Index

Abbas, Abdul K., 186
Actor-network theory, 323–324
ACT UP (activist group), 9–11
Acute lymphoblastic leukemia (ALL), 84–86, 111
  cALLA and, 117–122, 126–128, 133, 169
  clinical significance and, 128–130
  international studies and, 149–150
  interpretation issues and, 147–148
  prognostic studies and, 128–129
  Schlossman and, 168
  T cells and, 129–130
Acute myeloid leukemia (AML), 85, 126
AIDS, 4, 329
  AZT and, 265–266
  clusters of differentiation (CD) and, 9–11, 268–275
  flow cytometry and, 207, 210, 233, 237
  immunophenotyping and, 83 (*see also* Immunophenotyping)
  Janossy and, 125
  marker production and, 180–182
  monoclonal antibodies and, 146–147
  platform etymology and, 27
  public policy and, 78–79
  recovery and, 8–10
  regulation and, 259, 268–276, 280
Air Force, 54–55
Aiuti, Fernando, 111
Albert Bonniot Institute (IAB), 45–46
Albert Merritt Billings Hospital, 77
American Association of Pathologists and Bacteriologists, 245
American Cancer Society, 62, 65, 99
American Journal of Pathology, The, 81
American Lymph Node Registry, 245
American Medical Association, 52, 260–261
American Registry of Pathology, 245
American Society for Histocompatiblity and Immunogenetics (ASHI), 270
American Society of Clinical Pathology (ASCP), 271, 277, 284
American Society of Cytology, 66
American Society of Hematology, 271
American Type Culture Collection (ATCC), 133
Anemia, 162
Annual Review of Genetics, 100
Antibodies, 321
  bursa of Fabricius and, 102–103
  CD system and, 183–198
  FACS and, 107, 119–122
  Leu, 176–177
  production of, 159
  regulation and, 277–278 (*see also* Regulation)
  transplant rejection and, 98
Antigens, 99–101
  cALLA, 117–122, 126–128, 133, 169
  cell-surface markers and, 104–122, 172–183
  classification and, 297–316

Antigens (cont.)
differentiation of, 127–128, 144–145
flow cytometry and, 199–241 (*see also* Flow cytometry)
HLA workshops and, 184–188
HLDA workshops and, 189–198
Ly, 160, 165
morphological analysis and, 130–134
slide-based immunophenotyping and, 242–254
specificity and, 161
T cells and, 159–172 (*see also* T cells)
theta, 105–108, 164–165
tumor research and, 104–111
Antisera, 89–90, 105
Kung and, 171
Schlossman and, 168–169
T cells and, 108
theta, 163
APAAP (alkaline phosphatase–anti-alkaline phosphatase) technique, 200, 250–251, 252, 265
Architecture
Bauhaus school, 35
bioclinical interfaces and, 45–47
Caen Hospital, 33–34
European style and, 33–47
Hospital Construction Act of 1946, 35
hospital platforms and, 30–47
Lariboisière Hospital, 33, 35
organizational flow and, 38–47
Saint-Louis Hospital, 30–33
Western trend and, 33, 35
Arthritis, 125
Asherson, G. L., 125
Asofsky, Richard, 162–163
Association of Directors of Anatomic and Surgical Pathology, 278
Association of Pathology Chairs, 277
ATC flow cytometry machine, 231
Atomic Energy Commission (AEC), 53–54, 231
Automated multiphasic health testing (AMHT) centers, 239–240
"Automatic Cytology" conference, 240
Automation, 321–323
cancer and, 60–64
classification issues and, 247–254, 297–316
cytology and, 61–62
Europe and, 67–68
hematology and, 57–58
instrumentation vs. devices, 60–61
Japan and, 67–68
NCI and, 60–69
Pap test and, 60–69
pathology and, 57–59
reductionism and, 58–59
regulation and, 278–281 (*see also* Regulation)
screening processes and, 60–61
social consensus for, 59–60
spectrophotometers and, 65
Azidothymidine (AZT), 265–266

Bacteriology, 8
Barley, Stephen, 59
Barnett, David, 265–266
Bauhaus school, 35
B cell disease, 247
B cells, 94. *See also* Cell-surface markers
AIDS and, 268–275
ALL and, 130
antibodies production and, 159
antigen research and, 109–122
antisera singulation and, 108
blast crisis and, 136
bursa of Fabricius and, 102–103
cALLA and, 117–122
CDs and, 157
FAB classification and, 131
FACS and, 119–122
leukemia and, 88
lymphoma and, 313–314
regulation and, 281–283
slide-based immunophenotyping and, 247–249, 252–261
Beard, Mike, 127

