

- Activation analysis, copper ores and artifacts, 131–142
 obsidians, American, 210–221
 obsidians, prehistoric, 222–234
 pottery, ancient, 182–195
 pottery, English and American, 196–209
 pottery, Mayan, 165–181
 Sasanian gilt rhyton, 29
 silver in coins, 145–155
 Afghanistan kiln at Charikar, 77
 metal artifacts from, 106–113
 Afrigiyah, as a mint, 151
 Agrippa, 127
 Al Andalus (Cordoba, Spain), as a mint, 149
 Al Asil, Naji, 74
 Alexandria, 82
 Alpha-interaction tracks, 282
 Alpha-recoil dating, 279–282
 Altar de Sacrificios, Guatemala, 165
 Amber, infrared analysis of, 235–240
 Amenhotep III, 88
 Anahita, 10, 12–14
 Analysis, amber, by infrared spectroscopy, 235–240
 artifacts, amber, 235–240
 artifacts, copper, 131–144
 coins, copper-based, 114–130
 coins of Dark Ages, 161–164
 electron microbeam probe. *See* Gilding
 fluorine and nitrogen in bone, 272–278
 Luristan steels, 32–33, 37, 51
 metals from Afghanistan, 106–113
 obsidian, American, 210–221
 obsidian, prehistoric, 222–234
 ores, copper, 131–144
 pottery, ancient, 182–195
 pottery, English and American Colonial, 196–209
 pottery, Mayan, 165–181
 pottery, Mycenaean, 156–161
 silver in coins, 145–155
 trace impurities in copper, 131–142
 uranium and thorium by track techniques, 282
 Yucatan clays, 56, 59
 Anatolia, 230–233
 Angelica Knoll, Maryland, 199, 205
 Antioch, as a mint, 128
 Arabah, 142
 Arad, 61
 Ardashir I, 151
 Areachiyah, 232–233
 Arni, P. C., 98
 Ashdod. *See* Tell Ashdod
 Assur, 75
 Athenian Agora, 249
 Atomic absorption spectroscopy, 136–137
 Attapulgit. *See* Maya blue
 Attapulgit, Georgia, 56, 58
 Augustus, 114
 Awatovi, Arizona, 57–61

 Babylon, 75
 Bahrn II, 151
 Ballas, Egypt, 189–193
 Baltic region, 235–239
 Barnstaple, England, 196
 Bayley, Daniel, kiln, Newburyport, Mass., 199, 204, 206
 Becal, Yucatan, 56–59
 Beidha, 232–233
 Beisamoun, 232–233
 Berbati, Greece, 160–161
 Bergsøe, Paul, 2, 3, 26
 Bideford, England, 196
 Bird, Junius B., 18, 37
 Bird, V., 37
 Bø, 82, 84–85
 Bodmin Moor, England, 196
 Bonampak, Chiapas, Mexico, 55
 Bone, dating of, 272–278
 Boundary Creek, Wyoming, 229
 Braidwood, Robert, 56, 57
 Brew, J. O., 57
 Brill, R. H., 89, 250, 251–253, 282
 Bronze. *See also* Coins, copper-based
 from Afghanistan, 108–111
 from China, 110
 comparison to steel, 51
 Bryan, Kirk, 57
 Buck Brush Springs, Nevada, 213
 Buttrey, T. V., 150
 Byblos, 232–233
 Byne, Loftus St. George, 91

