

Index

Coin types and modern authors are listed below only if they are referred to in the main text. References that occur exclusively in the footnotes or lists of coins analysed are not indexed.

- acta fratrum arvalium* 255, 257, 287, 354
adsertor 304–5
 on coins 305
 Aegean 167, 199, 687
 Aegina, coinage of 167
 Aeneas 498
 Aequitas, as coin type 418
 indication of coin quality 418
aerarium Saturni 31, 231
 financial problems of 231, 237, 446
aes coinage *see* imperial coinage
 Africa 380
 hoards 264, 396
 mints in 267, 269–71, 283, 302
 Agatharcides of Cnidus 612
 Agricola, Georgius 53, 59, 60
 Agrippina I 188
 Agrippina II 189, 192, 467, 515, 559
Akçe 16, 33, 39, 44
 Akerman, John Yonge 64–5, 67, 73, 162, 193,
 202–3, 378
 Alciati, Andrea 53
 Alexander the Great, coinage of 667
 Alexandria 591, 606, 610, 624, 646, 649, 655,
 657, 674, 681
 as coin type 611, 634–6, 638–9, 641–2, 649
 mint for aurei 364, 370
 see also Egypt
 Alexandria-style coinage 497, 502, 576–81, 583,
 589–99, 602–4, 649, 655–7, 681–4, 697
 alloying process 96, 197, 223–4, 315, 316–18,
 323–5, 345, 363, 370, 405, 429, 476, 479,
 532, 556–7, 589, 604, 624–5, 652–3, 684
 alloying traditions 695
 American University of Beirut xxviii
 analysis
 activation 80, 83, 110, 501, 588, 651
 atomic absorption spectrometry 111–12,
 115, 120, 126, 217, 483, 522, 530, 533
 copper isotopes 88
 discriminant 185–6
 energy dispersive spectrometry (SEM-EDS)
 217, 515
 global 51, 78, 80, 83, 90, 228
 inductively coupled plasma atomic emission
 spectrometry (ICP-AES) 105, 112–26
 laser ablation inductively coupled plasma
 mass spectrometry (LA-ICP-MS) 85–7,
 109, 148, 419, 428, 522, 530, 533
 lead isotopes 4, 88, 89, 103–4, 112, 126–9,
 165–7, 176–8, 187, 199, 225, 263, 265–6,
 268, 272–6, 278–80, 285–7, 289, 303, 305,
 310–12, 315–18, 322, 351, 372, 375–6,
 405–7, 429–30, 433, 440, 451, 493, 497,
 504, 506, 512, 517–18, 528, 533, 546, 570,
 589, 595, 602–3, 685
 neutron activation 110
 non-destructive 78–9, 83, 85, 109, 148, 150
 Principal Components 164, 166, 246–7,
 285–6, 300, 325, 345, 370, 374–5, 415,
 476–8, 481, 485, 526, 570–1, 595, 625,
 629
 surface 78, 106–11, 125, 133–4, 136, 139–40,
 144, 147, 150, 228
 wet chemical 63, 79, 91
 x-ray fluorescence (XRF) 79–81, 83–5, 109,
 125, 148, 360–1, 501, 522, 610, 613
 Anatolia 33, 463, 491, 505–6, 534–7
 ore sources in 376, 497, 504, 512, 528,
 534–5, 546, 589, 685–6
 see also silver
 Anonymous Alexandrinus 674–5, 677
 anonymous denarii of AD 68–69 *see* Civil
 Wars
 antimony 4, 104, 112, 267, 280, 286, 331, 345,
 629, 706
 trace element 4, 331, 345, 629
 Antioch 586
 bronze coins of 576
 civic coinage of 554

- dating systems 498, 521, 541, 545, 562, 572, 576, 595–6
 mint for denarii 166, 364–5, 370–6, 453, 498, 502–4, 576, 583, 585–6, 589
 mint of 166, 498, 576, 581, 667
 tetradrachms of 540–605, 696
see also Syria; tetradrachm
 Antioch-style coinage 581–6, 682
 Antiochene standard 539, 559; *see also* Rhodian standard
 antiquarianism 54–6, 57, 61, 69, 202
 Antonia, as coin type 189, 621
 Antonine dynasty 72, 519
 Antoninianus 44, 55, 57, 58, 61–2, 64–5, 67, 69, 71, 79
 relationship to aureus 67, 72
 relationship to denarius 62, 64, 67–8, 74
 Antoninus Pius, emperor
 character 11
 denarius of 11, 15, 63–5, 67–9, 73–4
 reform misdated 17
 see also debasement
 Apamea (Lydia), cistophori of 466
 Apamea (Syria) 586
 coinage of 553
 Apollo, as coin type 635
 Aradus (Syria) 576
 tetradrachms of 540, 547–8
 Archaeology Data Service (ADS) xxv
 Archelaus, king of Cappadocia, coinage of 508–9, 520, 538, 680
 Arditurri 276
 Ariarathes X, king of Cappadocia, coinage of 507–8, 519, 538
 Ariobarzanes I, king of Cappadocia, coinage of 507–8
 Ariobarzanes II, king of Cappadocia, coinage of 508
 Ariobarzanes III, king of Cappadocia, coinage of 508
 Aristotle 31
 army
 angered by Nero's debasement 219
 in Italy 249–50
 on Danube 248
 on Rhine 219–20, 249, 254, 269, 287
 army pay 6–7, 9, 12–13, 41, 47, 62, 76, 250, 379, 380, 389, 455
 arsenic, trace element 4, 104, 112, 121–2, 168, 223, 362–3, 417–18, 624–6, 652–3, 655–6
 Artaxias, king of Armenia 509, 513
 Arts and Humanities Research Council (AHRC) xxviii
 as
 of copper 24, 46, 282, 288, 289, 295
 Republican 24, 160
 Ascalon, tetradrachms of 540
 Ashmolean Museum xxvii, 91, 149, 168, 470, 559
 Asia, province 164, 166, 463, 465, 467, 479, 505, 667
 Asia Minor 167, 465, 530
 coinage of 21, 24, 164, 199, 364–70, 463, 490
 assarion, unit of account 465
 assay 51, 95, 228
 Atargatis, as coin type 599
 Athens 96, 667
 atomic absorption spectrometry *see* analysis
 Attalid dynasty 465–6, 695
 Attic drachm 27, 47, 444, 465, 492, 667, 669–70, 674, 678–80, 691
 equivalent to denarius 54, 465, 539, 669, 674, 678, 691
 equivalent to Tyrian drachm 679–80
 see also drachm; weight standards
 Attic standard 559, 606–7, 667, 669, 672–4, 678–9, 691
 'Augustan coinage' xxv, 6, 23, 384, 434–5, 454, 687
 Augustus, emperor xxv, 3, 6, 8, 64, 160, 187–8, 199, 250, 330, 434–6, 465, 498, 604, 608–9
 as Octavian 341
 aureus of 57–8, 94, 168, 172, 206, 342, 388, 434–5, 438, 610, 687
 birthday of 498
 cistophori of 165, 465–70, 472, 486–7, 489, 671, 676
 denarius of 15, 20, 24, 54, 58, 60, 63–4, 94, 163, 165–9, 173–4, 176–9, 180–2, 188–9, 196–7, 202, 210, 221–2, 224, 226, 306, 323, 341, 343, 388, 396–7, 434, 438, 440–1, 470, 508, 551, 556–7, 604, 610, 612, 614, 659, 672, 687–8, 699
 Egyptian coinage of 608, 610, 614
 fineness of denarius under 167, 181
 Gaius and Lucius type of Lugdunum 165, 169–70, 172, 177–9, 180–2, 186–7, 343, 388, 545, 548, 556–7
 introduces dupondius of brass 24
 introduces sestertius of brass 24
 Laodicea tetradrachms of 540, 553
 Lycian coinage of 491–2
 mints for denarii 4, 164, 168, 175–6
 output under 173–4, 190, 250

- Augustus, emperor (*cont.*)
 posthumous issues of 302, 306–9
 reorganises revenues 231
 Rome denarii of 210
 Seleucia tetradrachms 490, 547, 553, 570–1,
 603, 671–2, 676
 Spanish denarii of 177–8, 181
 Syrian coinage of 552–61, 566, 570–1, 580,
 603–4, 671, 676, 680, 696
 Tarsus tetradrachms of 495
 weight standards under 169, 172, 384, 438,
 467–9, 486–7, 489, 492, 554–7, 570,
 603–4, 671–2, 696
see also Divus Augustus
- Aulus Gabinius *see* Gabinius
- Aurelian, emperor 40, 62
 coinage of 65
- aureus 47, 56–7, 76, 175, 184, 235, 237, 323,
 359, 386, 388–9, 392–4, 420, 432, 434–5,
 437–9, 447, 449, 457, 609–10, 687–8,
 692
- as standard of value 66–7, 229, 237, 446,
 694, 699
- history of 159–61, 168, 237, 377, 420,
 457
- of Augustus 57–8, 94, 168, 172, 206, 342,
 388, 434–5, 438, 610, 687
- of Caligula 172, 187–8, 284, 377, 383, 692
- of Civil Wars, AD 68–69 267, 303, 308, 313,
 318
- of Claudius 94, 168, 172, 195, 284, 377, 383,
 388, 394, 454, 457, 692
- of Domitian 11, 58–9, 360, 361, 377,
 379–80, 383–4, 387–9, 391–4, 407, 409,
 420, 453–4, 456–7, 460, 492, 692–4
- of Galba 239, 243–4, 259, 261, 267, 270–1,
 279, 281, 284, 294, 303, 313, 318, 328,
 384, 392, 451–2, 454
- of Julius Caesar 23, 66, 93–5, 160, 234, 237,
 388, 434–5, 438, 687, 698
- of Nero 10, 20, 56, 58–9, 65, 71, 76, 93–5,
 193, 195, 201–2, 204–6, 207, 211–12, 219,
 226, 228, 230, 232, 235, 237, 243, 252, 284,
 294, 303, 313, 328, 377, 383, 385, 394, 420,
 423, 432, 442–7, 454, 457, 690, 692–3
- of Nerva 409, 411, 426, 454, 460
- of Otho 59, 248, 252–3, 259, 261, 328, 451,
 454
- of Severus Alexander 47
- of Tiberius 94, 172, 184, 377, 383, 388, 438,
 447, 451, 457, 692
- of Titus 65, 350–2, 354, 355, 359, 379, 387,
 426, 449, 454
- of Trajan 58, 70, 76, 377, 389, 420, 423–6,
 432, 454, 459–60, 694
- of Vespasian 57, 267, 296–7, 298, 308, 326,
 328–9, 364, 370, 372, 373–4, 379, 387,
 426, 449, 452–4, 587
- of Vitellius 59, 239, 255, 257, 259, 261, 267,
 288, 294, 295, 308, 318, 328, 451–2, 454
- output 24, 189–90, 208, 212, 230–2, 326,
 350, 389, 393, 439–41, 445, 689–90,
 692–3
- pre-Neronian 70, 226, 331, 388–9, 392, 408,
 424, 432, 449, 460
- purity 6, 62, 65
- worth 25 denarii 23, 27, 46–7, 66, 72, 76,
 237, 434, 447, 460, 687
see also gold; hoards, of gold;
 quinarius; weight standards *and entries*
under individual emperors
- authority to coin 10, 19, 527–8, 537, 548, 611,
 660, 698
- auxiliary mints *see* mints
- awareness of changes to coinage 5, 18, 262–3,
 319–20
- Bachmann, Hans-Gert 102
- Baebelo 177
- Balbinus, emperor, coinage of 60–1
- Baldini, publisher 61
- Baldwin, A. H. and Sons xxvii
- Baldwin, Agnes 490–1
- Balkans 688
 hoards from 240–1, 263, 264, 319, 323,
 395–6, 448, 457
see also Dacia
- Banduri, Anselmo 61
- banking 81, 184
- Barrandon, Jean-Noel 83, 182, 651
- base metal coinage *see* imperial coinage;
 provincial coinage
- Batavians 239, 302
- Beck, Lucille 108
- Belgium 66
- bellum Neronis* 269
- Bernard, Edward 58
- Bibliothèque nationale de France 169, 193, 255
- bilingual coins 516–18
- billon coins 40
- Bimard de la Bastie, Joseph 54, 61–2
- bimetallism 6, 11, 14, 18, 44, 66, 69, 71, 76,
 160–1, 229, 230, 234–7, 392, 435, 440–1,
 444, 454, 687, 690, 693, 698–9
- ‘limping’ 235
- binary alloys *see* silver-copper alloys

- bismuth, minor or trace element 4, 101–2,
 104–5, 114, 116–19, 121–4, 126, 164–5,
 176, 178–9, 185–6, 188, 191–2, 196–7,
 224–5, 245, 246–7, 261–2, 270, 299, 315,
 318, 323–4, 331–2, 335–40, 342–3, 345,
 348, 351–2, 359–60, 368–70, 375, 404–7,
 415, 428–9, 432, 440–1, 476–7, 481,
 484–5, 487–8, 491, 493, 495–7, 502–4,
 525–6, 532, 536, 556, 560–1, 566–7,
 574–5, 580, 583, 586, 588–9, 592, 594,
 597–8, 602, 619–20, 623–5, 628, 636–7,
 645–6, 657, 659, 661, 683
- black market for ‘good’ coin 52, 385, 388, 451
- blanching 84–8, 90, 135, 146–7, 415; *see also*
 surface enrichment
- blanks 78–9, 84–5, 87–8, 96, 100, 130, 393,
 579, 581, 587, 666
 casting of 100, 109, 133, 139, 145–6, 393
 gouging of 96
 made from sheet metal 142, 145–6, 393
- Böckh, August 67, 93–5, 158, 206, 207, 668, 671
- Bolin, Sture 49, 71, 72–6, 210, 226, 239, 261,
 378, 426, 435, 444, 447–9
- Bonus, emperor 67
- Boudiccan rebellion 448
- Bouterouë, Claude 60
- brass
 debasement with 403, 415
 for coinage 3, 23–6, 48, 160, 230, 399
 for military equipment 403
 price of 48
- Brerewood, Edward 60
- Bristol 150–1
- Bristol City Museum xxvii, 149–51
- Britain 97, 149, 173
 hoards from 97, 150–3, 173–4, 181, 184,
 209–10, 228, 240–1, 264, 319, 323, 388,
 395–6, 436–7, 448–9, 457–8
 lead from 315
 lead mines in 32
- British Museum xxv, xxvii, 85, 123, 149, 151,
 168, 182, 193, 308
- bronze, alloy 286, 290–1
 minor component 315–16
- Bronze Age 178
- bronze coinage *see* imperial coinage; provincial
 coinage
- Buckinghamshire Museums xxvii, 149, 151–2
- Budé, Guillaume 53, 54, 56–7, 59, 201–2, 377
- bullion 4, 6, 28, 32–3, 36, 50, 74–5, 100, 133,
 146, 167, 178–9, 186, 196, 199, 210, 215,
 217, 220, 224–5, 229, 235, 265, 268, 297,
 313–18, 321, 335, 343, 345, 359, 368,
 403–5, 415, 430, 441, 444, 448, 481, 487,
 525, 531, 534–5, 546–7, 561, 567, 572,
 578, 585, 589, 597, 620, 629–30, 691
- Anatolian 376, 491, 497, 512, 528, 589
- Gallic 270, 272, 276–8, 282, 285, 287, 292,
 296–8, 301, 305, 308, 310, 313–18, 324,
 375, 430, 602, 620
- Iranian 372, 376, 497, 512, 528
- recycled 276–8, 282, 287, 298, 305, 308,
 310–13, 315–16, 318, 322, 324, 336, 345,
 352, 359, 661
- Spanish 177–9, 199, 268, 270–4, 276,
 279–80, 285–6, 289, 292, 296, 298–301,
 310, 313–18, 321–2, 324, 440, 602
- transfer of 4, 33, 643–4, 646, 660
see also silver
- Burnett, Andrew 34, 40, 81, 182–4, 527, 606,
 608, 610–11, 616
- Byzantine coinage 64
- Cabo de Gata 178
- Caesarea in Cappadocia, coinage of 11, 24, 62,
 84, 331, 365, 368–9, 372, 374, 375–6, 398,
 463, 490, 497, 500, 505–39, 546, 568–70,
 662, 672–3, 675–8, 680, 682–5, 696–7
- chronology 511, 514–16, 521, 523–4, 528,
 530
- circulation patterns 490–1, 505–6, 508–9,
 514, 519–20, 662, 672
- dating systems 521
- debasement of 506, 519, 529, 537–9
- fineness of 368, 506–8, 511, 513–16, 518–19,
 523, 525, 529–30, 537–8, 588, 604, 672,
 675, 677
- history of 505, 508, 513, 519–20, 537–9, 672,
 675, 678
- local-style coinage 519–21, 524, 528, 530–7,
 685
- of Caligula 507–13, 537, 671, 676, 678
- of Claudius 507, 509–10, 513–14, 537–8,
 557, 623, 671, 676, 678
- of Domitian 507, 519–20, 522, 524–9,
 531–4, 537–8, 671, 676, 683–4
- of Hadrian 505, 520
- of Lucius Verus 519
- of Marcus Aurelius 519–20
- of Nero 500, 505–7, 509–11, 514–19, 521,
 523, 535, 537–8, 568–70, 671, 676, 680,
 696–7
- of Nerva 506–7, 519–20, 528–38, 671, 676
- of Tiberius 507–13, 537–8, 671, 676, 678,
 680, 696
- of Titus 522, 524