Beckman Instruments, 230
Becton Dickinson, 133, 147
AIDS pandemic and, 271, 274
CD system and, 189
flow cytometry and, 206, 223, 226, 230–236, 238–239
marker production and, 176–183
Bernard, Alain, 184
Bernard, Claude, 69–70, 76, 113
Bernard, Jean, 50, 58, 112–113
Biological Stain Commission, 277
Biology, 92, 101–104
BIOMED, 268
Biomedical platforms, 23–24
antibodies and, 161 (*see also* Antibodies)
architecture and, 30–47
automatic Pap tests and, 60–69
bioclinical interfaces and, 45–47
cell-surface markers and, 155–156 (*see also* Cell-surface markers)
classification issues and, 28–30, 247–254, 297–316
clinical environment and, 4–12
description of, 1–4, 50–57
diagnosis procedures and, 2–3
epistemic issues and, 3
etymology of, 26–30, 50–57
example of, 12–17
flow cytometry and, 217–230 (*see also* Flow cytometry)
future directions for, 334–335
immunophenotyping and, 84–91 (*see also* Immunophenotyping)
infrastructure and, 326–327
instrumentation and, 57–69
multiple, 14–17
networking and, 323–330
new developments and, 4
organizational flow and, 29–30, 38–47
pathological processes and, 69–77
platform choice and, 14–17
public policy for, 77–82
reductionism and, 6–8
regulation and, 257 (*see also* Regulation)
sociological approach to, x–xii, 17–19, 321–335
survival curves and, 128
Biomedical Research Group (Los Alamos), 54
Biomedicine, 1–2, 25
automation and, 57–69
defining, 50–57
epistemology of, 50–53
etymology of, 50–57
government use of term, 53–56
hospital architecture and, 30–47
as natural history, 72
organizational flow and, 38–47
public funding and, 49
public policy for, 77–82
Biophysics, 231
Bio-Rad, 231
Blasts, 127, 136, 168
Blood. *See* Hematology
Blood Cells journal, 58
Bodmer, Walter, 142–143
Body and Antibody. A Report on the New Immunology (Wilson), 93
Bone marrow, 127
non-Hodgkin's lymphoma and, 319–320
myeloid cells and, 84–85
regulation and, 262–263
Bonner, William, 225
Borella, Luis, 109
Boston Health Department, 260–261
Boulez, Pierre, 1
Boumsell, Laurence, 184
Boyse, Edward, 97–98, 105
antisera and, 108
cancer antigens and, 99–101
T cells and, 159–161, 164–165
Britain. *See* United Kingdom
Brouet, Jean-Claude, 112
Brown, Geoffrey, 110
Bucher, Rue, 18
Bulletin of the World Health Organization, 196
Bursa of Fabricius, 102–103
Burton, Robert C., 175

Caen University Hospital, 33–34
Canada, 44, 276–277
Cancer, 2–4, 6. *See also* Leukemia
 antigen research and, 98–101, 104–122
 automatic Pap test and, 60–69
 biological-etiologic understanding of, 140
 Boyse/Old model of, 99–101
 cALLA and, 117–122, 126–128, 133, 169
 Canguilhem and, 71–72
 cell theory and, 73
 FACS and, 107, 119–122
 funding for, 86–88
 Gorer and, 97–99
 transplant rejection and, 98
 tumor research and, 104–111
 UKALL IV trial, 84
Cancer and Leukemia Group B (CALGB), 306
Cancer Research Campaign, 86–87
Canguilhem, Georges, 71–72, 76, 258, 331
Cantor, Harvey, 159–165
Capellaro, David, 119–120, 122
Caspersson, Torbjörn, 221–222, 229
CD counts. *See* Clusters of differentiation (CD) system
Celloscope, 222
CELLQuest, 290
Cell separators, 225
Cell-surface markers, 2, 22–23, 333–334. *See also* Immunophenotyping
 antigen research and, 104–111
 biology and, 101–104
 blasts and, 127, 136, 168
 Boyse/Old and, 99–101
 cALLA and, 117–122, 126–128, 133, 169
 CD system and, 155–159, 183–198
 cell populations and, 288
 classification and, 297–316
 commercial production of, 157–159, 172–183
 emergence of, 330–331
 FACS and, 89
 flow cytometry and, 214–217
 gating and, 285, 288–295
 genetics and, 142
 Good and, 102–104
 Greaves and, 84–91, 110
 HLA workshops and, 184–188
 HLDA workshops and, 189–198
 in humans, 166–172
 ICRF review of, 134–140
 imagery issues and, 285–295
 importance of, 155–156
 interfacing of, 140–141
 interpretation issues and, 147–148
 leukemia and, 109–117
 Ly series and, 100
 membrane structure and, 96–97
 mice and, 159–166
 Mitchison and, 91–92, 94–95, 104–107
 pathology and, 50, 73–74, 97–101 (*see also* Pathology)
 Pulvertaft and, 125
 Raff and, 104–108
 Schlossman and, 166–172
 separation and, 220–221, 225
 skin grafting and, 93–94
 Stoker and, 92–93
 surface studies and, 96–97
 T cells and, 109–111, 159–172
 technical improvements in, 91–97
Cell theory, 73
Cellular Pathology as Based upon Physiology and Pathological Histology (Virchow), 73–74
Centers for Disease Control and Prevention (CDC), 9
 AIDS and, 268–275
 gating and, 293
 immunophenotyping regulation and, 261, 268–275
 MPEP and, 273–274, 284–285
Centre d'Immunologie de Marseille-Luminy (CIML), 178
Chickens, 102–103
Chronic lymphocytic leukemia (CLL), 111–112, 318–319

cALLA and, 117–122, 126–128, 133, 169
Chronic lymphoproliferative disorders (CLPDs), 319
Chronic myeloid leukemia (CML), 127
Classification, 297
biphenotypic leukemic cell and, 307
bone marrow and, 319–320
broad activities of, 298–299
consensus and, 311–312
Delphi method and, 317
ECOG and, 306–308
EGIL and, 299–306, 308
FAB classification, 130–131, 299–300, 308
GEIL and, 300, 305–306
Harris and, 313–314
Kiel, 310, 314
leukemia and, 299–308
lymphoma and, 308–316
monoclonal antibodies and, 312
NCI and, 315
NIH and, 316–317
Rappaport and, 310–312
REAL, 309–316, 330
slide-based immunophenotyping and, 247–254, 299–316
therapeutic decisions and, 298
WHO and, 315–316
Class II devices, 278
Claude Bernard Association, 113
Clinical Cytometry Society, 241
Clinical environment, 22, 24
ACT UP and, 9–11
architecture and, 30–47
artwork and, 4–7
automation and, 57–69
bioclinical interfaces and, 45–47
biomedical platforms and, 49–91 (*see also* Immunophenotyping)
body fragmentation and, 20
CD counts and, 9–11 (*see also* Clusters of differentiation (CD) system)
classification and, 12–13, 297–316
consensus and, 316–320
MOU and, 93
networking and, 323–330
operators and, 283–285
organizational flow and, 38–47
quality control and, 261–262
reductionism and, 6–8
sociology for, 17–19, 23, 321–335
standards for, 260 (*see also* Regulation)
TIU and, 93
Clinical Laboratory Improvement Act (CLIA), 261
Clinical Laboratory Improvement Amendments (CLIA), 261
Clinical Pathology Accreditation (CPA), 266
Clusters of differentiation (CD) system, 133–134, 324, 333
AIDS and, 266, 268–275
B cells and, 157
cell-surface markers and, 155–159, 183–198
class II, 278
commercial preparations of, 157–159
counts, 9–13, 150, 153
differentiation and, 157, 159
flow cytometry and, 206–217 (*see also* Flow cytometry)
HLA workshops and, 184–188
HLDA workshops and, 189–198
imagery issues and, 285–295
marker production and, 172–183
organization of, 156–157, 183–198
regulation and, 266, 276 (*see also* Regulation)
reliability of, 196
scatterplots and, 286
T cells and, 157
CNRS (Centre National de la Recherche Scientifique), 207
Cole, Rufus, 77
College of American Pathologists (CAP), 261, 268, 270–273, 277–278
Collins, Harry, 59–60
Columbus Ohio Cancer Survey Project, 64