 Calclacite, 91
 Caley, Earle R., 114, 122, 149
 Canyon Junction, Wyoming, 226–229
 Capellini, G., 235
 Carlmeier, Peter, 32
 Carlos Greene, Mexico, 165
 Carmichaels formation, Pa., geology of, 273–275
 Cathedral of Mexico, 55
 Cayönu, Turkey, 230, 232
 Ceramics. *See* Pottery
 Cerro Gordo, Mexico, 262
 Chang, Mrs. In Soon Moon, 106
 Chaptal, 80
 Charikar, Afghanistan, 76–77
 Chichen Itza, Yucatan, 165
 Chiconautla, Mexico, 253–259
 Chronology for Valley of Mexico, 256
 Cintla, 165
 Claudius, 126
 Clays, analysis of, 161, 192–193
 Carmichaels formation, 273–277
 Sapillo and Attapulgit, 55, 58
 Seleucia and Samarra, 65–72
 Yucatan, 56, 59
 Coins, copper-based, analysis of, 114–130
 Dark Ages, analysis of, 161–164
 densities of, 114–117, 126
 historical studies, 149
 Ilkhanid, 154
 Mamluk, 154
 Parthian, 154
 Roman, 114–130
 silver, analysis of, 145–155
 Umayyad Dirhems, analysis of, 149, 151
 weights of, 114–117
 Colton, Harold, 57
 Commagene, 128
 Computers, for treating data, ambers, 235–240
 copper ores and artifacts, 131–143
 pottery, 182–195
 Cooney, John D., 88, 89
 Copper, native, oxidized, and reduced ores,
 comparison of, 131
 ores and artifacts, analysis of, 131–144
 Copper-based coins, analysis of, 114–130
 Copper-calcium-tetrasilicate, 80–90
 Cyprus, 192–194

 Daniels, Farrington, 244
 Dara-i-Kur, Afghanistan, 107, 108, 112
 Dark Ages, analysis of gold and silver coins from,
 161–164
 Dating, 244–283
 bone, 272–278
 hydration rim, 251–270
 nuclear track counting, 278–283
 radiocarbon, 244, 249–250
 solid-state track detectors, 279–283
 thermoluminescence, 244–250
 Davy, Sir Humphrey, 80
 Deebal, Wallace H., 106
 Density of coins, 114–117, 126
 de Sahagún, Fray Bernardino, 24
 Devon, England, 196
 Dimishq, as a mint, 151

- Diyana, Iraq, 77
 Donovan, P. D., 98
 Drake, Sir Francis, 196
 Drake's Bay, California, 196, 199, 204, 206
 Dupree, Louis, 106

 Easby, Dudley T., 18
 Efflorescence on objects, 91–102
 Egyptian blue, 80–90
 Eitun. *See* Tell Eitun
 El Ahaiah, Egypt, 191
 El Cayo, British Columbia, 165
 El Chayal, Guatemala, 211, 250 *passim*
 Electron microbeam probe analysis, gilt objects, 6
 El Khiam, 232–233
 Emission spectroscopy. *See* Spectrographic analysis
 Etruscan warriors and statuettes, 249

 Fayalite, in Luristan steels, 32
 Fission track dating, 279–283
 connection with thermoluminescence dating, 282
 FitzHugh, Elizabeth West, 55
 Foque, 80
 Foster, George, 61
 France-Lanord, Albert, 51–52
 Friedman, Erving, 251

 Gamma ray spectroscopy. *See* Activation analysis
 Gas chromatography, use of in bone dating, 272–278
 Germanium, in pots from Thebes, 158
 Gettens, R. J., 55, 89
 Gibbons, Donald F., 10 n
 Gilding, microscopic and metallographic examinations, 6, 9, 10–16, 18–25
 Old World and New World, comparison of, 2–4, 18, 26
 Peruvian objects, 18–26
 relationships between cultural and technological aspects, 26–27
 Sasanian and Byzantine objects, 4–18
 true and depletion, 2, 3–4
 Gilding of silver objects, 2–31
 by amalgamation, 3, 10–18
 analysis by activation analysis, 29
 analysis by electron microbeam probe, 6–7, 13–16, 21–26
 by cementation, 23–24, 27
 by gold leaf, 6–7, 9
 Giyan, Iran, 33, 34
 Glass, calibrated, for uranium and thorium, 282
 fission track dating of, 279–283
 thermoluminescence of, 250
 Glass Mountain, California, 211–215
 Glow curves, 245
 Gold, coins, analysis of, 161–164
 gilded silver objects, 2
 Gowland, 23
 Grabar, Oleq, 153
 Greece, mints in, 128
 Green Spring Plantation, Virginia, 199, 200, 208
 Guatemala (various sites), 211–220
 Guilday, John, 273
 Guthe, Carl E., 77