- Caesarea in Cappadocia, coinage of (*cont.*)
 of Trajan 506–7, 519–20, 529–38, 671, 676–7
 of Vespasian 365, 368–9, 372, 374–6, 505, 519–24, 526–9, 531–8, 570, 604, 662, 669–72, 676–7, 682–4, 696
 output 519, 538
 overvaluation 506, 511, 513, 519, 523, 537–9, 546, 623, 677–8
 relationship to cistophorus 525–6, 671, 676, 683–4
 relationship to Cypriot coinage 536, 671, 676, 683
 relationship to Cyrenaican coinage 531
 relationship to denarius 509–11, 513–15, 519–21, 523, 525–6, 536–9, 673, 680, 682–3
 relationship to Egyptian coinage 623, 662, 670–1, 676–7
 relationship to Lycian drachm 525, 531, 671, 676, 680, 683
 relationship to Pontic drachm 490–1, 536, 671, 676, 680
 relationship to Syrian coinage 514, 517, 531, 536, 557, 568–70, 604, 662, 670–2, 676–7
 relationship to Tarsus tetradrachm 497, 531, 536, 671, 676
 Rome-style coinage 331, 369, 398, 497, 519–21, 524–37, 682–4
 royal coinage 505–10, 519–20, 538, 680, 695
 types 511, 513, 515, 528–30
 weight standards 508–16, 518–19, 523–4, 530, 538, 569, 604, 669–72, 696
see also Cappadocia; didrachm; drachm; tetradrachm
- Caesarean year of Antioch *see* Julian year of Antioch
- Caley, Earle 79
- calibration 120–2
- Caligula, emperor 28
 aureus of 172, 187–8, 284, 377, 383, 692
 Caesarea, Cappadocia, coinage of 507–13, 537, 671, 676, 678
 character of 188
 denarius of 94, 168–9, 173–6, 180–1, 187–9, 191, 196–7, 210, 221–2, 224–7, 234, 324, 397, 405, 440, 442, 448, 493, 525, 535, 620, 623, 672, 678, 688–9
 Egyptian coinage of 620
 fineness of denarius under 167, 189
 mints of 175–6
 output under 173–5, 189, 190, 229, 234, 439
 Syrian coinage of 552–3, 555, 557–62, 588, 603–4, 671, 676, 678, 680
 weight standards under 170–2, 510, 513, 557, 559, 603, 671–2, 678
- Campania 355
- Capellus, Jacob 55
- Capitol 355, 359, 473
- Cappadocia 365
 kings of 505–9, 519–20, 538, 680, 695
see also Caesarea in Cappadocia
- Caracalla, emperor
 aureus of 58
 character 11–12
 countermark of 497
 denarius of 58, 76
 ‘depredations’ on coinage 12, 16
 radiate of 61–2, 67, 72, 74
 reckless expenditure 11–12, 15
see also debasement
- Carausius, emperor, coinage of 14
- Carisius, T., denarius of 158
- Carradice, Ian 326, 350–1, 360–2, 377–80, 384–5, 387–92, 394, 403, 405, 407, 432, 455, 473, 521
- Cartagena 177–8
- Carter, Giles 79, 86
- Carthage, mint of 269–70
- Carthago Nova 177, 271
- Cassius Dio 15, 47, 70, 271, 351, 355, 395, 409, 424, 426, 428
- Cassius Longinus
 tetradrachms of 541
- centralised minting 606, 682–6
 at Alexandria 497, 576, 589, 595, 598, 649, 655–7, 682–4
 at Antioch 370–1, 498, 502–4, 682
 at Caesarea in Cappadocia 11, 505–6, 514, 517, 569–70, 682
 at Rome 331, 369, 398, 473, 475, 479, 485, 488, 493, 495, 520–1, 526–8, 576, 600, 606, 673, 681–4, 686, 698
- Ceres, as coin type 193
- Chacon, Pedro 54, 56, 59
- chartalism 16, 40, 77, 235
- chemical analysis *see* analysis
- chemical cleaning of coins 110–11, 128
- Christiansen, Erik 591, 608–10, 613, 615–16, 623, 626–7, 632, 634–5, 638–9, 643–4, 646, 649, 655–6, 659
- chromium, trace element 4, 104, 112, 181, 225, 247, 406, 407, 417, 551–2
- chryseous*, as term for aureus 47
- Cicero 28

- Cilicia
 coinage of 463, 490, 495–7, 670, 676
see also Tarsus; tetradrachm
- Cipolla, Carlo 13, 27, 41
- circulation 5
 at premium 49–50, 52, 385, 449–52, 455, 459, 681, 692–3, 695
 of denarius 7, 24, 184, 190, 208–11, 236, 267–8, 385, 449, 463, 465, 540, 606, 609, 687–8, 699
 of gold 5, 24, 331, 449, 459, 688, 699
 of Hellenistic coinage 541, 548, 607–8
 of old coinage 199, 210, 447–9, 687–8, 697, 699
 of provincial silver 25, 365, 463, 465, 467, 485–6, 490–3, 495, 497–8, 501–6, 508–9, 514, 519–20, 540, 546–9, 553, 605–7, 662–3, 672–3, 679, 696, 698–9
 of silver in general 5, 699
- cistophoric standard 492, 667
- cistophorus 24, 463, 465–89, 505, 539, 671–2, 675–6, 678–9, 683–5, 695, 697
 Attalid 465–6, 695
 chronology of 466–7, 472–3, 480
 circulation of 465, 467
 countermarks on 467
 debasement of 466
 definition of 465
 fineness of 164–5, 466, 470–3, 475, 480, 483, 486–7, 489, 675, 679, 695
 history of 465–6, 672, 675
 of Augustus 165, 465–70, 472, 486–7, 489, 671, 676
 of Claudius 466–73, 475, 486–9, 492, 614, 623, 671, 676, 678, 697
 of Domitia 473–4
 of Domitian 466, 471–9, 481–2, 486–9, 493–4, 497, 525–7, 535, 671, 676, 683, 685
 of Hadrian 467, 486, 697
 of Julia 359, 475
 of Mark Antony 164–5, 166, 199, 466–7, 486, 489, 667, 678, 697
 of Nerva 466, 474, 479–82, 486–9, 671, 676, 684
 of Titus 466, 471–4, 482, 486–9, 671, 676, 683
 of Trajan 466, 474, 479, 482–9, 495–6, 671, 676, 684
 of Vespasian 364, 472
 overvaluation of 470–5, 481, 483, 485–7, 538, 623
 plated 472–3
 proconsular 165, 466
 recycled 485
 relationship to Caesarean coinage 525–6, 535, 671, 676, 683–4
 relationship to denarius 465, 470, 472, 475, 667, 671–2, 679, 683–4
 relationship to Egyptian coinage 623, 671, 676
 relationship to Lycian coinage 492–5, 525, 535, 671, 676, 683–4, 686
 relationship to Syrian coinage 667, 671, 676
 relationship to Tarsus tetradrachms 497, 671, 676
- Republican period 465–6
 Severan 697
 types 465–7
 weight standards 465, 467–75, 480, 482–3, 485–7, 489, 492, 667, 670–1, 676, 678, 696
 worth 3 denarii 465, 487, 667
- Civil Wars, AD 68–69 239–320
 anonymous aurei of 267, 303, 308, 313, 318
 anonymous denarii of 239, 267, 268, 281, 289, 296, 301–16, 324, 695
 denarii of xxv, 10, 20, 30, 233, 238, 239–320, 322–4, 372, 373–4, 381, 384, 432, 444, 451–3, 460, 689, 695
 provincial coinage of 572–5, 610, 646–9, 662
 weight of anonymous coins 312–13
see also Galba; Otho; Vespasian; Vitellius
- Civilis, C. Julius 301
 rebellion of 301, 305
- clashed hands, as coin type 257, 292, 309–11, 314
- ‘Claudian copies’ 24
- Claudius I, emperor 179, 448, 509, 610
 aureus of 94, 168, 172, 195, 284, 377, 383, 388, 394, 454, 457, 692
- Caesarea, Cappadocia, coinage of 507, 509–10, 513–14, 537–8, 557, 623, 671, 676, 678
- cistophori of 466–73, 475, 486–9, 492, 614, 623, 671, 676, 678, 697
- coinage in base metal 24
 denarius of 63, 94, 167, 168–9, 173–6, 180–1, 189–93, 196–7, 210, 221–2, 224–7, 234, 324, 397, 405, 437–42, 470, 487, 493, 525, 535, 551, 614, 620, 623–4, 659, 672, 678, 688–9, 699
- Egyptian coinage of 62, 493, 536, 610, 615, 620–7, 630, 644, 658–61, 664, 671, 676, 695
- fineness of denarius under 167, 191
- Lycian coinage of 491–2

- Claudius I, emperor (*cont.*)
 mints of 175–6, 179, 188
 output under 173–5, 190, 200, 229, 234, 439, 699
 removes Tiberian Egyptian tetradrachms 615, 623, 659–61
 Syrian coinage of 552–3, 555, 557–60, 671, 676, 678
 titles 189, 467
 weight reduction by 169–72, 190–1, 193, 195, 199, 206, 228, 388, 438, 454, 470, 620
 weight standards under 171–2, 190–1, 193–5, 207, 437–8, 453–4, 467–71, 510, 513, 538, 557, 559, 620–1, 630, 635, 671–2, 678
see also Divus Claudius
- Claudius II Gothicus, emperor, coinage of 6, 61
- Claudius Didymus 47
- Cleopatra VII, coinage of 608, 612–14, 619–20, 624–6, 630, 643–4, 659–60, 672, 695
- Clodius Albinus, emperor
 denarius of 14
- Clodius Macer 269, 302
- closed currency system 607, 609–10, 663
- club, as coin type 528
- co-operation between mints *see* centralised minting
- cobalt, trace element 4, 102, 104–5, 112, 124, 181, 225, 247, 406–7, 417–18, 546, 551–2, 566, 568
- Codex Bobiensis 668–9
- Cohen, Henri 67
- Colchester Castle Museum xxvii, 149, 153
- Colchis 505, 520
- ‘collapse’ of the coinage xxiv, 7, 15, 18, 40–1, 61, 201, 229, 395, 426, 434–5, 446, 459, 690, 700
- Cologne 254, 309, 316
- Commodus, emperor 674
 denarius of 11, 15, 63–5, 67–9, 328
 reforms all phantoms 17
- Concordia, as coin type 212, 216, 309, 374, 529
- Condamin, Jeanne 77–80
conductores argentariarum 32
- confiscation of property 12, 38, 41
- Constantine I, emperor, coinage of 20, 54, 58
- consuls 231, 330
- Cope, Lawrence H. 6, 80
- copper 4, 88, 139
 alloys of 105
 debasement with 4, 182, 197, 200–1, 217, 222, 223–5, 233, 235, 247, 286, 289, 290, 316, 318, 441–3, 445, 470, 550, 604, 607, 675, 679, 695–6
 depletion 84, 90–2, 133, 134, 139–40, 144, 146, 149–50, 163, 360, 362, 383, 415, 612–13, 616
 for coinage 3, 4, 6, 12, 25–6, 48, 60–1, 63–5, 78, 85, 96, 100, 168, 182, 197, 201, 217, 219, 223–4, 230, 247, 286, 289, 290, 315–16, 318, 324–5, 331, 333, 335, 345, 359–60, 363, 375, 393, 399, 403, 415, 417, 441, 446, 451, 475–6, 481, 504, 516, 525, 533–5, 556–7, 567–8, 575, 586, 589, 594, 604, 606, 612, 623–4, 628–30, 645–6, 652–3, 655, 657, 660, 675, 679, 681, 684, 689–90, 695, 698
 increases hardness of silver 442
 oxide 109, 135, 146–7
 price of 46, 48, 665–6
 sources 476, 479, 567, 624, 653, 657, 681, 689
see also leaching of copper; ore sources
 copper isotope analysis *see* analysis
 correction of coinage *see* restoration of currency
 corrosion 107, 135–6, 138, 142
 effect on fineness 149–50, 367–8, 383, 422, 572, 597, 619, 655, 665
 effect on weight of coins 90–2, 259, 365, 419, 436, 463, 572, 587, 616–17, 638, 650, 654, 665, 672–3, 695–6
see also copper depletion; leaching of copper
- Cotton, Hannah 547–8
- countermarks 467, 497, 581
- Cowell, Michael 84, 87, 390
- Crassus, M. Licinius, tetradrachms of 542
- Crawford, Michael H. 6, 9, 40–1, 76, 93, 151, 157–63, 220, 230, 233, 256, 264
- credit crisis of AD 33 97–8, 184
- credit money *see* money
- crescent, symbol on Syrian tetradrachms 572, 576, 581–2
- Crete 44
 coinage of 490
- cross-subsidies 14, 48
- crying down value of coin 388–9, 408, 455
- cupellation 35–6, 51, 95–6, 101–2, 159, 168, 177, 179, 196, 405, 653
- Cyprus, coinage of 370–1, 375–6, 463, 497–504, 536, 539, 590, 607, 671, 673, 675–6, 683, 686, 695
 chronology 498
 circulation 497

- coinage minted in Syria 498, 683
 dating systems 498
 fineness of 501–2, 590, 695
 overvaluation of 502
 relationship to Caesarean coinage 671,
 675–6, 683
 relationship to denarius 498, 502
 relationship to Egyptian coinage 671, 675–6
 relationship to Lycian coinage 686
 relationship to Syrian coinage 498, 502, 590,
 671, 675–6, 683
 relationship to Tarsus tetradrachms 502,
 671
 style of coinage 498
 types 497
 weight standards 498–501, 607, 671, 673
- Dacia 11, 70, 76, 379–80
 gold from 11, 70–1, 76, 425, 428
 hoards from 240–1, 323, 395–6, 457
 D'Arcet, Jean-Pierre-Joseph 60, 63
 data quality 122–9
 dating systems 498, 521, 541–2, 545–8, 562–7,
 572, 576, 578, 581–2, 590–1, 595–6, 610
 De La Nauze, Louis Jouard 423–4
 debasement
 advantages 36
 as alternative to taxation 9, 12, 38–9, 76
 as means to cover deficits 231, 538, 690,
 700
 as taxation 13, 39, 74
 cause of inflation 13–14, 40, 385
 causes loss of confidence 17, 42, 71, 219–20,
 229, 235, 700
 correspondence with high expenditure 9, 11,
 330
 definition 41
 detection of 228
 elite opinion of 12–13
 interpretation of xxiv, 6, 9–10, 13–14, 66, 69,
 71, 226, 229–38, 698–700
 link with morals 10
 medieval 10, 13, 16, 37, 39, 41, 75, 516
 modern 16
 of Caesarean coinage 506, 519, 529, 537–9
 of cistophorus 466
 of Egyptian coinage 611, 622–3
 of Ptolemaic coinage 507–8, 608, 613, 644
 Ottoman 13, 16, 39
 profit from 15, 43–4, 66, 82, 237–8, 430, 432,
 444–5, 451, 453, 459, 643–4, 686
 under Antoninus Pius 11, 15, 17, 69, 73–4
 under Caracalla 11–12, 14–15, 76
 under Commodus 11, 15, 17, 65, 67, 69, 71
 under Didius Julianus 61
 under Domitian xxiv, 379–80, 393–5, 397,
 454–6
 under Marcus Aurelius xxiv, 10–11, 17, 65,
 69, 71, 74, 76
 under Mark Antony 198–9, 424, 687–8
 under Nero xxiv, 3, 7–8, 10–11, 15, 19–20,
 52, 64–8, 71, 73–4, 76, 197–8, 200–38,
 239, 441–3, 460, 627, 634, 642, 649, 663,
 689–90, 699–700
 under Nerva 415
 under Otho 17, 228, 246–7, 251, 261, 318,
 330, 451, 453, 649, 692
 under Republic 9–10, 159, 197
 under Septimius Severus 11, 15, 47–8, 61,
 63, 65, 69, 71–3, 76, 215, 240, 264
 under Severus Alexander 60–1
 under Trajan xxiv, 3, 7, 11, 15, 17, 19, 65,
 68–9, 72, 75–6, 240, 264, 422–8, 430–3,
 458–60, 600
 under Vespasian 10, 15, 17, 71, 330
 under Vitellius 68, 261
see also fiscal debasement; monetary
 debasement
- deflation 71, 384–5
 demonetisation 5, 44, 424
 denarius
 as 'perpetual money' 73
 as standard of value 160, 237
 Caesarean 93–5
 'Caesareus' 57–8
 central to monetary system 7, 157, 694
 'Consularis' 57–8, 64
corona civica of Nero 168, 179, 192–3,
 195–8, 220–4, 234, 441–2
 'De Papyrius' 58
 definition of 668
 equivalent to Attic drachm 54, 465, 539, 669,
 674, 678, 691
 First Neronian Standard 162, 204, 216–19,
 228, 235–6, 246, 251, 261, 264, 297, 318,
 320–1, 330, 351, 381, 389, 392, 408, 419,
 422–3, 431–3, 443–4, 451, 453, 456,
 458–9, 470, 493, 495, 498, 539, 551, 566,
 570, 677, 680, 690–5, 699
 Gaius and Lucius type 165, 169–70, 172,
 177–9, 180–2, 186–7, 343, 388, 545, 548,
 556–7
 history of 7, 8–17, 23–4, 157–61, 237,
 377–80, 384, 434–60, 556