Commercialism, 157–159
CD system and, 183–198
cytometers and, 206, 217–239
HLA workshops and, 184–188
HLDA workshops and, 189–198
marker production and, 172–183
regulation and, 277
Common ALL antigen (cALLA), 117–122
antigen differentiation and, 127–128
Greaves and, 126
human T cells and, 169
morphological analysis and, 133
Computer tomography (CT) scanners, 287
"Concerted Action Automated Analytical Cytology" (CAAC), 68
Consensus, 311–312, 316–320
Coulter Electronics, 177–179
AIDS pandemic and, 271–272, 274
CD system and, 189
flow cytometry and, 222, 230–236
gating and, 294
marker production and, 180–181
regulation and, 283
Cutler-Hammer Inc., 63
CYDAC, 64–65
Cytoanalyzer, 64–65
Cytofluorograf, 219, 231–232
Cytogenetics, 45
Cytograf, 219, 231
Cytology Automation Program, 61
Cytometers, 151, 158, 322. *See also* Cell-surface markers; Flow cytometry
acceptance of, 210–211
articles indexed on, 211–213
automation and, 60–69
as black box, 207, 209
cell classification and, 217
CNRS and, 207
cross-discipline applications of, 212, 214
differentiation and, 157, 159
INSERM and, 207
MEDLINE data and, 211–213
OKT marker production and, 172–183
operation of, 214–217
as Rube Goldberg devices, 207–208
sales of, 206

Dagognet, François, 299
DAKO company, 254
Dana Farber Cancer Center, 167–168, 189
Daston, Lorraine, 332
Dausset, Jean, 184
Debré healthcare reform, 33
Delayed hypersensitivity, 159
Delphi method, 317
Department of Defense (DOD), 274
Diagnosis
automation and, 57–69
bioclinical interfaces and, 45–47
classification, 299–316
consensus and, 311–312, 316–320
Delphi method and, 317
EGIL and, 299–306, 308
FACS and, 89–91
germ theory and, 73
Greaves's proposal and, 84–91
hands-on, 59
hospital architecture and, 30–47
immunophenotyping and, 83–84 (*see also* Immunophenotyping)
manual, 69
multiple platforms and, 14–17
organizational flow and, 38–47
pathological vs. normal approach to, 69–77
platform regulation and, 297–320 (*see also* Regulation)
public policy and, 77–82
quality assurance and, 261–262
therapeutic decisions and, 298
Diagnosis Related Group (DRG), 279–280
Dill, Ken, 50–51
Disease, 49–50. *See also* Immunophenotyping; Leukemia
AIDS and, 268–275 (*see also* AIDS)

antigen research and, 104–122
automation and, 57–69
cALLA and, 117–122, 126–128, 133, 169
cancer and, 84 (*see also* Cancer)
classification issues and, 299–316
FAB, 130–131, 299–300, 308
germ theory and, 73
Good and, 102–104
Greaves's proposal and, 84–91
Hodgkin's, 102, 111, 125, 309, 311
pathological vs. normal approach to, 69–77
platform regulation and, 297–320
public policy and, 77–82
technology's influence on, 324–325
tumor research and, 104–111
Dittrich, W., 222
DNA (deoxyribonucleic acid), 224
automation and, 58, 60–61
flow cytometry and, 221–222, 229–230
index, 229
marker production and, 172–173
minute measurement of, 222
profiles, 2
Dorland, W. A. Newman, 52
Dorland's Medical Dictionary, 52
Dulbecco, Renato, 96
Dutch Cooperative Study Group on Immunophenotyping of Haematological Malignancies (SIHON), 267, 297

Eastern Cooperative Oncology Group (ECOG), 306–308
Engineering Foundation, 239–240
Enzymatic markers, 140–141
Erdheim, Jakob, 74
Ernst & Young, 29
E-rosettes, 110
Etiologic approach, 137, 140
classification and, 297–316
Etymology, 26–30, 50–57
Europe
automatic Pap test and, 67–68
public policy and, 80
regulation and, 264–268
European Committee for External Quality Assessment Programmes in Laboratory Medicine (EQALM), 268
European Group for the Immunological Characterization of Leukaemias (EGIL), 299–306, 308
European Lymphoma Club, 310
European Working Group on Clinical Cell Analysis, 268
Eurotransplant, 223
Evans, Robby, 170
External quality assessment (EQA), 261–262, 264–268