 Haçilar, Turkey, 249–250
 Hack, John, 57
 Hagenauer, Freiderick, 96
 Hall, E. T., 122
 Haller, W., 251
 Hardness, Luristan steels, 46, 49–51
 Mesopotamian pottery, 70
 Harris, J. R., 83
 Hasanlu, 80, 81
 Hassuna sites, 230–233
 Hazer Gusfand, Afghanistan, 107, 112
 Helm, O., 235

 Herculanum, 82
 Hodges, H. W. M., 37
 Honduras, 213–216
 Hopewellian obsidian artifacts, 226–231
 Hopkins, Clark, 65
 Hormizd II, 10
 Horse Cave, Afghanistan, 107, 112
 Houtermans, F. G., 244
 Hydration rates of obsidians, 251–255
 Hydration-rim dating, 251–270

 Index of disagreement, 190–191
 Infrared analysis, amber artifacts, 235–240
 Iron, from Afghanistan, 112

 Jamestown, Virginia, 199, 204–206
 Jeddito Valley, Arizona, 57, 60
 Jericho, 232–233
 Jonuta, Mexico, 164

 Kalkani Hill, 239
 Kennedy, George, 244
 Kent Island, Maryland, 199, 205
 Khosro I and II, 151
 Kiating, Szechuan Province, China, 98
 Kilns, 77–78
 non-kiln firing, 57, 66
 Kirkendall effect, 7, 9
 Kish, Iraq, 75
 Kixpek, Guatemala, 165
 Kjeldahl method, 272–277
 Knossos, 156–161
 Komarek, Karel, 97–98, 101
 Kurdistan, Iraq, 77
 Kyanos, 83

 Lake-of-the-Woods, Wyoming, 227–229
 Lake Van, Turkey. *See* Van Lake, Turkey
 La Ventilla, Mexico, 254–259
 Lead, efflorescence on, 93–97
 Lead formate, 93–97
 Lerma, Yucatan, 56–59
 Levey, Martin, v.
 Lightner, Max, 32
 Limestone, efflorescence on, 91, 93, 98
 Limoges enamel, efflorescence on, 97
 Lindy, John, 273
 Linear B, 158
 Lisht North Pyramid, 80, 88
 Logarithmic plotting of data, 172, 200
 Lovelock Cave, Nevada, 213, 217
 Lugdunum (Lyons), as a mint, 126–127
 Luristan steels, analysis, 32–33, 37, 51
 hardness, 46, 49–51
 heat treatment, 46–50
 metallography, 37
 shaping techniques, 37–41
 welding, lack of, 51

 Magnetic separation, in pottery analysis, 161
 Mama, Yucatan, 56–59
 Maquixco, Mexico, 253–259
 Mass spectrometry, 136, 142
Mastodon americanus, 273–275
 Maxwell-Hyslop, K. R., 37, 46
 Maya blue, 55–56
 Mayan fine orange pottery, analysis of, 165–181
 McCready, Allen, 273
 McDowell, Robert H., 65, 74
 Mérida, Yucatan, 56–59
 Mesa Verde, Colorado, 57
 Metallography, of Luristan steels, 37 *passim*
 Metals, analyses of. *See also* Coins; Ores
 from Afghanistan, 106
 copper-based coins, 114–130
 copper ores and artifacts, 131–144
 gilt objects, 6–7, 13–16, 21–26, 29
 Luristan steels, 32–33, 37, 51
 silver in coins, 145–155
 Metals, gilding of, 2–31