- denarius (*cont.*)
- Mark Antony legionary 20, 64, 66, 74, 98, 132, 152, 161–7, 174, 198–9, 209, 226–7, 323, 388, 424, 427, 432, 459–60, 605, 687–8, 691
 - Neronian xxv, 10, 20, 56, 58, 63–5, 93–5, 168, 174–5, 201–38, 233, 247, 258–9, 264, 312, 328, 351, 364, 389, 519
 - of Antioch 166, 364–5, 370–6, 453, 498, 502–4, 576, 583, 585–6, 589
 - of Ephesus 166, 326, 364, 365–70, 375–6, 453, 472
 - of Lugdunum 20, 24, 97, 99, 163, 180–2, 187, 199, 211, 232, 281–2, 285, 288, 314–15, 343, 428–30, 440–1, 455–6, 458, 487, 511, 556–7, 614, 620, 623, 659–60, 688–9
 - of the ‘o’ mint 364, 367–70, 453
 - output 22, 24, 157–8, 173–5, 184, 189, 190, 193, 200, 208–9, 223, 229, 230, 232, 237–8, 321, 326, 333–4, 350, 353, 360, 378, 389, 392, 394–5, 407, 412, 439, 441–2, 444, 448, 454–6, 458, 536, 689, 692, 699–700
 - plated 149, 162, 267, 279, 301–2
 - PONTIF MAXIM type of Tiberius 169–70, 172, 175, 177–9, 182–7, 339, 341, 388
 - post-Neronian xxv, 49, 66, 70, 152, 162, 168
 - pre-Neronian xxv, 11, 15, 49, 64, 66, 70, 74, 97, 99, 157–200, 207, 210, 220, 224–6, 229, 238, 323, 378, 385, 388, 392, 397, 408, 424, 426, 430–1, 448–9, 456, 459, 691–3
 - ‘preferred’ currency 9
 - Republican xxv, 3–4, 8, 9–10, 20, 23–4, 33, 55–7, 60, 63–4, 66, 74, 83–4, 97–8, 157–68, 173–4, 177, 179, 184, 190, 197, 199, 202, 207, 209–10, 226–8, 234, 301–2, 320, 323, 385, 387–8, 396, 425–7, 430, 434–7, 440, 448, 455–6, 459, 465, 508, 535, 548, 589, 610, 630, 646, 661, 667, 669, 671, 678, 683–4, 687, 691, 693–4, 697–9
 - relation to provincial coinage 9, 18, 20–1, 54, 230, 235–7, 365, 368–9, 370–3, 444–5, 450, 463, 465, 470, 472, 475, 487, 490–1, 492–3, 495–8, 502, 509–11, 513–15, 519–21, 523, 525–6, 536–9, 548–9, 556–7, 566, 570, 576, 583, 585, 589–90, 594, 597, 599–600, 604–5, 610–12, 614–16, 618, 623, 630, 643–6, 649, 652, 663–4, 666–7, 669–74, 676, 678–85, 691, 696–9
 - restoration by Carausius 14
 - restoration by Domitian 11–12, 14, 17–18, 52, 58–9, 65, 68–9, 72–3, 80, 262–3, 321, 351, 359, 377–408, 433, 450, 453–7, 594, 663, 692, 694, 697
 - restoration by Elagabalus 14
 - restoration by Macrinus 14
 - restoration by Marcus Aurelius 11
 - restoration by Nero 204, 216, 219–20, 228–9, 235, 377, 432–3, 450–2, 642–3, 692, 697
 - restoration by Pertinax 14, 17, 65
 - reevaluation of 160
 - Revised Neronian Standard 133, 204, 216, 219–20, 228, 233–4, 236–8, 245–6, 251, 261, 263–4, 270, 297, 318, 320, 380–1, 390–1, 393–4, 397, 403, 405, 407, 409, 418, 422, 431–3, 444–5, 450–1, 454–60, 482, 491, 551, 566, 594, 597, 604, 676–7, 680–1, 692–3
 - weight reduction by Claudius 169, 170–2, 190–1, 193, 195, 199, 206, 228, 388, 438, 454, 470, 620
 - worth 4 sestertii 24, 46–7, 447
 - worth 10 asses 160, 434
 - worth 16 asses 24, 160, 434
 - see also* debasement; money; restoration of currency; weight standards; *and entries under individual rulers*
- dendrite, dendritic 106, 108, 131–3, 135–40, 142, 144–5
- depletion gilding 78
- depletion silvering 78–9, 83–4, 87–8, 90, 109–10, 134, 146, 218, 415, 612–13
- see also* surface enrichment
- detection limits 115, 123
- Diadumenian, son of Macrinus 569
- Diana of Ephesus, as coin type 467
- Didius Julianus, emperor 62
- as point of change 61
 - denarius of 65
- Dido, treasure of 230
- didrachm
- definition of 670
 - of Caesarea in Cappadocia 331, 375–6, 398, 497, 505–6, 509–11, 513–31, 536–7, 557, 568–9, 670, 682–3
 - of Cyprus 371, 490, 497–8, 500–3, 683, 695
 - of Egypt 620
 - of Pontus 490, 515
 - of Syria 531, 557, 559–60, 599–600, 602
 - of Tyre 546, 548, 550, 695
- die axis 473, 521, 528, 533, 535–6
- die engravers *see* mints, personnel
- die links 467, 598–9

- die studies 267, 287, 299, 378, 389, 497, 562,
 577–8, 598, 615, 646
- dies, transfer of 479, 489, 528, 534–6, 576, 596,
 598, 682, 684, 698
- Digest of Roman Law 28
- diobol 608
- Diocletian, emperor
 coinage of 20, 60–1, 63, 690
 Price Edict of 26–7
- Diodorus Siculus 612
- Dioscorides 668–9
- distribution of new coin 29, 76, 157, 173, 184,
 208–11
- Divus Augustus, as coin type 281, 302, 306–9,
 312, 314, 509, 512, 615, 635, 639, 644, 685
- Divus Claudius, as coin type 192, 506, 515–20,
 537–8, 552–3, 567–70
- Divus Vespasianus 354–5, 357–8, 476, 478
- Domitia 473–4
- Domitian, emperor 35–6, 351, 409, 411, 590,
 595, 692
 as point of change 699
 aureus of 11, 58–9, 360–1, 377, 379, 380,
 383–4, 387–9, 391–4, 407, 409, 420,
 453–4, 456–7, 460, 492, 692–4
 Caesarean coinage of 507, 519–20, 522,
 524–9, 531–4, 537–8, 671, 676, 683–4
 character 11, 384, 394–5, 407, 455
 chronology of issues 360, 362–3, 377,
 389–90, 393
 cistophori of 466, 471–9, 481–2, 486–9,
 493–4, 497, 525–7, 535, 671, 676, 683, 685
 Cypriot coinage of 498, 502–4, 671
 denarius of 63, 65, 70–2, 74, 140, 142, 151,
 320–6, 351, 359–63, 377–408, 417–18,
 428–30, 453–60, 475–79, 481, 493–4,
 525–7, 533, 536, 594–5, 655, 683, 692–3
 denarius of, under Titus 324, 348, 354–9,
 363, 476, 478
 denarius of, under Vespasian 324–5, 339–49,
 367
 Egyptian coinage of 92, 590, 594–5, 611,
 655–8, 664, 671, 676
 finances 330, 379–80, 391–2, 394–5, 407,
 431, 455
 fineness of denarius under 381–3, 386,
 390–1, 393–4, 403, 415, 419, 453–9
 first reform, AD 82 11, 52, 263, 321–2,
 377–81, 383–9, 408, 453–7, 460, 655, 663,
 692, 697, 699
 increase in army pay under 379–80, 389, 455
 Lycian coinage of 406, 479, 492–3, 495, 497,
 535, 671, 676, 683, 686, 698
 output under 360, 389, 392–5, 407, 454–6,
 458, 536, 655, 692–3
 pre-reform denarii 140, 321–2, 324, 360–3,
 377, 381
 preferential removal of denarii 70, 227,
 262–3, 378, 387–8, 391, 395–8, 405, 408,
 456
 reforms as monetary adjustments 384–9,
 392, 394, 408, 455–8
 removes Julio-Claudian denarii 395–8, 405,
 427, 428, 430–1, 433, 456, 526, 528,
 534–6, 664, 694
 restores coinage 11–12, 14, 17–18, 52, 58–9,
 65, 68–9, 72–3, 80, 262–3, 321, 351, 359,
 377–408, 433, 450, 453–7, 594, 663, 692,
 694, 697
 second reform, AD 85 xxiv, 11, 263, 377–81,
 383, 387, 389–93, 397, 404–5, 407–8, 415,
 454–7, 692–4
 significance of reforms 384–9, 392–8, 431,
 454–9, 475, 693–4
 silver multiples 384
 Syrian coinage of 552, 555, 590–7, 603–4,
 655, 671, 676, 681, 684, 686, 697
 Tarsus tetradrachms of 495–7, 502, 504,
 591–2, 671, 676, 685
 titles 339, 342–3, 345, 348, 354, 389–91,
 472–3, 490
 weight standards under 360–1, 380–1,
 383–4, 388, 391–4, 410, 454, 456–7, 471,
 473–5, 591, 603, 655, 671, 692–3
- donatives 9–10
 in gold 160
 in silver 14
- Doncaster Museum xxvii, 149, 152
- drachm 59, 235–6, 444–5, 450, 666–70, 691,
 699
 bronze 608
 Caesarea in Cappadocia 331, 398, 500,
 505–25, 528, 530, 536–9, 546, 568, 669,
 671, 673, 680, 682
 cistophoric 463, 465, 667
 Cyrenaican 531
 definition of 668–9
 Egyptian 463, 610, 620, 669
 Lycian 406, 479, 490–5, 502, 531, 669, 671,
 673, 676, 680, 683–4, 686, 695, 698
 Pontic 490–1, 671, 673, 680
 relationship to denarius 463, 490, 492, 495,
 509, 514–15, 666–7, 669–70, 699
 Rhodian 674
 Roman 669–70, 672–3, 679–80
 Syrian 531, 560–2, 672

- drachm (*cont.*)
 theoretical 603–4, 661, 663, 669, 671–2,
 675–6, 678
 Tyrian 679–80
see also Attic drachm
- Dräger, Michael 365, 368
- drusus, as coin type 509–12
- ducat 44
- Duncan-Jones, Richard 6–7, 10, 13, 17–19, 24,
 30, 34, 38, 40, 44, 82, 91, 93–4, 151, 158,
 161, 168, 173, 175, 184, 190, 195, 203,
 206–8, 215, 226–8, 230, 233, 350, 377,
 380, 383, 395, 397, 427–8, 432, 435,
 437–8, 443, 459, 516, 609, 616–17, 620,
 625
- dupondius 24, 46, 282, 403
- Dura Europus 547
- eagle
 on altar, type on Syrian tetradrachms 373,
 498, 502, 576–8, 584, 586, 589–90,
 603
 on club, type on Syrian tetradrachms 563,
 578–9, 581–4
 on thunderbolt, type on Syrian
 tetradrachms 563, 572, 576, 578–9, 584,
 591, 596, 599
 on wreath or branch, type on Syrian
 tetradrachms 563, 572, 582, 584, 599
 with palm branch, type on Egyptian
 tetradrachms 634–6, 638–9, 641–2,
 662
- echelle grating, use in ICP-AES 115–16
- Eckhel, Joseph 56, 61–2, 202
- economy of Roman empire 75
 ‘primitivist’ model of 75–6, 81, 229
- Edward III, king of England 43
- Egypt 589, 591, 612, 660, 664
 grain from 612, 660
 hoards from 608, 612, 615–16, 623, 631–2,
 639, 644, 649, 655–6, 659–60
 lack of copper sources 606, 624
 lack of silver sources 606–7, 612
 prices in 13, 40, 71, 606–7
- Egypt, coinage of xxvii, 20–1, 25, 28, 65, 91,
 149, 328, 463, 465, 511, 539, 589, 606–4,
 667, 669–73, 675–80, 683, 685, 695–8
 circulation patterns 606–7, 663
 closed currency system 607, 609–10, 663
 dating systems 590–1, 610
 debasement of 611, 622–3
 experiment with fiduciary coinage 539,
 606–7, 609, 677–8
- fineness 607–9, 613–15, 618–19, 622, 626–7,
 633, 641–2, 648, 651, 654, 656, 658–60,
 675, 677, 695
 history of 606–8, 610–11, 614–15, 620,
 625–7, 633–5, 646–7, 649, 654–64, 672–3,
 675, 678
 in base metal 590, 598, 607–8, 610, 620, 646,
 649, 654
 indicator of state of Roman finances 611
 of Augustus 608, 610, 614
 of Caligula 620
 of Claudius 62, 493, 536, 610, 615, 620–7,
 630, 644, 658–61, 664, 671, 676, 695
 of Cleopatra 608, 612–14, 619–20, 624–6,
 630, 643–4, 659–60, 672, 676, 695
 of Domitian 92, 590, 594–5, 611, 655–8,
 664, 671, 676
 of Galba 615, 638, 642, 646–54, 658, 662–3,
 671, 676
 of Nero 580, 589, 608–10, 613, 615, 622–3,
 625–47, 649–54, 658–64, 671, 673, 676,
 680, 683, 697
 of Nerva 597–8, 611, 656–8, 664, 671,
 676
 of Otho 638, 646–9, 651–3, 658, 662–3, 671,
 676
 of Ptolemy I 607
 of Ptolemy II 644
 of Ptolemy XII 608, 613, 644
 of Severus Alexander 606
 of Tiberius 91–2, 493, 511, 608–10, 612–20,
 622–6, 635, 643–4, 650, 658–62, 664,
 669–71, 673, 676–7, 679, 685, 695–7
 of Titus 611, 654–8, 664, 671, 676
 of Trajan 598, 611, 657–8
 of Vespasian 539, 576, 590, 608, 610–11, 615,
 649–58, 662–4, 671, 676, 683
 of Vitellius 638, 646–9, 651–3, 662, 671, 676
 output 610, 615, 625–6, 631–4, 638–9,
 642–3, 646, 654–6, 660, 662, 697
 overvaluation of 539, 614, 618–19, 623, 643,
 660, 663–4
 Ptolemaic xxv, 20, 607–9, 611–15, 619–20,
 624, 630, 634, 642–6, 658–9, 667, 669–70,
 672–3, 685, 691, 695, 697
 relationship to Caesarean coinage 623, 662,
 670–1, 676–7
 relationship to cistophori 623, 671,
 676
 relationship of tetradrachm to denarius 463,
 511, 539, 610–12, 614–16, 618, 623, 627,
 630, 643–6, 649, 652, 659, 663–4, 667,
 676, 683, 685, 697