FAST Systems Inc., 274
Fetal tissue, 127
First International Symposium on Pulse-Cytophotometry, 224
First International Symposium on the Non-Hodgkin's Lymphomata, 249
Flow cytometry, 13
acquisition data for, 210
advantages of, 199–201, 206
AIDS and, 207, 210, 233, 237, 268–275
applications of, 206–207
calibration of, 278–281
careers in, 210
cell populations and, 288
classification and, 217, 297–316
commercial applications and, 218–230
consensus and, 316–320
cross-discipline applications of, 212, 214
data displays of, 216
development of, 206–214
DNA and, 221–222, 229–230
FACS and, 214–227, 231–241
fluorescein diacetate and, 228–229
gating and, 285, 288–295
Göhde and, 221–224
IBM and, 225

Flow cytometry (cont.)
imagery issues and, 285–295
improvement of, 217–230
increased sales of, 206
instrumentation issues and, 278–281
laser multiplication in, 235
light scatter and, 227–228
Los Alamos and, 219–221, 225–230
manufacturing of, 230–239
MEDLINE data and, 211–213
OKT work and, 219
operation of, 214–217, 283–285
overlapping applications of, 201
Pap test and, 218–219
professional organizations and, 239–241
qualitative data and, 230
regulation and, 259 (*see also* Regulation)
SPF values and, 229
standardization of, 272–273
Stanford and, 224–230
thyroid studies and, 219–221
transplantation and, 207, 210, 223
tumor ploidy and, 229
Flow Cytometry Standards Corporation, 271
Fluorescein diacetate, 228–229
Fluorescence-activated cell sorter (FACS), 89–91, 107, 134
cALLA and, 119–122
development of, 231–232
flow cytometry and, 214–227, 231–241
genetics and, 143
human T cells and, 169–170
Janossy and, 125
mice T cells and, 164
morphological analysis and, 132–133
OKT markers and, 177
regulation and, 282
Food and Drug Administration (FDA), 172–173, 261, 271, 277–279
Fortanier, Cécile, 184
Foucault, Michel, 1, 20
France
hospital architecture and, 30–36, 38
Medicare and, 38–39
organizational flow and, 38–47
public policy and, 78–81
regulation and, 267
Franco-American-British (FAB) diseases, 130–131, 299–300, 308
Frei, Emil T., 168
French Medical Research Institute (INSERM), 29, 78, 178, 207
Fröland, S. S., 109
Fujimura, Joan H., 90–91, 327
Fulwyler, Mack, 220–221, 225
Funding, 49, 86–87. *See also* Commercialism

Galison, Peter, 332
Gating, 285, 288–295
Gaudillière, Jean-Paul, 78
Gaussian distribution, 281–282
Genetics, 29, 142
Georges Pompidou European Hospital, 43
Germany
hospital architecture and, 36
leukemia and, 85
public policy and, 80–81
Germ theory, 73
Giorgi, Janis, 210
Glycosurea, 70
Göhde, Wolfgang, 221–224
Goldstein, Gideon, 171
Good, Robert, 102–104
Gorer, Peter, 97–99
Gowans, James L., 94, 103, 163
Grabar, Pierre, 113
Grafts, 125, 159
Greaves, Melvyn, 112–113, 123, 331. *See also* Immunophenotyping
acceptance of, 86
antigen studies of, 107–108, 114–117, 144–145
antisera production and, 89–90
articles published by, 124–125
B cells and, 88
biphenotypic leukemic cell and, 307
cALLA and, 117–122, 126–128, 133, 169

cell-surface markers and, 89–91, 110, 114
clinical significance and, 128–130
diagnostic proposal of, 84–91
FACS and, 89–91, 119–122
funding for, 86–88
genetics and, 142
ICRF and, 86–87, 134–140
international studies and, 149–150
interpretation issues and, 147–148, 150–151
Janossy and, 124–128
molecular biology and, 141–144
monoclonal antibodies and, 90–91
morphological analysis and, 130–134
OKT marker production and, 179
other projects of, 140–146
pediatric material and, 145–146
productivity of, 111
prognostic studies and, 128–130
regulation and, 265
Roitt and, 103
standardization of methods, 88
T cells and, 88, 168–169
TIU and, 86
Groupe d'Étude Immunologique des Leucémies (GEIL), 300, 305–306

Haldane, J. B. S., 98
Harboe, Niels M. G., 254
Harris, Nancy Lee, 310, 313–314
Health Care Financing Administration (HCFA), 261, 271, 279–280
Helper cells, 159–160
Hematology, 8, 325
AIDS pandemic and, 268–275
antisera and, 108–109
automation and, 57–58, 60–69
cell separation and, 220–221
classification and, 297–316
FAB classification and, 130–131
FACS and, 89–91
flow cytometry and, 219–221 (*see also* Flow cytometry)
gating and, 285, 288–295
imagery issues and, 285–295
leukemia and, 84–85 (*see also* Leukemia)
pediatric material and, 145–146
regulation and, 262–264, 281–283, 286–288
skin grafting and, 93–94
slide-based immunophenotyping and, 242–254 (*see also* Immunophenotyping)
staining methods and, 263
WBC and, 129
without a microscope, 286–288
Hematopathology, 6
Hepatitis, 125
Herzenberg, Leonard, 164–165, 240
flow cytometry and, 215, 225–226, 228–229
light scatter and, 227
marker production and, 180–181
OKT marker production and, 176–177, 179
HIV, 9–10. *See also* AIDS
clusters of differentiation and, 268–275
flow cytometry and, 207
immunophenotyping and, 123
monoclonal antibodies and, 146–147
MPEP and, 273–274
platform etymology and, 27
HLA (human leukocyte antigens) workshops, 184–188
HLDA (Human Leukocyte Differentiation Antigens) workshops, 189–198
Hodgkin's disease, 102, 111, 125, 309, 311
Holistic medicine, 51
Hospital Construction Act of 1946, 35
Hospitals. *See* Biomedical platforms; Clinical environment
Hospital-University Center (CHU), 33, 35
Howell, Joel D., 324
Human body, 19
clinical gaze and, 20

