohr's view on 17
- consolidation of 51
- Franck's connection with 137, 158
- Hevesy's connection with 146, 159
- institute's role in 3, 25, 43, 123, 163
- perceived crisis of 44, 45, 47, 49, 51, 52, 55, 59, 68, 78, 232
- therapy 90, 143, 149, 205, 217, 239
- Thomas B. Thrige Foundation 214, 215, 239
- Thomsen, Vilhelm 69
- Thomson, J. J. 140
- thorium 144
- Thrige Foundation (*see* Thomas B. Thrige Foundation)
- Timoféeff-Ressovsky, N. W. 95
- Tisdale, Wilbur E. 108, 112, 196, 199, 200, 216, 242
- advises Franck 154
- becomes administrator of IEB fellowships 182
- discusses experimental biology application with Hevesy 203–205
- earlier career 182
- exchange with Weaver 196, 197
- expresses doubt about Copenhagen experimental biology project 206–208, 210
- reports Bohr's total devotion to experimental biology 211, 212
- visits Copenhagen, April 1934 182–187, 191
- visits Copenhagen, October 1934 191, 193, 195, 196
- tissue 187 (*see also* lung tissue)
- Tokyo 242
- toxicity 209
- transuraniums 244, 245
- travelling seminar 107
- treatment (*see* therapy)
- trilogy
- Bohr's, 1913 130
- Heisenberg's, 1932–33 54
- Tromsø 26
- Trowbridge, Augustus 33, 126, 173
- tuberculosis 205
- Tuxen, Poul 201
- uncertainty principle 41, 46, 61, 86, 101
- uncertainty relations (*see* uncertainty principle)
- United States government 250
- Unity of Science
- group 92–94, 96, 115
- International Conference, Copenhagen, 1936 96, 235
- International Conference, Prague, 1934 93
- University Hospital, Copenhagen 224
- University of Berlin 111, 113, 114, 120, 128, 130, 132, 133, 149
- University of Birmingham 231
- University of Chicago 6, 168, 173, 178, 189
- University of Hamburg 111, 117, 118
- University of Illinois 197
- University of Iowa 182
- University of Leiden 26
- University of Leipzig 112, 114–116, 120, 121
- University of London 54, 118, 120, 149, 180
- University of Lund 142
- University of Manchester 6, 19, 39 137–140
- University of Michigan 55
- University of Minnesota 216
- University of Rochester 120, 152
- University of Uppsala 189
- University of Wisconsin 168, 171, 177
- uranium 244, 245
- Urey, Harold C. 144, 189, 191, 227
- Utrecht 114, 121
- Van de Graaff generator 196, 216–218, 242
- Van de Graaff, Robert 196
- venereology 91, 143
- Veterinary and Agricultural College, Copenhagen 143
- Vicia Faba 143
- Vienna 92, 116, 118, 139 (*see also* Radium Institute)
- Vincent, George E. 167, 169
- vitalism 69, 76, 88, 93, 96, 99
- Wagner, O. H. 144
- Walton, Ernest T. S. 56
- Warburg, Emil 130
- Washington University 197
- Washington, D.C. 121

356 *Index*

- wave mechanics 61 (*see also* quantum mechanics)
- wave-particle duality 13, 41, 85
- Weaver, Warren 111, 184, 187, 203–205, 207, 216, 217
- becomes Natural Sciences Director of the Rockefeller foundation 111, 171
 - consolidates experimental biology program 188–190
 - earlier career 171
 - exchange with Tisdale 196, 197
 - involvement in Franck visit to the United States, 1933 135
 - meets Bohr, February 1937 216
 - meets Bohr, July 1933 125, 126, 179, 184
 - opinion of quantum theory 171
 - prepares experimental biology program 173–182
 - relies on prestigious scientists 177, 179–182, 184, 185, 197, 216
 - reports on Copenhagen Unity of Science conference 97
 - reports on Thrige Foundation's gift to the institute 214
 - visits Copenhagen, summer 1932 173
- Weimar Germany 110
- Weiner, Charles 107
- Weisskopf, Victor 6, 11–14, 120, 123, 160, 198
- Wells, G.P. 181
- Wells, H.G. 181
- Werner, Sven 21, 27, 219
- Westcott, H. C. 151
- Wheeler, John A. 247
- White terror 141
- wholesale prices 18, 25, 35, 220
- Wilkins, T. Russell 152
- Williams, Evan J. 147
- Wolfsohn, Günther 109, 110, 113, 114
- Wood, Robert Williams 135, 136
- Wooster, William A. 46
- World Exhibition, 1933 111
- x rays 95, 142, 217, 239 (*see also* spectroscopy: of x rays)
- x-ray spectroscopy (*see* spectroscopy of x rays)
- Yale University 24, 31, 168
- Zeitschrift für Physik* 151
- Zeuthen Fund 215
- Zeuthen, Lauritz 215
- Zilsel, Edgar 93
- Zimmer, K. G. 95
- zirconium 142
- zoology 197
- Zoophysiological Laboratory 185, 225
- (*see also* Krogh, August)
- Zurich 61, 117, 120, 121, 137