- relationship of tetradrachm to Ptolemaic coinage 608–9, 611, 615, 624, 630, 634, 643–6, 658–9, 685
- relationship to Syrian coinage 576, 580, 589–91, 594–5, 597–8, 610–11, 626, 649, 655–7, 662–3, 670–1, 676–7
- relationship to Tyrian coinage 609, 660–2, 671, 676–7
- tetradrachm worth 1 denarius 463, 511, 539, 610, 614–16, 645, 658, 660, 667, 677, 696
- types 611, 615, 621, 633–5, 638–9, 641–2, 646, 649, 654
- weight standards 607, 614, 616–17, 620–1, 627, 630–2, 635–8, 642, 647–50, 654–61, 667, 669–73, 696
- see also* Alexandria; Ptolemaic dynasty; tetradrachm
- Eirene, as coin type 649
- Eisenschmidt, Johannes 26, 57, 60–1, 202, 423
- Elagabalus, emperor
 denarius of 14
 Syrian tetradrachms of 14
- electrode potential 101, 107
- electrum 100, 102
- Elizabeth I, queen of England 387
- Elsen, Jean 93, 158
- embrittlement 137–8, 142, 144
- emission lines 114, 120
 interference with 114, 118
- England 16, 42–3, 49, 66, 387
- English Heritage xxviii
- Ephesus 47, 465
 cistophori of 166, 466–7, 472
 denarii of 166, 326, 364, 365–70, 375–6, 453, 472
 mint of 166, 326, 364, 365–70, 375–6, 467
- Epiphanius 668, 670
- Erizzo, Sebastiano 53, 55
- Estiot, Sylviane 182, 184–6, 188, 197, 436
- etchants, etching 130, 132, 135–6, 139–40
- Eusebius 668
- eutectic 106, 108, 131–5, 138–42, 144–5, 442, 506, 511
- EX SC on Neronian denarii 193, 441
- exchange *see* money
- expenditure 6–12, 42, 62, 76, 82, 330, 378–80, 391, 394, 407, 409
- export of aurei 229
- export of denarii 34, 49, 51, 74, 229, 448–51, 459, 692–3
- Famars 64
- Faustina I, empress, denarius of 63–4
- Faustina II, empress, denarius of 64
- Fenuelle, M. H. 64–5
- Festus 28, 465, 674–5
- Fides, as coin type 309
- fiduciary money 6, 15, 20, 40, 66, 68–9, 71, 161, 229, 235–7, 444–5, 453, 459, 506, 539, 606, 609, 642, 664, 677–8, 694, 699;
see also overvaluation
- finds of coin (site finds) 50, 75, 97, 321, 514, 609; *see also* hoards
- fineness
 determination of 100
 of Antiochene denarii 371
 of Asian cistophori 164–5, 466, 470–3, 475, 480, 483, 486–7, 489, 675, 679, 695
 of Caesarea in Cappadocia 368, 506–8, 511, 513–16, 518–19, 523, 525, 529–30, 537–8, 588, 604, 672, 675, 677
 of Cypriot coinage 501–2, 590, 695
 of Domitian's pre-reform denarii 362, 381–2
 of Domitian's first reformed period 381–2
 of Domitian's second reformed period 381–2, 403
 of Egyptian tetradrachms 607–9, 613–15, 618–19, 622, 626–7, 633, 641–2, 648, 651, 654, 656, 658–60, 675, 677, 695
 of Ephesus denarii 367–8
 of First Neronian Standard denarii 217–18, 228, 246, 261, 297, 318, 320–1, 326, 330, 350, 367, 381, 392, 419, 423, 443–4, 450, 453, 456, 458–9, 470, 493, 690, 693–5, 699
 of gold 6, 62, 65
 of Julio-Claudian denarii 167–8, 187, 189, 190, 197–8, 213–19, 434, 443–4, 450, 688–9, 694
 of Lycian silver 492–5, 695, 698
 of Mark Antony denarii 161–2, 167, 198–9
 of Neronian Transitional phase denarii 216–17, 233, 443, 690
 of Pontic drachms 491
 of Republican denarii 159, 687
 of Revised Neronian Standard denarii 219, 228, 238, 245–6, 261, 263, 270, 297, 318, 320, 367–8, 390–1, 393–4, 403, 405, 409, 444, 450, 459, 482, 491, 692–3
 of Syrian coinage 540, 542, 544–5, 550, 554–7, 559, 561, 566, 570, 574, 580, 583, 585–6, 590, 593–4, 597, 599, 602–4, 675
 of Tarsus tetradrachms 496
 of Tyrian coinage 550, 603–4, 609, 695
 sterling 43

- Finley, Moses 75
 fire at Rome *see* Great Fire
 fire damage, alters composition of coin 480, 512, 559
 First Neronian Standard *see* denarius; fineness; Nero; standard of denarii
 fiscal debasement, 22, 41–3, 52, 68, 71–2, 76, 82, 229–32, 236–7, 261, 330, 379–80, 391–2, 394, 418, 424–5, 431, 433, 446, 453, 608, 690, 694, 700
 characteristics 10, 16, 42, 45
 fiscal deficits 6–7, 9, 19, 45–6, 52, 72, 157, 198, 236, 330, 379–80, 391–2, 394–5, 431, 446, 538, 608, 690, 699–700
Fiscus Caesaris 31, 231, 330, 446
 flans *see* blanks
flatura argentaria monetae Caesaris 35
 Flavian dynasty 56, 98, 263, 387, 397, 453, 539, 691
 coinage of 70, 84, 97, 166, 226, 227, 321–408, 451–60, 472–9, 486–9, 493, 497, 506, 510, 519–28, 570, 675, 677, 680, 685
 see also entries under individual emperors
 Florence 13, 27, 43
 flows of metal 34–5, 75–6, 376
 forgeries
 modern 255, 257, 297
 see also cistophorus, plated; denarius, plated; irregular issues
 Fortuna, as coin type 529
 France 13, 16, 39, 66, 177–8, 181, 187, 199, 225, 263, 265, 268, 313, 315, 317, 322; *see also* Gaul
 Frank, Tenney 71, 175, 351, 425
 free minting 16, 29–30, 33, 42, 75, 76, 161, 527, 547
 function of coinage *see* money
 Gabinius, Aulus
 tetradrachms of 542, 544–5
 Gadara (Syria) 587
 Gaius, emperor *see* Caligula
 Gaius, jurist 28
 Galba, emperor 10, 47, 230, 248–9, 254, 263, 295–6, 301, 304, 314, 562
 African mint 269–70, 302
 aureus of 239, 243–4, 259, 261, 267, 270–1, 279, 281, 284, 294, 303, 313, 318, 328, 384, 392, 451–2, 454
 character 245, 304
 chronology of denarius issues 241–2, 245, 269, 271, 279, 282, 314
 countermarks of 581
 denarius of 14, 58, 63, 65, 72, 134, 220, 226, 239–45, 246, 247, 258, 263–87, 289, 299, 302–3, 305, 310–11, 314–16, 318, 320, 336, 374, 394, 451–2, 692, 695
 Egyptian coinage of 615, 638, 642, 646–54, 658, 662–3, 671, 676
 fineness of denarius under 244–5, 270, 272, 276–9, 282, 285–6, 394, 403, 451, 454
 output under 208, 239–42, 262, 572, 646
 portrait types 242, 269, 270, 282, 572
 posthumous coinage 281
 rebellion of 268–9
 reverse types 242
 Syrian coinage of 552, 555, 562, 572–6, 581–4, 589, 603–4, 662, 671, 676
 titles of 239, 241–2, 269–82, 287, 315
 weight standards under 220, 242–4, 283–4, 384, 451–2, 573–4, 603, 647, 671
 western mints of 233, 239, 241–2, 245, 267, 268–87, 289, 297–8, 299, 301–3, 310–11, 314–16, 318, 320, 324, 374, 384, 392, 444, 451–2
 see also Divus Augustus
 Galen 57, 668–70, 672
 Gallia, coin type 267, 277, 302
 Gallienus, emperor 72
 coinage of 57, 60–3, 65, 67, 73
 Gaul 173, 239, 254, 269, 301, 688, 695
 conquest of 27
 empire of the Gauls 301, 305
 hoards from 173–4, 184, 210, 220, 240, 317, 323, 388, 436–8, 457–8
 lead from 430
 mints in xxv, 14, 20, 24, 175, 179, 239, 267, 269, 277–83, 284, 286–98, 300–6, 308–13, 315–18, 373–6, 440–1, 451–2, 679
 ore sources in 177, 179, 199, 225, 265, 268, 272, 285, 287, 296, 305, 308, 311, 313–18, 375–6, 430, 440, 602, 695
 see also France; Lugdunum; Narbo; silver; Gallic; Vienna
 Germanicus 188, 509, 512–13, 528, 685
 Germany 240, 295, 301
 export of coins to 74
 hoards from 209–10, 220, 240, 264, 319, 323, 457–8
 mints in 309, 315
 Giard, Jean-Baptiste 175, 182, 185, 188–9, 288, 298–9, 305
 Gibbon, Edward 62
 Giesecke, Walther 161, 203
 Gilmore, P. 569
 global analysis *see* analysis

- globe, as mint symbol 270–1, 278, 289
- gold
- as salary 39
 - as standard of value 66, 235, 237, 694, 699
 - Dacian 11, 70–1, 76, 425, 428
 - Dalmatian 231
 - Egyptian 606–7, 612
 - for coinage 3, 10–11, 25–6, 48–50, 63, 75, 83, 159–61, 190, 199, 231, 407, 607, 612
 - importance of gold coinage 5–7, 82, 160, 694
 - minor component in silver 4, 17, 36, 101–2, 104–5, 112, 123–4, 126, 163–5, 176, 178–9, 185–6, 188, 191–2, 196–7, 224–5, 245–7, 261–2, 270, 299, 315, 318, 323–4, 331–2, 335–40, 342–3, 345, 348, 351–2, 357–60, 368–70, 375, 404–7, 415, 428–9, 430, 432, 440–1, 476–7, 481, 484–5, 487–8, 491, 493, 495–7, 502–4, 517, 525–6, 532, 536, 546, 551, 556, 560–1, 566–7, 574–5, 580, 583, 585–6, 588–9, 592, 597–8, 602, 619–20, 623–5, 628, 636–7, 644–6, 657, 659, 661, 683
 - oversupply of 237, 439–40, 688–9
 - parting 612
 - price of 26–7, 44, 48, 69, 231, 237, 425, 439, 441, 687, 689, 695, 699
 - purity of 6, 62, 65
 - regulation of supply 32, 442
 - role in taxation 77
 - Spanish 199
 - see also aureus; solidus*
- goldsmiths 49
- Gölitzer, E. 613–14, 618, 622, 627, 641
- Gordian III, emperor
- coinage of 57, 60–1, 63–4
- gramma see scripulum*
- granular structure, grain 107, 138, 142–3, 145–6
- Great Fire under Nero 211, 230–2, 330, 442–3, 446, 642–3, 690
- Great Fire under Titus 355, 359, 473
- Greaves, John 49, 55, 57
- Greece 97, 210–11, 236, 687
- hoards from 97, 210, 264, 388, 396, 438
 - ore sources in 167, 493, 504, 546
 - silver from 167, 504, 612, 685–7
- Greek coins
- archaic and classical 88, 167, 612, 667–8
 - Hellenistic xxv, 465, 491–2, 505–9, 520, 540–2, 544–6, 548, 557, 606–9, 611–15, 619–20, 624, 630, 634, 642–6, 667, 672–3, 678, 685–6, 695, 697
 - see also provincial coinage*
- Gresham, Thomas 387–8
- Gresham's Law 37, 48–52, 74–5, 226–7, 387, 391, 397, 447, 449, 455–6
- not a universal law 49
- Gronovius, Frederick 54, 202
- Gros tournois* 16
- Grosso*
- of Florence 44
 - of Venice 44
- Guey, Julien 77–9
- gunmetal 123, 316
- Hadad, as coin type 599
- Hadrian, emperor 36, 320, 605
- coinage of 61, 64
 - denarius of 67, 73
 - overstrikes earlier cistophori 467, 486, 697
 - provincial coinage of 65, 467, 495, 505, 520
 - Republican coinage under 425, 427, 457, 520
- half shekel 546
- Hammer, J. 68–9
- Harl, Kenneth 6–7, 10–12, 14, 18, 23, 34, 40, 82–3, 94, 168, 201, 206, 232, 379, 388–9, 394, 425–6, 434, 606, 609, 616, 623, 664, 666
- harmonisation of standards 444–5, 456, 679, 698–9
- Hazzard, R. A. 607–8, 613
- Heichelheim, Fritz 71, 425, 428
- Hemerologium Florentinum* 498, 521
- hemidrachm
- of Caesarea in Cappadocia 505, 514, 520–2
 - of Cyrenaica 531
 - of Lycia 491, 493
- Henry III, king of England 44
- Henry VIII, king of England, debasement of 16, 42
- Herod I, king of Judaea 548
- Herzog, Rudolf 69
- Hesychius 668, 670
- Hierapolis (Syria) 599
- Hill, Philip 426–7
- Hispania, coin type 267, 271, 277, 302
- Historia Augusta* 60, 67
- hoards 5, 28, 50, 70, 74, 89–90, 96–9, 149–53, 161, 395–7, 412, 425, 448, 673, 692
- African 264, 396
 - as evidence for public awareness of change 5, 19, 50–2, 66, 70, 82, 96, 160, 218, 226–8, 263–4, 302–3, 319–21, 323, 378, 387, 430, 448–50

- hoards (*cont.*)
 as evidence for circulation 5, 70, 96–9, 157,
 161, 208–11, 263, 267–8, 387, 425–7, 438,
 447, 490–1, 519–20, 540–1, 547, 553–4,
 605, 608, 615, 623, 687, 692
 as evidence for output 5, 45, 98, 173–5, 184,
 189, 190, 193, 208–9, 236, 239–41, 256,
 262, 264, 321, 389, 412, 445, 631–2, 639,
 643, 655–6
 as evidence for wear 98–9, 163, 436–8,
 457–8
 as store of wealth 74
 Balkan 240–1, 263–4, 319, 323, 395–6, 448,
 457
 bias in 90, 97
 British 97, 150–3, 173–4, 180–1, 184,
 209–10, 228, 240–1, 264, 319, 323, 388,
 395–6, 436–7, 448–9, 457–8
 Claudian 438
 Egyptian 608, 612, 615–16, 623, 631–2, 639,
 644, 649, 655–6, 659–60
 Flavian 97, 98, 208–10, 321, 323, 388,
 395–7
 Gallic 173–4, 184, 210, 220, 240, 317, 323,
 388, 436–8, 457–8
 German 209–10, 220, 240, 264, 319, 323,
 457–8
 Greek 97, 210, 264, 388, 396, 438
 Hadrianic 605
 Hellenistic 541
 Hungarian 388, 438, 448
 Italian 97, 184, 208–10, 263–4, 319, 323,
 388, 395–6, 432, 437–8, 447, 457, 687
 Julio-Claudian 163, 169, 172–5, 181–2, 184,
 193, 208, 448–9, 687
 laws against hoarding 27
 Neronian 208, 227, 448, 548–9
 north-western European 97, 323
 of gold 184, 190, 388, 437–8, 445, 449,
 692
 of provincial silver 467–9, 486, 490–1, 498,
 505, 508–9, 519–20, 547–49, 568, 608
 patterns of xxv, 5–6, 19–20, 66, 70, 73–4,
 96–9, 173, 218, 226, 320–1, 323, 395–7,
 467, 490–1, 497–8, 508–9, 519–20, 540–1,
 547–9, 554, 569, 605, 608, 615, 623, 644,
 659
 Portuguese 323, 396
 preferential selection of coins by hoarders
 70, 90, 227, 262–3, 320–1, 323, 377, 387,
 392, 397, 408, 447–51, 455–6, 459, 548,
 692–4, 699
 regional variations 97–8
 Republican 158–9
 Romanian *see* Balkan *above*
 Spanish 173–4, 184, 388, 396, 438, 448
 Swiss 174, 227, 448
 Syrian and Near Eastern 498, 541, 543,
 547–9, 553, 569, 605, 662
 Turkish 467–9, 486, 490, 509, 520,
 662
 underweight hoards 91, 97
individual hoards
 Abydus hoard 608
 Acarnania hoard 210, 240, 387
 Aïn Temouchent hoard 264
 Akko Remez hoard 153, 572, 597
 Ambenay hoard 160
 Angers hoard 160
 Anglesey hoard 387, 396
 Arbanats hoard 158, 436–7, 457
 Asyut hoard 612
 Aubenton hoard 240, 323
 Baeretswil hoard 150
 Barway hoard 319
 Beck Row hoard 163, 217, 240, 256, 264,
 303, 319, 323, 388, 457–8
 Beirut hoard 549
 Berthouville hoard 317
 Besançon hoard 160
 Birdoswald 1930 hoard 396
 Birdoswald 1949 hoard 396
 Boscoreale hoard 438
 Boston Spa hoard 240, 256, 264, 319, 396,
 457
 Bredgar hoard 160, 438
 Briatico hoard 388, 438
 Brislington hoard 150, 319, 525
 Budge Row hoard 209, 240, 319, 323
 Budinathan hoard 397
 Caesarea 1906 hoard 490, 509, 520
 Caesarea 1980 hoard 520
 Casal de Friume hoard 323, 387, 396
 Castagnaro hoard 240, 256, 264, 319, 396,
 427
 Castromao hoard 174, 227, 448
 Cherbourg hoard 160
 Ciorăști/Francești hoard 241
 Cirencester hoard 396
 Cogeces del Monte hoard 173–4
 Colchester hoard 264
 Comiso hoard 93
 Dattari hoard 91, 608, 616, 644
 Dersca hoard 396
 Dobârca hoard 395–6
 Dombresson hoard 174, 227, 448