Human body (cont.)
diagnostic automation and, 59–60
fragmentation of, 20
low-level radiation and, 219–221
modeling/sampling and, 20–21
purified source material and, 167–168
T cells and, 166–172
Human Genome Project, 240

IBM, 65, 218–219, 225, 232
Imagery
cell populations and, 288
CT, 287
dot plot, 291–292
gating and, 285, 288–295
MRI, 287
PET, 287
scatterplots and, 286
"Immunodiagnosis of Human Leukaemia" (Greaves), 84–91
"Immunology of Leukaemia, The" (symposium), 112
Immunophenotyping, 2, 8
antigen research and, 98–101, 104–122, 127–128, 144–145
biology and, 101–104, 141–142
cALLA and, 117–122, 126–128, 133, 169
CD system and, 133–134, 155–159, 183–198
cell-surface markers and, 92–97, 104–122, 155–156, 172–183, 288 (*see also* Cell-surface markers)
classification and, 247–254, 297–316
clinical significance and, 128–130
color coding and, 151
composite, 140–141
consensus and, 311–312, 316–320
description of, 3–4
diagram generation by, 138–140
emergence of, 83–84, 330–331
etiologic approach to, 137
extending capabilities of, 151, 153
FAB classification and, 130–131
FACS and, 89–91, 107, 119–122
flow cytometry and 12–13 (*see also* Flow cytometry)
future directions for, 334–335
gating and, 285, 288–295
Good and, 102–104
Greaves and, 84–91 (*see also* Greaves, Melvyn)
ICRF and, 91–92, 95–97, 134–140
imagery issues and, 285–295
interfacing of, 140–141
international studies and, 149–150
interpretation issues and, 147–148, 150–151
Janossy and, 148–149 (*see also* Janossy, George)
leukemia and, 84–87, 109–122 (*see also* Leukemia)
limitations of, 123
lineage fidelity and, 135–136
lymphoma and, 308–316
membrane structure and, 96–97
monoclonal antibodies and, 90–91
morphological analysis and, 130–134
MOUs and, 93
networking and, 323–330
organizational flow and, 44–45
pathology and, 95–101, 134–140
prognostic studies and, 128–130
public policy and, 77–82, 257
regulation of, 260–275 (*see also* Regulation)
simplification of, 151
skin grafting and, 93–94
slide-based, 199–201, 206, 242–255, 297–316
social context and, 17–19, 23, 321–335
SRBCs, 109
stabilization of, 128–130
standardized reagents and, 157
survival curves and, 128
WBC and, 129
workshops on, 148–149, 184–198
Immunotech, 177–178, 189
Imperial Cancer Research Fund, 57, 86–87, 123, 145

cALLA and, 118–122, 133
immunophenotyping and, 91–97
review process of, 134–140
Impulscytophotometer, 222, 224, 231
Index Catalogue of the Surgeon General's Library, 52
INSERM, 29, 78, 178, 207
Institute for Child Health (ICH), 129, 145–146
Institute of Medicine, 56
Institut Gustave Roussy, 231
Instrumentation. *See* Automation
Internal quality control (IQC), 261–262
International Academy of Cytology, 68
International Agency for Research on Cancer, 88
International Cancer Conference, 311
International Committee for Standardization in Hematology (ICSH), 262–264
International Lymphoma Study Group (ILSG), 250, 309–316
International Society for Analytical Cytology (ISAC), 240–241, 284
International Union of Immunological Societies, 93
In vitro diagnostic products (IVDs), 181
Islets of Langerhans, 71

Janossy, George, 112, 114, 116, 122, 153
articles published by, 124–125
citation index for, 200–206
doctoral work of, 125
Greaves and, 124–128
ICRF review and, 135–140
interpretation issues and, 147–148, 150
monoclonal antibodies and, 146–147
morphological analysis and, 130–134
OKT marker production and, 179
personnel training and, 149
regulation and, 257, 265
Japan, 67–68
Johnson, Lyndon, 77
Joint Council of Immunohistochemical Manufacturers (JCIM), 278
Journal of the American Medical Association, 123

Kamentsky, Louis, 65–67, 240
flow cytometry and, 218–219, 225, 231
RCS of, 231
Kaplan, Henry S., 311
Karyotypic markers, 140–141
Kidd, Pamela G., 292
Kiel classification, 310, 314
Knapp, Walter, 307
Knorr Cetina, Karin, 328
Koch, Robert, 50
Koss, Leo, 64
Kung, Patrick, 170–171
marker production and, 172–183

Lancet, The (medical journal), 103
Langham, Wright, 220
Lariboisière Hospital, 33, 35
Lawrence Livermore National Laboratory, 62, 230
Lederberg, Joshua, 224–225
Leica, 222
Leiden Pathology Institute, 222
Lennert, Karl, 247–249, 312, 314
Lenoir, Timothy, 75
Leukaemia Research Fund (LRF), 87, 112, 142, 144–145, 242, 253
Leukemia
ALL, 84–86, 111, 117–122, 125–130, 146–150, 168
AML, 85, 125–126
antigens and, 98–101, 104–122, 127–128
antisera and, 89–90
biological-etiologic understanding of, 140