- Metals, smithing, 32–54
 Metalworking, Luristan steels, 32–52
 Mexico, various sites, 211–220, 259
 Meyers, Pieter, 29, 168 n
 Mica, fission tracks in, 279–282
 Michigan, 137
 Microscopic examination, Egyptian blue, 80
 gilded objects, 6, 9, 10–16, 18–25
 Milliprobe X-ray spectrometer, 145, 161–162
 Monster, teenaged, 273
 Mount Konocti, California, 212, 214
 Moynehan, T. M., 98
 Munhata, 232–233
 Munsell soil color charts, 67–68
 Mycenae, 156–161, 239
- Nag ed Deir, Egypt, 191–193
 Nahal Oren, 232–233
 Near East, mints in, 128
 Nebuchadnezzar, 91, 94
 Nemausus, as a mint, 127
 Nemrut Dağ, 230, 232
 Neutron activation analysis. *See* Activation analysis
 Newburyport, Mass., 199, 204
 Nile mud, 191–193
 Nippur, Iraq, 75
 Norris Cut-off, Wyoming, 226–229
 Nubia, 93
 Nueva Esperanza, Mexico, 165
 Nuzi, Iraq, 88
- Oak Wood, 91–98
 Obsidian, American, analysis of, 210–221
 analysis by neutron activation, 222–234
 analysis by X-ray fluorescence, 210–221
 artifacts from Levant, 230–233
 artifacts from Zagros-Taurus arc, 230–233
 dating by fission track method, 279–282
 hydration rim dating, 251–270
 prehistoric artifacts, analysis of, 222–234
 shaping techniques, 37–41
 from Valley of Mexico, gray vs. green, 253
 passim
 Obsidian artifacts, Colonial period site analysis, 267–270
 economic analysis, 266–267
 shaping, types and methods of, 260–266
 sources of material, 266–267
 types, distributions at sites, 260–261
 Obsidian Cliff, Wyoming, 226–231
 Ores, analysis, 131–142
 Organic acids, as cause of efflorescence, 91–100
 Orleansville, Algeria, 93
 Otumba, Mexico, 211, 265, 266 passim
 Oya-ji Temple, Japan, 98
- Pabst, A., 80, 82, 84, 85
 Pachuca, Mexico, 211
 Palaikastro, Crete, 158–161
 Papalhupa, Guatemala, 211
 Parrish, Mildred, 65
 Pemaquid, Maine, 199, 205
 Peroz, 151
 Peru, Chimu, 22–26
 Viscus, 18–26
 Pewter, from Afghanistan, 111
 Piedres Neigras, Guatemala, 165
 Plymouth, Mass., 199, 205
 Polyphemus, 51
 Pompeii, 82
 Pottery, analysis of, Ancient, 182–195
 analysis of, English and American Colonial, 196–209
 analysis of, Mayan, 165–181
 analysis of, Thebes and Knossos, 156–161
 analysis of, upper Egypt, 191–193
 coal for firing fuel, 57
 color, 60, 66–70, 73–74, 75 passim
 efflorescence on, 91
 firing temperatures, 70–77
 firing tests, 57, 60, 67–72
 glazes, 61–78
 homogeneity of uranium in, 282
 kilns, 77–78
 magnetic separation in analysis of, 161
 Old World and New World, compared, 61–62
 thermoluminescence dating, 244–250, 282
 Puzzioli, 82
- Radiocarbon dating, 244, 249–250
 Radiography, for dating bones, 272
 of Luristan steels, 43–44
 Ramad, 232–233
 Redstone Schoolhouse, Pa., 273
 Relative humidity, effect on efflorescence, 97–98, 101
 Rhyton, silver, 4–6, 29
 Rome, as a mint, 123
 Root, William C., 28
 Rosenquist, A. M., 82, 84, 85
 Rothenberg, Beno, 142
 Ruhl, Katharine C., 10 n
- Samarra, Iraq, 65–72
 San Ildefonso, New Mexico, 77
 San Jose, British Columbia, 165
 Sapillo Creek, New Mexico, 55, 58
 Sasanian, gilded silver objects, 2–18, 26
 Sasanian coins, analysis of, 149–154
 Sasanian metallic objects, 153–154
 Satterswaithe, Linton, 165
 Sawyer, Alan R., 18
 Sayre, E. V., 29, 150
 Schippa, Giovanni, 82, 84, 85
 Scott, Alexander, 91
 Seibal, Guatemala, 165
 Seleucia on Tigris, Iraq, 65–72
 Shamshir Ghar, Afghanistan, 106
 Shapur I, 149, 151
 Shells, efflorescence on, 91, 97–98
 Shepard, Anna O., 66, 70, 72, 77
 Shepherd, Dorothy, 4
 Silver, Anahita rhyton, 10, 12–14
 Byzantine book cover, 6–10
 coins, analysis of, 145–155, 161–164
 gilded objects, 2–31
 plate of Hormizd II, 10–11
 torso of Sasanian king, 14–18
 Smith, Cyril Stanley, 23 n, 50
 Snake Cave, Afghanistan, 106
 Sodium chloride, efflorescence on objects, 98
 Sodium nitrate, efflorescence on objects, 98
 Soignies, Belgium, 91
 Solid-state nuclear track detectors, 279–283
 Spain, mints in, 127–128
 Spectrographic analysis, copper ores and artifacts, 131–132
 pottery of Mycenaean times, 156–161
 Standard pottery, 183–188
 Standards for analysis, glasses calibrated for uranium and thorium, 282
 of metals, 122–124, 146
 of obsidians, 224
 of pottery, 167–168, 183–188
 Standards, color. *See* Munsell soil color charts
 Steel, in Luristan objects, 32–52
 Stirrup jars, 158–161
 Streak method of sampling, 150, 153
 Student's distribution, 200–204
 Succinic acid in amber, 235–239
 Suhr, Norman, 56
 Susa, Iraq, 75
- Talish, Iran, 33–34
 Tasmania, 91
 Teacalco, Mexico, 253–259
 Tell Ashdod, 192–194
 Tell Eitun, 192–194