- Edston hoard 241
 El-Madamud hoard 615
 Elginhaugh hoard 209–10, 323
 Eriswell hoard 227, 388, 448
 Erla hoard 427
 Erythrae hoard 467
 Este hoard 209–10, 227, 388, 447, 449
 Este hoard of aurei 438
 Évreux hoard 160
 Falkirk hoard 241–2, 256, 264
 Frāncesti hoard 98, 264, 319
 Fröndenbergh hoard 256, 264, 319
 Gerzeoul hoard 520
 Hammermühle hoard 319
 Herapel hoard 387
 Homiceni II hoard 240, 264
 Howe hoard 240, 323, 396
 Hunedoara hoard 396
 Hungarian hoard 93
 Ilisua hoard 396, 427
 Iluro hoard 388, 438
 Istanbul hoard 468–9
 Jászdózsza hoard 448
 Karanis hoard 615, 659
 La Gaumont hoard 172
 Lалуке hoard 174
 Latakia, Syria, hoard 498, 500
 Lavenham hoard 256, 264, 319, 396
 Lawrence Weston hoard 98, 240, 256, 264,
 319, 360, 398
 Lentilly hoard 438
 Limoges hoard 160
 Livia hoard 543
 Ljubljana hoard 448
 Lugo hoard 396
 Magiovinium hoard 98, 151, 240, 256, 264,
 319, 398
 Magura hoard 240, 264
 Maillé hoard 436–7, 457
 Medves hoard 240, 264, 396, 457
 Membury hoard 436–7, 457–8
 Meussia hoard 163, 174, 182, 186, 436–7,
 457–8
 Montans hoard 388, 437–8
 Mount Carmel hoard 549
 Mozatella hoard 396
 Nant hoard 457
 Nazareth hoard 498
 Nazoldelavo hoard 508
 Needham hoard 151, 174, 181, 227, 448
 North Suffolk hoard 163, 240, 256, 264, 319,
 323, 387–8, 396, 436–7, 457–8
 Norton Subcourse hoard 437, 457
 Old Buckenham hoard 437, 457
 Oraste hoard 396
 Ormskirk hoard 427
 Ostia hoard 208–9, 267, 303, 319
 Otricoli hoard 210, 240, 319, 323, 387,
 396
 Overly Hill hoard 209, 240, 319
 Pasul Vúlcanului hoard 240, 264, 396
 Patras hoard 210, 240, 264, 387, 396
 Patras hoard of aurei 388, 438
 Poiana hoard 323, 396
 Pompeii 1899 hoard 323
 Pompeii 1911 hoard 449
 Pompeii 1959 hoard 209, 457
 Pontevedra hoard 396
 Prestwood A hoard 152
 Puriceni hoard 240, 264
 Qumran hoard 548–9
 Rachelu hoard 227
 Reka Devnia hoard 98, 241–2, 248, 255–6,
 263–4, 303, 319
 Rheingönheim hoard 209, 220, 240, 256,
 264, 267, 303, 306, 319, 457–8
 Rome hoard 209, 240, 319, 323
 Saint-Georges-sur-Loire hoard 388, 438
 Saint-Igeaux hoard 174
 Saint-Priest hoard 160
 Salamis hoard 500
 Saumur hoard 160
 Scole hoard 227, 388, 448
 Selby hoard 227, 448–9
 Shapwick Villa hoard xxvii, 149, 152, 161,
 217, 241–2, 256, 264, 303, 319
 Shenstone hoard 163, 209, 240, 319, 323,
 388, 457–8
 Shillington hoard 437, 457
 Side hoard 467
 Silchester hoard 264, 319
 Skellow hoard 152, 163, 181, 217, 240, 256,
 264, 319, 323, 387–8, 396, 457–8
 Stein hoard 209, 319
 Suffolk hoard 174
 Sutton hoard 174, 436–7, 457–8
 Szombathely-Hereny hoard 388, 438
 Tartus hoard 548
 Tulcea hoard 240, 323
 Verulamium hoard 396
 Volubilis hoard 396
 Vyskovce hoard 68, 264
 Warmington hoard 174, 193, 227, 436–7,
 448, 457–8
 West Sicily A hoard 437, 457
 West Sicily B hoard 437, 457

- individual hoards (cont.)*
 Woodham Mortimer hoard 152–3, 173–4,
 181, 183, 448
 York hoard 209, 240, 303, 319
 Zemun hoard 383, 409
 Hoefler, Jean Chrétien Ferdinand 64–5
 Hollstein, W. 103, 178
 Hopkins, Keith 36, 77, 82, 158
 horseman, coin type of Galba 269–72, 277,
 285, 314
 Howgego, Christopher xxvii, xxix, 6–7, 9, 11,
 22, 25, 30, 40, 82, 87, 232, 497, 552, 554,
 611, 626
 Hultsch, Friedrich Otto 67–9, 93, 193, 202–3,
 206, 610, 668–70
 Hungary, hoards from 388, 438, 448
 Hussey, Robert 58, 62, 202
- Illyricum, mint in 299–300
 imperial coinage 3, 7, 46, 157, 160, 270, 465,
 609, 611, 659
 in base metal 6, 14, 24, 67, 69, 77, 88, 150,
 193, 227, 229, 230, 232, 257, 282, 288–9,
 295, 355, 403, 442, 449, 452, 688–9
 relationship to provincial coinage xxiii, 7, 9,
 11, 18, 20–1, 25, 54, 229, 230, 235–7, 365,
 368–9, 370–3, 444–5, 450, 463, 465, 470,
 472, 475, 487, 490–3, 495–8, 502, 509–11,
 513–15, 519–21, 523, 525–6, 536–9,
 548–9, 556–7, 566, 570, 576, 583, 585,
 589–90, 594, 597, 599–600, 604–5,
 610–12, 614–16, 618, 623, 627, 630,
 643–6, 649, 652, 659, 663–4, 666–7,
 669–74, 676, 678–85, 691, 696–9
 stability of 4, 7, 18, 22–3, 25, 26, 44, 45,
 46–8, 52, 157, 200, 238, 432, 659, 694,
 700
 imperial cult 498
 imperial provinces 442
 tax revenues from 231
 India
 export of coins to 74, 226, 397, 430, 448,
 688
 finds from 51, 184, 226, 397, 448
 source of metal 177, 187, 199
 trade with 34, 226, 688
see also lead; ore sources; silver
 inflation 12–13, 40, 42–3, 71, 76, 385
 ingots 666
 of lead 430
 of silver 32–3, 36, 96, 430
 inverse segregation 108; *see also* dendritic
 Iran 35
 source of silver 372, 376, 497, 504, 512, 528,
 685
see also bullion; Nakhlak; ore sources; silver
 iron
 cast 162
 in Mark Antony denarii 162
 trace element 4, 104, 112, 123–4, 415–17,
 533–4
 Iron Age 225
 irregular issues 241, 267, 279–81, 286, 295,
 306, 355, 404–5, 415, 520, 607, 622, 655;
see also cistophorus, plated; denarius,
 plated; forgeries
 Isodorus 668–9
 Israel Antiquities Authority xxvii, 111, 153, 572
 Italy 66, 97, 157, 173, 184, 190, 209–10, 230,
 236–7, 249, 254, 432, 439–40, 442, 445–7,
 488, 688
 hoards from 97, 184, 208–9, 240, 263–4,
 323, 432, 437–8, 447, 457, 687
 IVDAEA denarius type 333, 335, 497
 ivory 177
- Jerusalem 27, 47, 548
 Jewish war 549, 578, 679
 Jobert, Louis 54, 60–2
 Jones, Arnold H. M. 11–12, 32, 34, 39, 75–6, 82
 Jones, Brian W. 351, 379–80, 384–5, 394–5
 Jones, G. D. B. 321
 Josephus 27, 47, 679
 Juba I, king of Mauretania, coinage of 174
 Judaea 578
 as coin type 333, 335, 364, 374
 location of mint for aurei 364, 370
 Judaea capta coinage 364, 576, 587
 Julia, daughter of Titus
 aureus of 359
 cistophori of 359, 475
 denarius of 354, 358–60, 363
 Julia Domna, empress
 countermark of 497
 radiate of 61
 Julian, emperor 29
 Julian year of Antioch 498, 542, 545, 562, 572,
 576, 578, 584
 Julio-Claudian dynasty xxv, 56, 197, 392, 434,
 523, 538, 546, 614, 685
 coinage of 15, 57, 59, 97, 99, 152, 157–238,
 323, 395–7, 405, 434–51, 455, 458, 485,
 490, 506, 508–20, 526, 534–6, 540, 546,
 551–71, 604, 614–46, 658–63, 671, 675,
 683, 687–700
 Julius Caesar 27, 159, 434, 689

- aureus of 23, 66, 93–5, 160, 234, 237, 388, 434–5, 438, 687, 698
 coinage of 24, 93, 160, 383, 434, 439, 444, 687
 creates imperial monetary system xxv, 236, 434–5, 444, 687, 689–90, 692
 denarius of 93, 158, 160, 434, 436, 438, 687
 weight standards under 158, 169, 198, 434, 438, 687
 Julius Pollux 674–5
 Jupiter, as coin type 212–13, 289, 309, 310–11, 314
 Jupiter Vindex 212
 Justinian, emperor 57
- keration* 668
 Keynes, John Maynard 229
 Khalkidiki 167, 493, 546
 Klapproth, Martin Heinrich 63
 Kraay, Colin 303–5, 572, 576
 Kunisz, Andrei 229–30, 234
- Laodicea (Phrygia), cistophori of 466
 Laodicea (Syria) 586
 tetradrachms of 540, 547, 553
 laser ablation *see* analysis
 Latin Monetary Union 66
 leaching of copper 111, 133
 effect on global silver content of coin 80, 84, 149–50, 163, 360, 362, 367–8, 383, 422, 572, 580, 597, 619, 665
 effect on weight of coin 90–2, 219–20, 252, 259, 326, 328, 365, 419, 436, 463, 572, 574, 587, 616–17, 638, 665, 671, 695–6
- lead
 associated with silver 100–2, 222
 British 315
 debasement with 60
 Gallic 430
 Indian 199
 minor component 4, 12, 17, 33, 36, 102, 104–5, 112, 123–4, 126, 167–8, 179, 192, 196, 220–4, 323, 331, 357–9, 360, 363, 368–9, 375, 405–6, 429–30, 446, 481, 485, 516–17, 556, 560–1, 566–7, 592, 594, 645–6, 653
 Sardinian 429–30
 sources of 177
 Spanish 602–3
 used in refining 4, 36, 102, 159–60, 168, 177–9, 220–3, 266, 287, 322, 359, 360, 405–6, 429, 446, 497, 516, 546, 566, 653
 lead isotope analysis *see* analysis
- legal tender laws 9, 50, 663
 legionary denarii of Mark Antony *see under* denarius
 legionary eagle between standards, as coin type 213, 219
 Letronne, Jean-Antoine 26, 59–60, 62–3, 93, 202, 377, 378, 424
 Leverhulme Trust xxviii
lex metallis dicta 32
 Leyden Papyrus X 51, 228
 Libertas, as coin type 529
 Liguria 250
 limiting production, as alternative to debasement 234, 439, 689, 699
 liquidity crisis of AD 33 *see* credit crisis
 litharge 177
 lituus, as diagnostic mark on coins 180–1, 621
 Livius Drusus, tribune 219
 Livy 668
 Lo Cascio, Elio 209–10, 226, 230–1
 loans 12, 330
 Louis XIV, king of France, revaluation under 16
 Lucius Verus, emperor
 aureus of 65
 provincial coinage of 519
 Lugdunum 269, 304
 besieged by Vindex 239, 278, 301–2
 coinage of 20, 24, 97, 99, 163, 168–9, 173, 175, 177, 180–2, 184, 187–8, 199, 208, 211, 226, 232, 279, 288–90, 292–5, 301, 304, 306, 308, 314–15, 323, 339, 343, 373, 428–30, 443, 448, 455–6, 458, 487, 493, 511, 534, 536, 556–7, 614, 620, 623, 659–60, 688–9
 mint of 175, 179, 182, 196, 223, 232–3, 235, 269, 271, 278, 281–2, 285, 288, 297–8, 314, 316, 430, 440–2, 446, 452, 487, 660, 681, 688–9, 691
 rarity of denarii in Italy 184, 190, 208–10, 440, 688, 691
 Lusitania 270
 Lycia, coinage of 406, 479, 490–6, 502, 531, 669, 671, 673, 676, 680, 683–4, 686, 695, 698
 circulation alongside denarii 493, 495, 673, 698
 circulation of 492–3
 fineness 492–5, 695, 698
 history of 491–2, 494
 of Augustus 491–2
 of Claudius 491–2
 of Domitian 406, 479, 492–3, 495, 497, 535, 671, 676, 683, 686, 698

- Lycia, coinage of (*cont.*)
 of Nerva 492–3, 671, 698
 of Trajan 492–6, 531, 671, 676, 684, 686, 698
 relationship to Caesarean coinage 525, 535, 669, 671, 676, 680, 684
 relationship to cistophorus 492–6, 525, 535, 671, 676, 683–4, 686
 relationship to Cypriot coins 686
 relationship to denarius 492–3, 495–6, 669, 673, 683–4, 698
 relationship to Egyptian coinage 671, 676
 relationship to Pontic coinage 492, 676, 680
 relationship to Syrian coinage 671, 676
 Rome-style coinage 492–5, 531, 673, 683–4
 weight standards 492–3, 495, 669, 671, 673, 698
see also drachm, Lycian
- Lysimachus, king of Thrace, as coin type 520
- Mac Dowall, David 133, 203–4, 208, 211–13, 219, 226, 230, 232, 397, 438–9, 442–3, 445, 448
- Macedonia 157
 ore sources 493, 546
 silver from 167, 406, 479, 493, 687
see also Khalkidiki
- Macrinus, emperor, coinage of 14, 569
- Maggiore, Sardinia 430
- Manchester, University Museum xxvii, 111, 149, 307–8, 360, 383, 398, 403, 415, 423
- manganese, trace element 4, 104, 112, 247
- Manius Cordius Rufus, denarius of 158
- Manlius, A., coinage of 160
- Marcus Aurelius, emperor
 character 11
 countermark of 497
 denarius of xxiv, 10–11, 15, 64–5, 69, 71, 74, 76
 provincial coinage of 519–20, 626
 reforms all phantoms 17
- Mark Antony 162, 167, 226, 323, 341
 cistophori of 164–6, 199, 466–7, 486, 489, 667, 678, 697
 fineness of denarius under 167, 198–9
 weight standards under 167, 198, 667
see also denarius, Mark Antony legionary
- Martin, Peter-Hugo 302–3, 305, 309, 311–13
- Massif Central, France 177–8, 181, 187, 199, 225, 263, 265, 268, 305, 311–13, 315–18, 322, 376, 406, 430, 440, 602, 688
- Mattingly, Harold 70, 175, 182, 188, 229, 232, 257, 269, 275, 277, 278, 281, 287, 301, 304, 309, 331, 378, 381, 426, 442
- McAlee, Richard 542–3, 553, 572, 576, 581, 585, 590, 596, 599
- McKerrell, H. 102
- medals, as term for coins 53
- medieval European coinage 29, 39, 43–6, 98, 516
 debasement of 10, 13, 16, 37, 39, 41, 516
 stability 25, 27
- Melkart, as coin type 546, 548, 599, 602
- melting of coin 49, 51, 74, 177
- Melville-Jones, John R. 465, 670, 674–5
- merchants 13, 28, 660
- Merrington, Ralph 465, 468–9
- Meshorer, Yaakov 548
- Messalina, as coin type 621
- metal supply *see* supply of metals
- metallism 6, 13, 16, 49, 235, 384
- metallography 88–9, 96, 130–47, 149–50, 393, 423
- metals, origin of according to ancients 31
- Metcalf, William E. 187, 228, 248, 364, 486, 519–21, 524, 528, 536, 538, 626
- metrology *see* weight standards
- Mickwitz, Gunnar 70–1, 203, 425
- microscope, metallurgical 130
- microstructure 106, 109, 130, 132–4, 137–8, 142, 145
- military class denarii of civil wars 289, 296, 302–3, 308–12, 314–15
- military pay *see* army pay
- Milne, J. G. 91, 608, 611–12, 615, 617, 622, 626, 634, 646
- mines 4, 6–7, 12, 18, 30–4, 82, 177, 317, 453, 695
 closure 31
 copper 32
 contractors 31–3
 decline in output 33
 gold 32
 lead 32
 output 76, 82
 ownership 30–4
 restriction of output 27, 28, 31
 silver 32, 453
see also Britain; Cabo de Gata; Gaul; Massif Central; ore sources; Rio Tinto; Sierra de Gador; Sierra Demanda; Sierra Morena; Siphnos; Spain
- mintmarks 563
- mints
 auxiliary 179–82, 186, 688
 capacity 536