Leukemia (cont.)
biphenotypic leukemic cell and, 307
blast crisis and, 127, 136
Boyse/Old model of, 99–101
cALLA, 117–122, 126–128, 133, 169
cell-surface markers and, 109–117 (*see also* Cell-surface markers)
classification and, 299–308
clinical subdivisions of, 84–85
CLL, 111–112, 117–122, 126–128, 133, 169, 318–319
CML, 127
consensus and, 311–312, 316–320
cultured cell lines and, 126
ECOG and, 306–308
EGIL and, 299–306
FAB classification and, 130–131
FACS and, 89–91, 107, 119–122
Greaves and, 84–91, 112–113
immunophenotyping and, 83–84 (*see also* Immunophenotyping)
international studies and, 149–150
interpretation issues and, 147–148
lymphatic vs. myeloid, 84–85
membrane structure and, 96–97
molecular biology and, 141–144
morphological analysis and, 130–134
mortality of, 85
purified source material and, 167–168
regulation issues and, 264–267 (*see also* Regulation)
Seligmann and, 112–113
spleen/lymph node swelling and, 84
Lever House, 36
Levinthal, Elliott C., 224–225
Lichtman, Andrew, 186
Lineage fidelity, 135–136
Linguistics, 25–30, 50–57
Liver, 70
Los Alamos Scientific Laboratory, 61–62, 222
flow cytometry and, 219–221, 225–230
light scatter and, 227–228
Lukes, Robert J., 245, 249, 310, 312
Lushbaugh, Clarence, 220
Ly antigens, 160, 165
Lymph nodes, 84
Lymphocytes, 114–115
antigen research and, 104–111
antisera and, 108–109
B cells and, 88, 94
bursa of Fabricius and, 102–103
cALLA and, 117–122, 126–128, 133, 169
marker production and, 173–183
skin grafting and, 93–94
T cells and, 88, 94, 159–172 (*see also* T cells)
Lymphoid infiltrates, 12
Lymphoid malignancies, 123
Lymphoid neoplasms, 162
Lymphomas
B cells and, 313–314
classification II and, 308–316
consensus and, 316–320
heterogeneity of, 298
Hodgkin's, 309
ILSG and, 309–316
non-Hodgkin's, 311, 313, 319–320
Rappaport and, 311
REAL approach and, 309–316
slide-based immunophenotyping and, 242–254
T cells and, 313–314
WHO and, 310–311
Lymphosarcoma, 111
Ly series, 100

Macroglobulinemia, 247
MACS, 180–181
Magnetic resonance imaging (MRI), 287
Manhattan Project, 54–56
Marti, Gerald E., 272–273
Mason, David Y., 242
citation index for, 200–206
slide-based immunophenotyping and, 243–247, 250–254
Massachusetts Institute of Technology (MIT), 134
Mathematics, 228, 273, 281–282, 292
Mayall, Brian, 240

Medawar, Peter, 93–94, 98
Medical oncology unit (MOU), 93, 111
 blast crisis and, 127
 prognostic studies and, 129
Medical Research Council (MRC), 49, 83
 funding and, 86–88
 Greaves's proposal and, 84–91
 Mitchison and, 94
 UKALL IV trial, 84, 86
 Working Party on Leukaemia, 85
Medicare, 38–39, 81
Medicine. *See* Biomedicine
MEDLINE, 52, 103–104, 211–212
Melamed, Myron, 65, 67, 218–219
Membrane Immunology Laboratory (MIL), 125, 129, 133
Memorial Sloan-Kettering Cancer Center, 65
Mendelsohn, Mortimer, 240
Mice, 159–166
Microscopes, 286–288
Mill Hill, 124, 164
Milstein, César, 184
Minowada, Jun, 126–127
Mitchison, N. A., 91–92, 140, 162
 antigen research and, 107–108
 cell-surface markers and, 104–107
 TIU and, 94–96
Mitogens, 116
Model Performance Evaluation Program (MPEP), 273–274, 284–285
Molecular Probes, 254
Möller, Göran, 107–108
Monoclonal antibodies, 90–91
 classification and, 312
 flow cytometry and, 233–234
 platform operation and, 132–133, 137, 145–147
 slide-based immunophenotyping and, 253
Morphologic, Immunologic, and Cytogenetic (MIC) Cooperative Group, 300
Morphological analysis, 14
 automation and, 57–59
 cALLA and, 133
 CDs and, 133–134
 FAB classification and, 130–131
 FACS and, 132–133
 as gold standard, 130
 Greaves's proposal and, 84–91
 immunophenotyping and, 130–134, 242–254
 light scatter and, 227–228
 social context and, 17–19
 ultramorphology and, 248
Muirhead, Katherine, 275
Müller, Johannes, 73
Mycosis fungoides, 170
Myeloids (marrow-derived cells), 84–85

Nantes Hospital platform, 39, 41–42, 45
National Advisory Committee for Aeronautics (NACA), 54
National Aeronautics and Space Administration (NASA), 53–56, 225
National Cancer Institute (NCI), 228
 automation and, 60–69
 classification and, 311–312, 315
National Cancer program, 96
National Committee on Clinical Laboratory Standards (NCCLS), 270–271, 274, 282, 293
National Health Service (NHS), 36, 49
National Heart, Lung, and Blood Institute, 271–272
National Institute for Allergy and Infectious Diseases (NIAID), 162, 292
National Institutes of Health (NIH), 49, 51, 56
 AIDS and, 269, 271
 Cantor and, 162
 classification and, 316–317
 commercial marker production and, 172
 flow cytometry and, 225, 228–229
 immunophenotyping and, 134

National Institutes of Health (NIH) (cont.)
public policy and, 77–78
Networking, 323–330
New England Journal of Medicine, 103
Nixon administration, 96
Nobel Institute for Cell Research, 221
Nouvelle Revue Française d'Hématologie journal, 58

ODAM, 231
Old, Lloyd, 97–98, 105
antisera and, 108
cancer antigens and, 99–101
T cells and, 160–161
Oncogenes, 2
On the Normal and the Pathological (Canguilhem), 69
Organizational scientists, 29–30
Ortho Diagnostic Systems, 133, 171
AIDS pandemic and, 271
flow cytometry and, 224, 230–234
regulation and, 282
Ortho-Kung-T cell (OKT), 172
flow cytometry and, 219
marker production and, 173–183
prediction capabilities of, 175–176
Oxford Lymph Node Registry, 245