Tello, Iraq, 75
 Tell Uqair, Iraq, 75–76
 Tenango, Mexico, 254–259
 Teotihuacan Valley, Mexico, 255, 262, 266–267
 Ternbach, J., 37
 Teton Pass, Wyoming, 226–230
 Thebes, Egypt, 158–161
 Theophilus, 7 n
 Theophrastus, 83
 Thermoluminescence, 161
 effect of inhomogeneity on, 282
 of pottery, 244–250
 Thompson, R. H., 56
 Thorium, analysis by track techniques, 282
 Tiberius, 114
 Ticul, Yucatan, 56–59
 Tilki Tepe, Turkey, 232–233
 Timna, South Arabia, 83, 88
 Tiryns Treasure, 239
 Torraca, Giorgio, 82, 84, 85
 Trace elements. *See individual methods of analysis or materials*

 Uaxactun, Guatemala, 165
 Uqair. *See* Tell Uqair
 Ur, Iraq, 75, 77, 92
 Uranium, concentration maps of, in objects, 282

 Van Beek, Gus, 83
 Van Buren, Elizabeth Douglas, 74
 figurine colors, 75–77
 Valladolid, Yucatan, 56–59
 Van Lake, Turkey, 230–233
 van Olphen, H., 56
 Van Tassel, René, 91–93, 97
 Venta de Carpio, Mexico, 254–259
 Vespasian, 129
 Vestorius, 82
 Vitruvius, 82

 Warka, 75
 Wasit, as a mint, 151
 West Thumb, Wyoming, 226–229
 Willey, Gordon, 165
 Winntzrer, Casper, 97
 Winslow, Arizona, 98
 Wright, Henry T., 70, 75
 Wulff, Hans E., 89
 Wüstite, in Luristan steels, 32, 36–37

 X-Ray diffraction, bones, for dating, 272–273
 clays from Seleucia, 65
 efflorescent salts on objects, 91–97, 100
 Egyptian blue, 80–85
 Maya blue and related clays, 55–58
 X-Ray fluorescence analysis,
 copper-based coins, 114–130, 145
 Dark Age coins, 161–164
 milliprobe analyzer, 161–162
 obsidian artifacts, 210–221
 standards for, in analysis of metals, 122–124

 Young, William J., 82, 84, 85
 Yucatan, Mexico, 55–61
 Yvoir, Belgium, 91

 Zaachila, Oaxaca, Mexico, 55
 Zakro, Crete, 158–161
 Zarang, as a mint, 153