- competition between 28
 contractors 35
 control of 19, 25, 611, 660, 681–2
 fee for production (minting fee) 75, 516
 medieval 85, 88, 95, 516
 misconduct 41–2, 368
 mobile 167
 organisation of 349, 479, 489, 493, 516, 567
 output of 22, 24, 82, 157–8, 173–5, 184, 189, 190, 193, 200, 208–9, 223, 229, 230, 237–8, 240–2, 256, 262, 321, 326, 333–4, 336, 342, 350, 353, 360, 378, 389, 392–5, 407, 412, 439–42, 444–5, 448, 454–6, 458, 519, 536, 538, 540–1, 562, 577–8, 582, 584, 610, 615, 625–6, 631–4, 638–9, 642–3, 646, 660, 662, 689, 692, 699–700
 personnel 35, 489, 534–5, 569, 576, 682, 684, 689
 price for raw materials (mint price) 75, 392–3, 439, 441, 547, 665–6
 process of production at 82, 84–5, 87–8, 90, 95–6, 222, 349, 359, 368, 393, 405, 479, 566–7, 624–5, 652–3, 660, 666, 688, 691, 698
 quality control 17, 19, 321, 335, 342, 385, 405, 453, 681, 688
 supply of metals 29–38, 46, 76–7, 82, 247, 337, 360, 368, 393, 398, 406–7, 415, 428, 439–41, 446–7, 454–5, 476, 479, 487–8, 493, 502, 504, 516, 527, 531–7, 557, 561, 567, 575, 589, 611–12, 624–5, 629–30, 652–3, 660–1, 665–6, 681–6, 689, 693, 698
 technology 18, 78–9, 84–5, 87–8, 89, 95–6, 222–3, 359, 393
 wastage at 95–6, 666
see also centralised minting *and entries for individual mints*
- mixing lines 177–8, 226, 265
 mixing of coin, to disguise debasement 51
Mna 673–5
 Attic 675
 definition of 673
 Italian 675
 models
 of Bolin 75, 449
 ‘primitivist’ 75, 76–7, 81
 Moesia 248
 Mommsen, Theodor 64–70, 75, 93, 161, 202, 206, 229, 235, 378, 424–5, 610, 690
 monetary adjustment 385, 425, 432–3, 435–8, 443, 458
 monetary debasement 7, 41, 43–6, 66, 68, 71–2, 236, 392, 418, 433, 443, 446, 458, 690, 694, 700
 monetary instability 71, 700
 monetary policy 384–6, 607
 role of emperor 19
 role of emperor’s financial secretary 19, 385
 monetisation 40, 76, 449, 607
 money
 ancient coinage as 53, 55, 70
 as instrument of the state 9, 25, 76–7
 as means of payment 9, 14, 41, 76–7, 160, 660
 as medium of exchange 9, 25, 26, 76–7, 688
 as store of wealth 74
 coins only form of 76, 81
 credit money 81
 demand for 14, 41, 49, 52, 449
 function 9, 14, 25–6, 41, 44, 46, 48, 74, 76–7
 medieval 77
 of account 44, 46, 48–9, 608
 quality 13–14
 quantity 13–14, 26, 82
 science of 53
 sophistication 81
 supply of 6, 13–14, 27–8, 41, 43–4, 81–2, 160, 407, 607, 694
 monometallism 66, 435, 445, 690
 morals
 in ancient economic thought 8
 of emperors 10–11, 19
 Morgan, R. Gwyn 248–50, 254, 269
 Mount Argaeus, as coin type 511, 516–19, 528
 Mucianus 10
 Museum of London xxvii, 149
 Museum of Somerset *see* Somerset Museums
- Nabataeans, coinage of 84
 Nakhlak, Iran 497, 528
 Naples 93
 Narbo 269, 304
 mint of 269, 278–81, 282, 285–6, 291, 316
 reattribution of certain coins to Spanish mint(s) 279–80, 285–6, 314–15
 nard 177
 Nasamones 380
 natural erosion of standards 37, 41–3, 98, 173, 190, 199, 234, 237, 388, 392, 436–9, 485–6, 679, 687–9, 699
 Naville, Lucien 93–6, 158, 206
 Neptune, as coin type 374
 NERC Isotope Geochemistry Laboratory (NIGL) xxviii, 112, 127

- Nero, emperor xxiii, xxv, 15, 40, 48, 57, 65,
 167, 177, 189, 190, 201–38, 245, 263, 269,
 271, 302, 330–1, 433, 442, 447, 459, 506,
 547, 553, 590, 605, 609–10, 615, 623, 677
 as point of change 57–9, 64–70, 201–38, 377,
 441–7, 553, 605, 626–7, 633, 642, 659,
 662, 675, 678–9, 689–92, 697–9
 attempts to abolish indirect taxes 231
 aureus of 10, 20, 56, 58–9, 65, 71, 76, 93–5,
 193, 195, 201–2, 204–7, 211–12, 219, 226,
 228, 230, 232, 235, 237, 243, 252, 284, 294,
 303, 313, 328, 377, 383, 385, 394, 420,
 423, 432, 442–7, 454, 457, 690, 692–3
 Caesarea, Cappadocia, coinage of 500,
 505–7, 509–11, 514–19, 521, 523, 535,
 537–8, 568–70, 671, 676, 680, 696–7
 changes to state finances 231, 235–6
corona civica denarii 168, 179, 192–3, 195–8,
 220–4, 234, 441–2
 date of reforms 211, 232–3, 442–3, 546, 690
 denarius of xxv, 10, 20, 56–9, 63–5, 67–8, 71,
 73, 76, 93–5, 173, 179, 201–38, 242–3,
 247, 258, 264, 324, 328, 335, 405, 415,
 442–7, 470, 491, 551, 566, 570, 630, 659,
 689–92
 Egyptian coinage of 580, 589, 608–10, 613,
 615, 622–3, 625–47, 649–54, 658–64, 671,
 673, 676, 680, 683, 697
 extent of debasement 215–20, 690
 extravagance 10, 201, 230
 figurative denarii 193–8, 221–3, 225, 232,
 234, 441
 financial difficulties 15, 71, 201, 211, 230–1,
 233–4, 237, 330, 442–3, 446, 627, 642–3,
 690, 700
 fineness of denarius under 195–7, 213–19,
 441–4, 450, 454, 690
 First Standard 162, 204, 216, 217–19, 228,
 235–36, 246, 251, 261, 264, 297, 318,
 320–1, 330, 381, 389, 392, 408, 419,
 422–3, 431–3, 443–4, 451, 453, 456,
 458–9, 470, 493, 495, 498, 539, 551, 566,
 570, 677, 680, 690–5, 699
 gives grants to public treasury (*aerarium*)
 231, 446
 Golden House of 249
 interest in state finances 231, 235–6, 237
 interpretation of improvement 228–9
 interpretations of debasement 226, 229–38,
 442, 679–80, 690–2, 699
 Laodicea tetradrachms 540
 mint at Lugdunum 24, 201, 223, 442–3,
 688–9
 orders tax regulations to be published 231
 output under 173–5, 193, 208–9, 223, 229,
 230, 232, 234, 236, 237–9, 240–2, 262,
 392, 439, 444, 562, 625–6, 631–4, 638–9,
 642–3, 662, 697
 phases of coinage 212–13, 625–6, 697
 Pontic coinage of 490–1, 515, 671, 673, 676,
 680
 portrait types 211, 246, 467, 562–3, 633–5,
 638
 post-reform coinage 94, 152, 168, 196,
 201–38, 239, 240, 242–3, 246, 251–2, 258,
 261, 263, 265–6, 268, 293–4, 297–9,
 322–3, 380–1, 383–4, 388, 410, 440–52,
 481, 490–2, 510, 519, 551, 602, 615, 643,
 645–6, 652, 659, 661, 669–73, 677–80,
 683, 690–3
 pre-reform coinage 58, 94, 173–5, 179, 181,
 188, 191, 192–200, 202–3, 210–11, 222,
 224–8, 232–4, 293, 377, 394, 439, 440–2,
 445, 448–9, 451, 470, 548, 566, 645, 689,
 693
 profits from debasement 15, 237, 444–5,
 451
 provincial coinage of 65, 229–30, 237,
 444–5, 450, 490–1, 553, 581, 605, 671,
 675–6, 679, 697, 699
 reform of base metal coinage 230, 442
 reform of c. AD 64 xxiv, 3, 7–8, 11, 17,
 19–20, 49, 52, 76, 95, 157, 162, 168, 173,
 179–80, 190, 197–8, 201, 211, 383–5,
 388–9, 393, 407, 423, 427, 430, 432, 434,
 440–7, 454, 458, 460, 472, 487, 538–9,
 546, 551, 566, 627, 630, 643, 661, 675,
 678–80, 690–2, 694, 696, 698–9
 reform of c. AD 68 17, 216, 219–20, 228,
 231, 450–2, 566, 649, 692
 reforms as monetary adjustments 236–7,
 392, 446, 458, 690
 removes Ptolemaic coinage 643–6, 659
 restores coinage 204, 216, 219–20, 228–9,
 235, 377, 432–3, 450–2, 642–3, 692, 697
 revised standard 133, 204, 216, 219–20, 228,
 233–4, 236–8, 245–6, 251, 261, 263–4,
 270, 297, 318, 320, 380–1, 390–1, 393–4,
 397, 403, 405, 407, 409, 418, 422, 431–3,
 444–5, 450–1, 454–60, 482, 491, 551, 566,
 594, 597, 604, 676–7, 680–1, 692–3
 significance of reforms 20, 71–2, 226–9,
 235–8, 384–5, 442–7, 450, 679–80, 690–2,
 694, 696–7, 699
 significance of weight standards 234–6,
 443–5, 673, 679, 690–1

- supporters at Lugdunum 304
 Syrian coinage of 517, 547–9, 551–3, 555, 558–72, 574, 576–8, 580, 583–4, 588, 591, 603–5, 626, 634–5, 649, 671, 676, 680, 682–3, 697
 transfer of minting from Lugdunum to Rome 175, 201, 211, 223, 232, 442, 446, 689
 transitional phase 215–17, 233, 235–6, 263–4, 443, 690
 titles of 211–13, 232, 442, 445, 467, 514–15
 visits Greece 635
 weight reductions 168, 193–5, 198, 201–3, 215, 227–30, 233, 237, 443, 690, 699
 weight standards under 203–8, 218–19, 221, 235–6, 238, 250–1, 258–9, 283, 293, 328, 383–4, 443, 450–2, 470, 472, 490, 510–11, 516, 518–19, 538, 560–1, 563–4, 569, 603, 620, 630–2, 642, 649–50, 669, 671, 673, 678–9, 690–2, 696
see also debasement
 Nero, as coin type 212
 Nero and empress, as coin type 212
 Nero Claudius Drusus 189
 Nerva, emperor 11, 389, 409, 411, 426, 595
 aureus of 409, 411, 426, 454, 460
 chronology of issues 411–12
 Caesarea, Cappadocia, coinage of 506–7, 519–20, 528–38, 671, 676
 cistophori of 466, 474, 479–82, 486–9, 671, 676, 684
 debasement 415
 denarius of 71, 73–4, 98, 320, 326, 396, 409–18, 428, 429–30, 457–9, 481–2, 484–5, 495–6, 529, 596–7, 602, 684
 Egyptian coinage of 597–8, 611, 656–8, 664, 671, 676
 finances 379, 395, 409, 431
 fineness of denarius under 391, 408–9, 414–16, 418, 423, 457
 Lycian coinage of 492–3, 671, 698
 output under 412
 removes Julio-Claudian denarii 397, 430
 Syrian coinage of 552, 555, 593–9, 602–4, 656, 663, 671, 676, 681, 684, 697
 titles of 412, 528, 596
 weight standards under 409–11, 418–19, 457, 480, 594, 596–7, 603, 671
 neutron activation *see* analysis, activation
 nickel, trace element 4, 102, 104–5, 112, 181, 225, 362–3, 417, 533–4, 546, 551, 566, 568, 602, 624–6, 628–9, 652–3, 655–7
 Nike *see* Victory
 Nilus, as coin type 633
 nominalism 6
 non-destructive analysis *see* analysis
 Norwich Castle Museum xxvii, 149, 151
 Novo Brdo 33
 numismatics
 historical approach 53
 philological approach 54–6, 201–2
 nummus, as term for sestertius 27, 47
 ‘O’ mint denarii 364, 367–70, 453
 identification of mint with Ephesus 367, 369, 453
 obol 608, 610
 Octavia, as coin type 633
 Oddone, M. 642
 Ohio State University 79
 Olçay, Nekriman, 465, 468–9
 Ondrouch, Vojtek 68
 ore sources 31, 166–7, 177–9, 224–6, 440, 533, 546
 Anatolian 376, 497, 504, 512, 528, 534–5, 546, 589, 685–6
 Gallic 177, 179, 199, 225, 265, 268, 272, 285, 287, 296, 305, 308, 310–11, 313–18, 375–6, 430, 440, 602, 695
 Greek 167, 493, 504, 546
 Indian 177, 187, 199
 Iranian 372, 376, 497, 504, 512, 528, 685
 Macedonian 493, 546
 mixed 88, 95, 296, 504, 589
 Sardinian 178, 429
 Spanish 177–9, 199, 225, 265, 268, 271–2, 276, 285–6, 289, 296, 300, 310, 313–18, 440, 602, 688
 see also bullion; gold; Khalkidiki; silver
 ores 100, 168, 176, 222–3, 225–6, 315–16, 322–3, 352
 argentiferous copper 100, 102
 argentiferous lead 100, 101, 179, 429, 440
 argentite 100
 cerargyrite 100
 cerussite 100
 dry 100, 102, 176, 181, 192, 225, 352, 405, 406, 525–6, 534, 536
 galena 100, 177, 179, 197, 225, 315, 405, 612
 jarosite 100, 102, 176–8, 196, 199, 322
 oxidised 102, 175, 196
 pyrite 32, 100
 Orosius 409
 Otacilia Severa, empress, coinage of 64