Paietta, Elisabeth, 303, 305, 307
Papermaster, Ben, 228–229
Papanicolaou, George, 62
Pap test, 240
automation of, 60–69
Europe and, 67–68
flow cytometry and, 218–219
mills, 68
U.S. and, 67–68
Partec, 224, 231, 238
Pasteur, Louis, 50
Pasteur Institute, 113
Pathology, 45, 331
antigens and, 98–101, 104–108
automation and, 57–69
Canguilhem and, 69–73, 76
cell theory and, 50, 73
classification and, 247–254, 297–316
consensus and, 311–312, 316–320
human T cells and, 166–172
immunophenotyping and, 95–101, 242–254 (*see also* Immunophenotyping)
leukemia and, 299–308 (*see also* Leukemia)
lymphoma and, 308–316
mice T cells and, 159–166
NCI and, 311–312
public policy for, 77–82
reductionism and, 74–75
regulation of, 266 (*see also* Regulation)
understanding disease and, 69–77
Virchow and, 73–74
vs. normal approach, 69–77
World War II and, 75–77
Wunderlich and, 75
Patients
ACT UP and, 9–11
AIDS recovery and, 8–10
artwork and, 4–8
pathological vs. normal approach to, 69–77
reductionism and, 6–8
standards for regulation, 260 (*see also* Regulation)
survival curves and, 128
Pentagon, 55
Pernis, Benvenuto, 161
Pharmacists, 80
Phenotypes, 14. *See also* Immunophenotyping
biphenotypic leukemic cell and, 307
blasts and, 127, 136, 168
feature sharing by, 127
term clarification and, 12–13
Phywe AG, 222–224, 231, 238
Piller, Gordon, 143–144
Pinkel, Donald, 136
Platforms. *See* Biomedical platforms
Ploem, Johan S., 222–223, 238
Pober, Jordan S., 186
Positron emission tomography (PET) scanners, 287

Preud'homme, Louis, 104, 112, 243–244, 247, 249
Pricewaterhouse Coopers, 29
Prognostic studies. *See* Diagnosis
Public policy
AIDS and, 78–79
CD system and, 257
France and, 78–81
Germany and, 80–81
immunophenotyping and, 82 (*see also* Regulation)
Medicare and, 81
NIH and, 77–78
pathology and, 77–82
pharmacists and, 80
Pulvertaft, 125–126

Quality assurance, 261–262, 264–268, 276

Rabbits, 89–90
Raff, Martin, 104–108, 161–164
Rapid cell spectrophotometer (RCS), 231
Rappaport, Henry, 245, 310–312
Reagents. *See* Clusters of differentiation (CD) system
Reductionism, 6–8
antigen research and, 104–111
automation and, 58–59
biomedical platforms and, 50–57
pathology and, 74–75
public policy and, 77–82
Regulation, 331–332. *See also* Public policy
AIDS and, 259, 268–276, 280
APAAP and, 265
B cells and, 281–283
of blood, 262–264, 281–283, 286–288
CD system and, 257
classification issues and, 297–316
commercialism and, 277
consensus and, 311–312, 316–320
defined, 257–259
delays in, 264
diagnostic entities and, 297–320
EQA and, 261–262, 264–268, 276
Europe and, 264–268
FACS and, 282
gating and, 288–295
gaussian distribution and, 281–282
ICSH and, 262–264
of imagery, 285–295
of instruments, 278–281
IQC and, 261–262
leukemia and, 299–308
lymphoma and, 308–316
of operators, 283–285
of practices, 276–277
of reagents, 277–278
SIHON and, 267
standardization of, 272–273
T cells and, 281–283
UK NEQAS and, 264–267, 276
United States and, 260–264, 268–275
workshops and, 257
Reif, Arnold E., 105–108, 163
Reiser, Stanley Joel, 261
Research, 54–57. *See also* Greaves, Melvyn
antigen, 98–101, 104–122, 127–128, 144–145
CD system and, 183–198
flow cytometry and, 217–240 (*see also* Flow cytometry)
funding and, 86–87
future directions for, 334–335
Good and, 102–104
HLA workshops and, 184–188
HLDA workshops and, 189–198
human T cells, 166–172
mice T cells, 159–166
Mitchison and, 104–107
OKT marker production and, 172–183
Raff and, 104–108
Stoker's approach to, 86–87
Revised European-American lymphoma (REAL)
classification, 250, 309–316, 330
Rheinberger, Hans-Jörg, 327–328
RNA (ribonucleic acid), 2

Robbins, Lewis, 62–63
Roitt, Ivan, 103, 107–108
Roswell Park Cancer Institute, 295
Royal Free Hospital, 146
Ruhleder, Karen, 326

Saint-Louis Hospital, 30–33, 40, 43, 87, 113
Sandritter, W., 222
Scatterplots, 286
Schechter, Alan, 50–51
Schlesinger, Michael, 105–107
Schlossman, Stuart, 121–122
  CD system and, 184, 189
  human T cells and, 166–172
  marker production and, 173–183
Schwann, Theodore, 73
Science Policy and Biomedical Research, 56
Screening processes, 147
  automation and, 60–69
  classification and, 297–316
  flow cytometry and, 207, 210
Seligmann, Maxime, 87, 89
  antigen research and, 104, 112–117
  cALLA and, 117–122
  cell-surface markers and, 114
  immunophenotyping review and, 134
  slide-based immunophenotyping and, 247, 249
  T cells and, 164
Sen, Luisa, 109
Sheep red blood cells (SRBCs), 109
Shoor, Bernard, 226
Skin grafting, 93–94
Skylab, 55
Slide-based immunophenotyping, 242
  advantages of, 199–201, 206, 243
  APAAP and, 200, 250–252
  classification and, 247–254, 297–316
  data collection and, 245
  development of, 243–254
  immunocytochemical methods and, 250–254
  lymphomas and, 247–250
  overlapping applications of, 201
  paraffin-embedded material and, 244, 251
  pathology and, 199–200
  preparation issues and, 244
  REAL classification and, 250
  representational continuity and, 243–247
Sloan-Kettering Institute, 65, 218–219
Small cleaved cells, 12
Smith, Kline & French, 272
Social issues, x–xii, 321–322
  automation, 57–69
  bioclinical interfaces and, 45–47
  context and, 17–19, 23, 331–335
  networking and, 323–330
Society for Analytical Cytology (SAC), 240, 271
Spectrophotometer, 65
SPF index, 229
Spleen, 84, 162
Staining methods, 263
Stanford University, 134
  Department of Genetics, 62
  flow cytometry and, 224–230
  Instrumentation Research Laboratory (IRL), 224–226
  T cells and, 164
Star, Susan Leigh, 326
Stoker, Michael, 86–87
  cell-surface markers and, 92–93
  immunophenotyping and, 94
  TIU and, 94
Strauss, Anselm, 18
Survival curves, 128
Sweet, Richard, 220–221
Sydenham, Thomas, 49–50
Symposium on National Policies for Biomedical Research, 56

Tanke, Hans, 238
Taylor, Clive R., 245–247, 252–253
T cells, 8–10, 94. *See also* Cell-surface markers
  AIDS and, 268–275
  ALL and, 129–130
  antibodies production and, 159
  antigen research and, 109–122

antisera and, 108
blast crisis and, 136
bursa of Fabricius and, 102–103
cALLA and, 117–122
CD system and, 157
cooperator, 159
delayed hypersensitivity and, 159
determinants of, 169
differentiation and, 157, 159–161
FAB classification and, 131
FACS and, 119–122, 164, 169–170
flow cytometry and, 207, 210
functions of, 159–166
graft destruction and, 159
helper, 159–160
Herzenberg and, 164–165
in humans, 166–172
killer, 159
leukemia and, 88
lymphoma and, 313–314
in mice, 159–166
OKT, 172–183, 219
prognostic studies and, 129
purified source material and, 167–168
regulation and, 281–283
Schlossman and, 166–172
slide-based immunophenotyping and, 248–249, 252–261
suppressor, 159
thymus and, 163
Technology, 330–335. *See also* Commercialism; Immunophenotyping
automatic Pap test and, 60–69
biomedicine automation and, 57–69
cell-surface markers and, 89–97 (*see also* Cell-surface markers)
defining medical, 324
FACS and, 89–91, 107, 119–122
flow cytometry and, 206–214 (*see also* Flow cytometry)
Greaves's proposal and, 84–91
influence on disease, 324–325
light scatter and, 227–228
monoclonal antibodies and, 90–91
networking and, 323–330
regulation and, 278–281 (*see also* Regulation)
Theta antigens, 105–108, 164–165
Thévenot, Laurent, 38
Thomas, Lewis, 56–58, 77, 325
Thymus, 100, 163
Thyroid, 219–221
Tolles, Walter, 63–64
Transplantation, 98, 207, 210, 223
Transplantation Proceedings, 110
Transplantation Society, 176, 210
Tumor immunology unit (TIU), 84, 86, 140
cALLA and, 118–122
cell-surface markers and, 93
genetics and, 142–143
Greaves and, 111
Janossy and, 125
Mitchison and, 94–96
Stoker and, 94
Tumors. *See also* Cancer
antigen research on, 104–122
ploidy, 229
"Tumor-Specific Antigens" (ACS conference), 99

Ultramorphology, 248
UNESCO, 56
United Kingdom, 36
British Committee for Standardization in Haematology, 264
cancer research funding and, 86–87
immunophenotyping and, 97–101
leukemia and, 85, 125, 129, 146–148
organizational flow and, 44
public policy and, 80
regulation and, 264–267
skin grafting and, 93–94
U.K. acute lymphocytic leukemia (UKALL) clinical trials, 125, 129, 146–148
U.K. acute myeloid leukemia (UKAML) clinical trials, 125
UK National External Quality Assessment Schemes (UK NEQAS), 265–267, 276

United States
AIDS pandemic and, 268–275
Air Force, 54–55
Army Medical Center, 274–275
automatic Pap test and, 67–68
Biophysical Society, 50
Centers for Disease Control and Prevention (CDC), 9, 261, 268–275, 284–285, 293
consensus and, 318
Department of Defense (DOD), 274
Food and Drug Administration (FDA), 172–173, 261, 271, 277–279
hospital architecture and, 35–37
Hospital Construction Act of 1946, 35
NACA, 54
NASA, 53–56, 225
public policy and, 80–81
regulation and, 260–264, 268–275
Walter Reed Army Institute, 271, 274
Universal Microspectrophotometer (UMSP), 221
University Hospital Center, 43
University of Leiden, 237–238

Van Dilla, Marvin, 219–220, 225, 240
van Musschenbroek, Johan, 237
Videbaek, Aage, 245
Virchow, Rudolf Ludwig Karl, 50, 73–74, 84
Vogt, Robert F. Jr., 292
Volkswagen Foundation, 222

Wailoo, Keith, 324
Waldenström's macroglobulinemia, 247
Walter Reed Army Institute, 271, 274
White blood cell count (WBC), 129
Wied, George, 61–62, 66, 240
Wiernik, Peter, 307
Wilson, David, 93
Working Party on Leukaemia, 147
World Health Organization, 56, 88, 196, 249
ICSH and, 262–264
lymphoma classification and, 310–311, 315–316
World War II (post-developments)
biology/medicine formation and, 49
immunology and, 93
pathology and, 75–77
public policy sense, 77–82
Wunderlich, Carl, 75

Zeiss, 221–222
Zynaxis Cell Science, 275