- Otho, emperor 10, 47, 62, 239, 242, 254–5, 263, 270, 296–7, 309
 aureus of 59, 248, 252–3, 259, 261, 328, 451, 454
 celebrates victory 248
 chronology of issues 247–50
 countermarks of 581
 denarius of 135–7, 226, 237, 245–54, 258, 263–6, 303, 318, 326, 451, 692
 Egyptian coinage of 638, 646–9, 651–3, 658, 662–3, 671, 676
 fineness of denarius under 246, 252–4, 394, 403, 419, 451, 454, 692
 output under 208, 237, 239–41, 248–9, 261–2, 412, 572, 646, 692
 portrait types 246, 255
 reform of denarius 10, 17, 228, 246–7, 251, 261, 318, 326, 330, 433, 451, 453, 649, 692
 reuses dies of Galba 246
 reverse types 245–6
 Syrian coinage of 552, 555, 572–6, 581–4, 589, 603–4, 662, 671, 676
 titles of 245–6, 248, 249
 weight standards 250–2, 573–4, 603, 647, 671
- Ottoman empire 39
 coinage of 13, 39, 44
 minting 33
- ounce, Roman 55, 57, 202, 217, 219, 236, 668–71, 673, 675, 677–8
- ounkia *see* ounce
- output of coin *see* aureus; denarius; mints; *and entries under individual rulers*
- overstriking 290, 467, 473, 486
- overvaluation 13, 15, 20, 43, 229
 calculation of 486–7
 of gold coinage 66, 234
 of silver coinage 9, 40, 49, 66, 74–5, 157, 229, 235, 444–5, 449, 451, 453, 459, 470, 472–5, 481, 483, 485–7, 491, 502, 506, 511, 513, 519, 523, 537–9, 546, 556–7, 566, 570, 590, 597, 614, 618–19, 623, 643, 660, 663–4, 677, 679–80, 686, 690, 696, 699
see also fiduciary money
- oxidation 101; *see also* cupellation
- palm branch, as symbol 289
- Panvini Rosati, Francesco 93
- Paphos 497–8
- Parks, Danielle 497–9
- Parthian empire, as source of metals 376
- Patin, Charles 9, 53, 56, 60, 301
- Pauton, Alexis-Jean-Pierre 26, 57–8, 424
- payment *see* money
- penny of England 43–4
- Pergamum 467
 cistophori of 466
 mint of 466
- Pernicka, E 102
- Pertinax, emperor
 denarius of 11, 14, 65
 reform a phantom 17
- phase diagram 106
- Philip I, emperor, coinage of 64
- Philip Philadelphus, Seleucid king
 coinage of 540–2, 544–6, 552, 557–8, 686
see also Posthumous Philip tetradrachms
- Philo of Alexandria 28
- philologists and coinage 54–6
- Phoenician standard 540, 607
- Photius 670
- Picon, Maurice 77–80
- Pinkerton, John 59–60, 62, 162, 202
- Pisonian conspiracy 212
- Pliny the Elder 9, 31–2, 34–5, 51, 57, 64, 78, 95, 162, 177, 199, 219, 226, 228, 231, 304, 305
 concerning Nero's coinage 54, 56–7, 59, 94, 201–3, 207, 230
- Pliny the Younger 395, 409
- Plutarch 47, 250, 270–1, 295
- Polemo II of Pontus
 coinage of 490–1
see also Pontus
- Polybius 668
- Pompeian era 545
- Pompeii 208–10, 449
- Pompey 159, 547
 coinage of 160
- Pontus
 circulation of coinage 490–1
 coinage of 490–1, 515, 671, 673, 676, 680
 fineness of coinage 491
 overvaluation of drachm 491
 relationship of drachm to denarius 490–1, 673
 relationship of drachm to other provincial coinages 671, 676, 680
 weight standard of drachm 490, 671, 673, 680
see also drachm, Pontic
- Poppaea, as coin type 633–6, 638, 642
- Porto, Leonardo da 53
- Portugal, hoards from 323, 396

- Posthumous Philip tetradrachms 540–6,
 551–5, 557–8, 560–1, 667, 672, 686
 fineness 544–5, 550, 555, 580, 603–4,
 678
 overvaluation 545–6
 types 542
 weight standards 542–3, 597, 603–4, 667,
 678
- Postumus, emperor
 coinage of 57, 61, 63
- pound, Roman 5, 55, 57–9, 66, 93–6, 157–9,
 163, 169, 203, 206–8, 218, 236, 420, 423,
 434, 438, 443, 668–73, 687
 attempts to determine 157–9, 206–8
- Praetorian Guard 61–2, 249, 309
- praetors, given authority over the *aerarium*
 231
- prices 13, 40, 63, 71, 385, 407, 606, 700
- Principal Components *see* analysis
- Priscian 47
- Probus, emperor, 67
 coinage of 64, 608
- production costs 14–15, 46, 48, 237, 393, 408,
 425, 439, 441, 456, 516, 662, 665–6, 679,
 689, 694, 699–700
- propaganda 190
- proton activation *see* analysis, activation
- provincial coinage xxv, 3–4, 7–9, 17, 21, 24, 51,
 61, 149, 164, 331, 364–5, 376, 444–5,
 463–86, 695–8
 authority 25, 30, 527–8, 536–7, 547–8, 660,
 681–2, 686, 698
 Caracalla and 12
 civic coinage 365, 367, 467, 540, 547, 554,
 568, 581, 587, 606, 675, 681
 denominations 3, 24, 666–80
 enforcement of value 9, 663
 fineness 164–5, 463, 466, 470–3, 475, 480,
 483, 486–7, 489, 491–6, 506–8, 511,
 513–16, 518–19, 523, 525, 529–30, 537–8,
 540, 542, 544–5, 550, 554–7, 559, 561,
 566, 570, 574, 580, 583, 585–6, 588, 590,
 593–4, 597, 599, 602–4, 607–9, 613–15,
 618–19, 622, 626–7, 633, 641–2, 648, 651,
 654, 656, 658–60, 672, 675, 677, 679, 695,
 698
 loss of public confidence in 12
 Nero and 20, 65, 229, 230, 235–6, 237,
 444–5, 450, 490–1, 537–9, 553, 581, 605,
 671, 675, 676, 679, 697, 699
 output 463, 490, 519, 538, 540–1, 562, 572,
 577–8, 582, 584, 610, 615, 625–6, 631–4,
 642–3, 646, 660, 662, 697
 relationship of provincial coinages to each
 other 463, 490–8, 502–4, 511, 514, 517,
 525–6, 531, 535–6, 547–9, 551–2, 557,
 568–71, 576, 578, 580, 585, 589–95,
 597–8, 604–5, 609–11, 623, 626, 649,
 655–7, 660–3, 665–86
 relationship to imperial coinage xxiii, 7, 9,
 11, 18, 20–1, 25, 54, 229, 230, 235–7, 365,
 368–9, 370–3, 444–5, 450, 463, 465, 470,
 472, 475, 487, 490–3, 495–8, 502, 509–11,
 513–15, 519–21, 523, 525–6, 536–9,
 548–9, 556–7, 566, 570, 576, 583, 585,
 589–90, 594, 597, 599–600, 604–5,
 610–12, 614–16, 618, 623, 627, 630,
 643–6, 649, 652, 659, 663–4, 666–7,
 669–74, 676, 678–85, 691, 696–9
 weight standards 463, 465, 467–75, 480,
 482–3, 485–7, 490, 492–3, 495–6,
 498–501, 492, 508–15, 518–19, 523–4,
 530, 538, 542–3, 549, 554–5, 557, 559–60,
 563–4, 569–74, 577, 579–88, 590–1, 594,
 596–604, 606–7, 609, 614, 616–17, 620–1,
 627, 630–2, 635–8, 647–50, 654–61, 667,
 669–74, 678–80, 691, 696, 698
see also Asia Minor; Attic drachm; Caesarea;
 cistophorus; Cyprus; didrachm; drachm;
 Egypt; Lycia; Pontus; Syria; tetradrachm;
and entries under individual mints
- provincial imperial coinage 611
- Pseudo-Aristotle 19
- Ptolemaic dynasty
 coinage of xxv, 20, 607–9, 611–15, 619–20,
 624, 630, 634, 642–6, 658–9, 667, 669–70,
 672–3, 685, 695, 697
 debasement of coinage 507–8, 608, 613,
 644
 removal of coinage from circulation 608–9,
 615, 643–6, 659, 685, 697
- Ptolemaic standard 607, 642, 667, 669–70, 672
- Ptolemais (Syria), coinage of 607
- Ptolemy I 607
- Ptolemy II 644
- Ptolemy XII Auletes 608, 613, 644
- Pupienus, emperor, coinage of 61
- quadrans 24
- quadriga, as coin type 374
- quaestors, deprived of authority over *aerarium*
 231
- quantification of coinage output 5, 45, 98, 378,
 389, 562
- quarter dollars of Spain 49
- quarter drachm of Lycia 491

- quinarius
 of gold 23, 46, 182, 361, 384
 of silver 8, 11, 23, 46, 159, 279, 281–2, 361, 384, 492, 545
- radiate denomination 44, 55, 57–8, 61–2, 64–5, 67, 69, 71, 79
 relationship to aureus 67, 72
 relationship to denarius 62, 64, 67–8, 74
- Rathbone, Dominic 230–2, 236, 445, 606, 609
- ratio of gold to silver 23, 26–7, 40, 44, 63, 72, 76, 173, 190, 229, 234–5, 383, 388, 392, 394, 407, 420, 425, 434–5, 438–9, 441, 443–5, 451–6, 687, 689, 691–4
- reales* of Spain 49
- recall of coinage 66, 74–5, 99, 424–8, 431–2, 694, 699; *see also* withdrawal of coinage
- recycling xxv, 4–5, 12, 18, 28–9, 34–8, 42, 89, 95, 98–100, 103, 128, 159, 177, 179, 181, 199, 235–7, 247, 261, 263, 265, 268, 276–8, 282, 287, 290, 297, 305, 308, 311–13, 315–16, 318, 322, 324, 331, 336, 345, 352, 359, 405–7, 415, 417, 427–9, 432–3, 440, 446–7, 456, 459, 479, 485, 493, 495, 497, 502, 526, 533–6, 546, 551, 556–7, 560, 589, 592, 597, 602, 612, 615, 619–20, 623, 629–30, 634–5, 643–6, 653, 655, 657, 660, 666, 681, 685–7, 691, 694, 697–9
- of Augustan denarii 441, 612
- of Augustan Syrian tetradrachms 560
- of aurei 446, 690
- of cistophori 485, 488
- of Domitianic denarii 389, 415, 476, 525
- of Domitianic Syrian tetradrachms 592
- of Egyptian tetradrachms 612, 623, 629, 635
- of Flavian denarii 331, 417, 497, 528
- of Flavian tetradrachms 597
- of Hellenistic coins 546, 686
- of Lugdunum denarii 620, 623, 659–60, 683
- of Neronian denarii 247, 265, 336, 417, 646
- of Posthumous Philip tetradrachms 557, 560
- of pre-Neronian reform denarii 225–6, 235–6, 324, 331, 352, 397–8, 405, 428–32, 456, 459, 493, 525–7, 534–6, 620, 623, 683, 691–2, 694
- of provincial silver 479, 485, 488, 495, 502, 533, 535, 551–2, 556–7, 560, 578, 592, 597, 612, 615, 623
- of Ptolemaic coinage 608–9, 615, 619–20, 624, 630, 634, 643–6, 659, 661, 685, 697
- of Republican denarii 226, 236, 265, 302, 324, 331, 345, 424–5, 432, 440, 447, 456, 459, 535, 589, 630, 646, 661, 683–4, 687, 691, 697, 699
- of Seleucid tetradrachms 557
- of Tiberian Egyptian tetradrachms 615, 623, 635, 644, 660, 697
- of Trajanic denarii 428
- of Tyrian silver 551–2, 578
- of Vitellian denarii 336
- Reece, Richard 80, 641, 651
- refining 17, 33, 35, 89, 95, 101, 159, 168, 179, 196, 199, 220–4, 236, 266, 287, 317, 359–60, 405, 429–30, 446, 516, 546, 624, 653, 666, 691
- process 35–6, 95–6, 177–9, 222–3, 287, 317, 359, 405, 429–30, 546, 566, 624, 653, 688
- use of imported lead in 177–8, 322
see also mints, process of production at, *and* technology
- reform of coinage
 under Antoninus Pius 17
 under Augustus 434, 687
 under Claudius 169–72, 190–1, 193, 195, 199, 206, 228, 388, 438, 454, 470, 620
 under Domitian xxiv, 11–12, 14, 17–18, 52, 58–9, 65, 68–9, 72–3, 80, 262–3, 321–2, 351, 359, 377–408, 415, 431, 433, 450, 453–9, 460, 475, 594, 655, 663, 692, 694, 697, 692–4, 699
 under Julius Caesar xxv, 6, 23, 160, 434–5, 687
 under Nero xxiv, 3, 7–8, 11, 17, 19–20, 49, 52, 71–2, 76, 95, 157, 162, 168, 173, 179–80, 190, 197–8, 201, 211–13, 216, 219–20, 226–9, 231–3, 235–8, 383, 384–5, 388–9, 392–3, 407, 423, 427, 430, 432, 434, 440, 441–7, 450–2, 454, 458, 460, 472, 487, 538–9, 546, 551, 566, 625–7, 630, 643, 649, 661, 675, 678–80, 690–2, 694, 696–7, 698–9
 under Otho 10, 17, 228, 246–7, 251, 261, 318, 326, 330, 433, 451, 453, 649, 692
 under Trajan xxiv, 3, 7, 11, 15, 17, 19, 66, 68, 70, 72–3, 75, 240–1, 256, 264, 377, 387–9, 408, 418–19, 424–8, 430–3, 448, 458–60, 495, 600, 694, 697, 699
see also aureus; debasement; denarius; restoration of currency; *and entries under individual emperors*
- Regling, Kurt 70, 378

- regnal years 498, 562–7, 572, 578, 581–2, 584, 586, 590–1, 595–6, 598, 610–11, 613–15, 617, 619–20, 623, 625–9, 633–9, 641–3, 645–6, 649, 654, 657
- renewal of coinage 36, 98–9, 210, 662–3, 694, 697, 699
- rents 12, 230, 450
- Republican coinage 56, 62–4, 74, 83–4, 93, 96–7, 157–67, 168, 184, 190, 199, 202, 207, 209–10, 226–7, 234, 237, 301–2, 321, 323, 331, 345, 385, 387–9, 395–6, 425, 430, 434–7, 440, 448, 456, 459, 465, 508, 535, 548, 589, 610, 630, 646, 661, 667, 669, 671–2, 678, 683–4, 687, 691, 693–4, 697–9
- continued circulation of in imperial times 190, 209–10, 226–8, 234, 237, 321, 385, 387–9, 395–6, 408, 424–5, 430, 436–7, 448, 455, 508, 687, 691, 693
- removal from circulation 66, 70–1, 73–5, 227, 236, 302, 320, 321, 395–6, 424, 426, 459, 662, 694
- types 426
- weight standards of 158–9, 163–4, 169, 177, 179, 207, 388, 434, 604, 667, 669, 671–2, 678, 687, 698
- see also* as, Republican; denarius, Republican; quinarius; recycling; Victoriatus
- Research Laboratory for Archaeology and History of Art, Oxford 80–1, 123
- restoration of currency xxiv, 10, 12, 18, 39, 42, 45, 699–700
- under Carausius 14
- under Domitian 11–12, 14, 17–18, 52, 58–9, 65, 68–9, 72–3, 80, 262–3, 321, 351, 359, 377–408, 433, 450, 453–7, 594, 663, 692, 694, 697
- under Elagabalus 14
- under Macrinus 14
- under Marcus Aurelius 11
- under Nero 204, 216, 219–20, 228–9, 235, 377, 432–3, 450–2, 642–3, 692, 697
- under Pertinax 11, 14, 65
- revised Neronian Standard *see* denarius; fineness; Nero; standard of denarii
- Rhodian standard 492, 514, 539, 667, 674; *see also* Antiochene standard
- Rhoxolani 248
- Rio Tinto 34, 82, 177–8, 271–2, 276, 279, 289, 313, 321–2
- Roma, as coin type 193, 196, 212–13, 219, 602, 635, 649
- Roman drachm *see* drachm
- Romania *see* Dacia
- Rome 230, 269, 276, 295, 333–4, 395, 646, 688
- mint of 3, 24, 160, 175, 187–8, 193, 196–7, 201, 210–11, 226, 232–3, 235, 239–68, 279, 283, 287, 293, 296–7, 299–300, 318–20, 322–63, 377–433, 442, 445–6, 451–3, 470, 473, 475–9, 488, 495, 521, 524–8, 531, 533–7, 545, 589–90, 595–6, 599–600, 602, 611, 661, 666, 679–84, 686, 688–9, 691, 695, 698
- relocation of mint 359
- see also* centralised minting; imperial coinage
- Romé de l'Isle, Jean-Baptiste-Louis 26, 57–9, 63–4, 377–8, 424
- Rome-style provincial coinage 331, 473, 479, 497, 576, 682–3, 698
- of Asia 466, 473, 475, 479, 482, 485, 683–4
- of Caesarea in Cappadocia 331, 369, 398, 497, 519–21, 524–37, 682–4
- of Cyrenaica 531
- of Egypt 606
- of Lycia 406, 479, 492–5, 531, 683–4, 686
- of Syria 531, 599–604, 684
- of Tarsus 531
- Roumeli 33
- Royal Numismatic Society 123
- Sabatier, Justin 64–5
- Sabina, empress, denarius of 64
- Salamis 497–8
- Salus, as coin type 212–13, 219, 304
- Salutaris (C. Vibius) 47, 465
- sampling techniques 78–81, 83–7, 105–11, 128, 152, 514–15
- San Clemente, church of, Rome 35
- Santiponce 33
- Sardinia
- ore sources in 178, 429
- see also* lead; Maggiore
- Savio, Adriano 229, 296, 364, 634, 642
- Savot, Louis 54–61, 63, 202, 377
- SC as mark on imperial base metal coinage 193
- Scaliger, Joseph 54
- scanning electron microscopy 109, 134, 143, 149, 217, 423, 515
- sceptre as diagnostic mark on Tiberian denarii 182–3, 185
- Schiassi, Filippo 63–4
- Schmitt-Korte, Karl 84
- Schweizer, F. 81
- Scott, David 130
- scripulum 668–9

- segmented-array charge coupled device (SCD) 115–16, 118
- Seleucia Pieria, Syria 586
 coinage of 490, 547, 553, 570–1, 603, 671–2, 676
- Seleucid dynasty 547, 607
 coinage of xxv, 540–2, 544–6, 548, 557, 606–7, 667, 672, 691, 695
- Seleucus VI, Seleucid king, tetradrachm of 542
- Semis 24
- senate 231, 248, 255, 269, 271, 278, 296, 304, 314, 330, 333, 442
- senatorial provinces, tax revenues from 231
- Septimius Severus, emperor 48, 68
 as point of change 61, 63, 66, 69, 72–4
 debasement of AD 194 xxiv, 15, 65, 72–3, 76, 215, 240, 264
 denarius of xxiv, 15, 57, 69–70, 73, 76
 provincial coinage of 670
see also debasement
- Serapis, as coin type 634–6, 638
- Serez 33
sestertia 67
sestertius
 of brass 23–4, 46, 62, 150, 282, 403
 of silver 23, 545
 unit of account 46, 184, 231, 249–50, 330, 404, 447
- Severan dynasty 36, 40, 57, 59–60, 71, 467
 as point of change 60–2
 coinage of 152, 568, 697
- Severus Alexander, emperor 47
 coinage of 47, 57, 60–1, 63, 606
- Shapwick Hoard *see* hoards
- shekel 546
- ship, as coin type 635
- Sidon, tetradrachms of 540, 547, 607
- Sierra de Gador 272
- Sierra Demanda 178, 276
- Sierra Morena 313
- SIGNA P R types 304
- 'siliqua' 20
- silk 177
- silver
 Anatolian 376, 491, 497, 512, 528, 534, 589, 685–6
 as coating for copper coinage 60, 62
 as standard of value 66, 160, 237
 chloride precipitate 111
 Egyptian 606–7, 612, 643
 elemental versus bullion 17–18, 100, 217, 386, 507
 for coinage 3–4, 14–15, 25–6, 48, 50, 76, 83, 95–6, 100, 159, 160, 176–9, 190, 606, 610–12, 620, 681–6, 698
 for jewellery 51
 for plate 28, 51
 from mixed sources 88, 95, 178–9, 199, 272, 285, 296–8, 305, 308, 310, 312–13, 315, 318, 322, 406, 534, 589, 602
 Gallic 177, 179, 225, 265, 268, 270, 272, 275–8, 282, 285, 287, 296–8, 301, 305, 308, 310, 313–18, 324, 375–6, 430, 602, 620, 695
 Greek 167, 504, 612, 685–7
 Indian 199
 Iranian 372, 376, 497, 512, 528, 685
 market rate for 234–5, 439, 687
 minor component in alloy 267, 280, 286
 native 100, 406
 official rate for 234, 393, 439, 441
 old 181, 225, 287, 406
 price of 14–15, 26, 43–4, 48, 69, 237, 392–3, 406–8, 425, 439, 441, 444, 453, 455, 485, 607, 665–6, 679, 687, 689, 694–5, 698
 'pure' silver 17–18, 101, 142, 146, 167, 198–9, 201, 210, 215, 228, 237, 245, 268, 271, 276–7, 279, 296, 299, 318, 320–1, 351, 373, 379, 384, 390, 393, 407, 422, 432, 441, 444, 448, 451–2, 454, 460, 545, 550, 607, 675, 678–9, 688–9, 691–3, 695
 role in taxation 77, 445, 456, 691–2
 shortage of 643
 sources of 31, 166–7, 177–9, 222, 224–6, 428, 536, 546, 575, 589, 606, 620, 630, 652, 661, 681–6, 689, 693
 Spanish 177–9, 199, 225–6, 265, 268, 271–4, 276, 279–80, 285–6, 289, 296, 300, 310, 313–18, 321–2, 324, 440, 602, 688, 695
 Tyrian 547, 578, 679
see also bullion; depletion silvering; ore sources; recycling; refining; silver-copper alloys; supply of metals; surface enrichment
 silver content of denarii *see* fineness
 silver-copper alloys, nature of xxiv–xxv, 41, 60, 78–80, 83, 85–6, 105–9, 131, 146, 393, 506
 effect on weight of coins 90
 sampling problems 110, 152, 415, 572
 simpulum, as diagnostic mark on coins 180–1, 634, 646
 Siphnos 167, 198, 376, 504, 687
 slag 132, 177
 smelting 32, 100–2, 168, 179, 222–3
 Smith, William 57

- Smyrna, coinage of 367
 Snettisham 33
soldino 44
 solid solubility 131
 solidus 93
 Somerset Museums xxvii, 149, 152
 Soutzo, Michel C. 229, 445
 Spain 269, 301, 695
 hoards from 173–4, 184, 388, 396, 438, 448
 mines in 32–4, 167, 177, 313, 315, 321–2, 324, 695
 mints in xxv, 14, 163, 239, 267–9, 270–7, 283, 284, 286–96, 298–304, 306, 308, 310–12, 314–15, 392, 451–2, 679
 ore sources in 177–9, 199, 225, 265, 268, 271–2, 276, 285–6, 289, 296, 300, 310, 313–18, 315–16, 440, 602, 688
 seventeenth-century coinage 30
 see also silver, Spanish
 Spanheim, Ezechiel 56
 spear as diagnostic mark on Tiberian denarii 182–3, 185
 spices 177
 stability of coinage *see* imperial coinage
 standard of denarii
 First Neronian 162, 204, 216, 217–19, 228, 235–6, 246, 251, 261, 264, 297, 318, 320–1, 330, 351, 381, 389, 392, 408, 419, 422–3, 431–3, 443–4, 451, 453, 456, 458–9, 470, 493, 495, 498, 539, 551, 566, 570, 677, 680, 690–5, 699
 ideal or theoretical 444–5, 451, 454–5, 691, 695–6
 Neronian weight 206, 283, 296, 298, 312, 314, 318, 328, 351, 519, 669–72, 693, 695
 ‘of Vespasian’ 427
 Republican 168, 199, 202, 207, 388, 455, 545, 614, 667, 669, 671–2, 678, 687
 Revised Neronian 133, 204, 216, 219–20, 228, 233–4, 236–8, 245–6, 251, 261, 263–4, 270, 297, 318, 320, 380–1, 390–1, 393–4, 397, 403, 405, 407, 409, 418, 422, 431–3, 444–5, 450–1, 454–60, 482, 491, 551, 566, 594, 597, 604, 676–7, 680–1, 692–3
 standard of value 66–7, 161, 229, 237, 446, 694;
 see also aureus; denarius; gold; silver
 standard reference materials (SRM) 123
 star, as diagnostic mark on coins 635, 646, 654
 state, role in coinage production 9, 12, 16, 19–20, 22, 25–6, 28–34, 36–46, 48, 76–7, 82, 157, 161, 184, 190–1, 198–201, 226, 229–38, 527–8, 537
 stater 520, 670, 673
 equated with tetradrachm 670
 sterling fineness 43
 Stevenson, R. 102
 stockpiling of metal 236–7, 247, 261, 263, 430, 644, 694
 Strabo 32
 striking, process of 107, 109, 134, 136, 139, 142–3, 145–6
 Suda 670
 Suetonius 27, 47, 230, 249, 257, 271, 304, 330, 351, 355, 380, 394–5, 450
 Sulla, coinage of 160
sultani 44
 supply of coinage *see* money, supply of
 supply of metals 29–38, 46, 76–7, 82, 160, 247, 297, 337, 360, 368, 393, 398, 406–7, 415, 417, 428, 439–40, 441–2, 446–7, 454–5, 476, 479, 487–8, 493, 502, 504, 516, 527, 531–7, 557, 561, 567, 575, 589, 611–12, 624–5, 629–30, 652–3, 660–1, 665–6, 681–6, 689, 693, 698
 surface analysis *see* analysis
 surface enrichment of alloys 77–8, 79–80, 83, 85, 87–8, 90, 107–9, 125, 133, 140–41, 152, 217–18, 415, 427; *see also* blanching; depletion gilding; depletion silvering
 Sutherland, Humphrey 94, 168, 182–4, 193, 199, 203, 206, 215, 229–30, 232, 236, 257, 268–9, 271, 275, 282, 284, 296–7, 302–4, 306, 308–9, 311, 314, 379, 395, 442–3, 449, 466, 468–9
 Switzerland 66
 hoards from 174, 227, 448
 Sydenham, Edward A. 69, 94, 203, 229, 232–3, 442, 506, 521, 524, 568
 Syria 14, 505, 586, 589
 hoards from 498, 541, 543, 547–9, 553, 569, 605, 662
 Syria, coinage of 21, 24, 364, 370–6, 463, 465, 490, 495, 497–8, 502–6, 517, 539–607, 609–10, 626, 634–5, 662–3, 667, 670–3, 675–8, 680–4, 686, 696
 Alexandria-style coinage 497, 502, 576–81, 583, 589–99, 602–4, 649, 655–7, 681–4, 697
 chronology 541, 546, 562–3, 572, 579, 582, 584, 590, 595–6, 598
 circulation patterns 495, 498, 506, 514, 540, 546–9, 553, 607, 663, 672
 dating systems 498, 542, 545–8, 562–7, 572, 576, 578, 581–2, 584, 586, 590–1, 595–6

- Syria, coinage of (*cont.*)
 fineness of 540, 542, 544–5, 550, 554–7, 559, 561, 566, 570, 574, 580, 583, 585–6, 590, 593–4, 597, 599, 602–4, 675
 history of 547–8, 551, 553, 572, 578–9, 582, 584, 672, 675, 678
 of Augustus 552–61, 566, 570–1, 580, 603–4, 671, 676, 680, 696
 of Caligula 552–3, 555, 557–62, 588, 603–4, 671, 676, 678, 680
 of Claudius 552–3, 555, 557–60, 671, 676, 678
 of Domitian 552, 555, 590–7, 603–4, 655, 671, 676, 681, 684, 686, 697
 of Galba 552, 555, 562, 572–6, 581–4, 589, 603–4, 662, 671, 676
 of Nero 517, 547–9, 551–3, 555, 558–72, 574, 576–8, 580, 583–4, 588, 591, 603–5, 626, 634–5, 649, 671, 676, 680, 682–3, 697
 of Nerva 552, 555, 593–9, 602–4, 656, 663, 671, 676, 681, 684, 697
 of Otho 552, 555, 572–6, 581–4, 589, 603–4, 662, 671, 676
 of Tiberius 553
 of Trajan 531, 552, 555, 593, 598–605, 671, 676, 681, 684, 686, 697
 of Vespasian 364, 370–6, 502–4, 539, 552, 555, 575–91, 595, 597, 603–4, 626, 649, 662, 671, 676, 680, 683, 686
 output 540–1, 562, 572, 577–8, 582, 584, 626, 662
 overvaluation 545–6, 551, 556–7, 566, 570, 590, 597
 relationship to Caesarean coinage 517, 557, 568–70, 604, 662, 670–2, 676–7
 relationship to cistophorus 667, 671, 676
 relationship to Cypriot silver 498, 502–4, 590, 671, 676
 relationship to denarius 548–9, 556–7, 566, 570, 576, 583, 585, 589–90, 594, 597, 600, 602, 604–5
 relationship to Egyptian coinage 576, 580, 589–91, 594–5, 597–8, 610–11, 626, 649, 655–7, 662–3, 670–1, 676–7
 relationship to Tarsus tetradrachms 497, 591–2, 671, 676
 Rome-style coinage 531, 599–604
 types 373, 498, 502, 542, 546–7, 552, 554, 563, 568, 572, 576–9, 581–4, 586, 589–91, 596, 599, 603
 weight standards 542–3, 547, 549, 554–5, 557, 559–60, 563–4, 569–74, 577, 579–88, 590–1, 594, 596–604, 609, 667, 670–2, 691, 696
 see also Philip Philadelphus; Posthumous Philip tetradrachms; tetradrachm; Tyre
- tabula Cleopatrana* 668
- Tacitus, emperor 60
- Tacitus, historian 47, 184–5, 212, 230–1, 250, 254–5, 287, 295, 304, 330, 333
- talent
 Aeginetan 674
 Alexandrian 674
 Antiochene 674–5
 Attic 668, 674–5
 Babylonian 674
 Cilician 674
 Cistophoric 465, 674–5
 definition of 673–4
 Egyptian 674
 Italian 674
 Ptolemaic 674–5
 Rhodian 674–5
 Syrian 674
 Tyrian 674–5
- Tarraco
 mint of 269–78, 285–7, 294–5, 298, 314
 reattribution of certain coins to Gallic mint(s) 275–6, 285, 314
- Tarsus, coinage of 495–7, 504, 671, 673, 676, 685
 circulation 495
 fineness of 496
 of Augustus 495
 of Domitian 495–7, 502, 504, 591–2, 671, 676, 685
 of Hadrian 495
 of Tiberius 495
 of Trajan 495, 531
 relationship to Cypriot coinage 502, 671, 676
 relationship to denarius 496–7, 685
 relationship to Syrian coinage 495, 671, 676
 Rome-style coinage 531
 weight standards 496, 671, 673
 see also Cilicia; tetradrachm
- Taurus mountains 167
- taxation 7, 9, 36, 38–9, 76–7, 231, 236, 445, 479, 660, 691–2, 699
 changes under Nero 231, 235–6, 445, 691
 elite attitude to 12–13, 76
 exemptions 231
 in gold coin 77
 in kind 76
 in silver coin 77, 456, 691–2, 699
 inadequate 6, 9, 38, 76, 231, 380
 indirect 231

- Jewish 610
 medieval 16
 modern 16
 rebellion 380
 regulations 231
 reorganisation under Augustus 231
 role of base metal coinage in 77
 techniques of production *see* mints
 temple of Aphrodite at Paphos, as coin type 497
 temple of Janus, as coin type 212
 temple of Rome and Augustus, as coin type 467
 temple of Salus 212
 temple of Vesta, as coin type 212
 tenants 13
 ternary alloy 316
tesserae nummulariae 69
 tetradrachm
 definition of 670
 equated with stater 670
 Nero and Divus Claudius 567–70, 588, 603, 671–2, 676, 680
 Neronian eagle tetradrachms 562–7, 569–70, 572, 574, 576–8, 580, 583–4, 591, 603–5, 662–3, 682
 of Caesarea in Cappadocia 505–6, 514, 517, 552–3, 568–70, 682
 of Cilicia 463, 490, 495–7, 670–1
 of Cyprus 370–1, 375–6, 463, 497–504, 607, 671, 683, 695
 of Egypt 20, 25, 28, 62, 65, 91–2, 149, 328, 463, 465, 505, 511, 539, 576, 580, 589–90, 594–5, 597–8, 606–64, 676, 678, 695–8
 of Seleucia Pieria 490, 547, 553, 570–1, 603, 671–2, 676
 of Syria 14, 24, 61, 364, 370–6, 463, 465, 495, 497–8, 502–5, 517, 531, 540–606, 609–10, 626, 649, 662–3, 672–3, 678, 680, 696
 of Tyre 25, 517–18, 540, 546–53, 578, 603–5, 609, 660–2, 667, 671, 676–7, 679, 686, 695–6
 Posthumous Philip 540–6, 550–5, 560–1, 570, 580, 597, 603–4, 672, 678, 686
 Ptolemaic 540, 607–9, 611–15, 630, 642, 658–9, 667, 670, 672, 685
 Seleucid 540–2, 606, 672
 Southern mint tetradrachms 577–8, 587–90, 603, 671, 676, 680
 Zeus tetradrachms 552
 see also Alexandria-style coinage; Apamea (Syria); Aradus; Ascalon; cistophorus; Egypt; Laodicea (Syria); Sidon; Syria; Tarsus; *and entries under individual rulers*
 tetarchy 64
 Themistius 29
 Theodosian Code 32
 Thessco xxviii, 85
 Thomson, Thomas 63
 Thornton, Mary E. K. 229
 throne as diagnostic mark on Tiberian denarii 182–3, 185
 Tiberius, as coin type 635, 638, 644
 Tiberius, emperor 31, 227, 250, 448, 608
 aureus of 94, 172, 184, 377, 383, 388, 438, 447, 451, 457, 692
 Caesarea, Cappadocia, coinage of 507–13, 537–8, 671, 676, 678, 680, 696
 character of 188
 denarius of 24, 58, 63–4, 94, 97, 168–9, 173–4, 176–9, 181–9, 197, 210, 221–2, 224–7, 323–4, 388, 396–7, 405, 440, 449, 493, 510–11, 525, 535, 551, 620, 623–4, 672, 678, 688, 699
 Egyptian coinage of 91–2, 493, 511, 608–10, 612–20, 622–6, 635, 643–4, 650, 658–62, 664, 669–71, 673, 676–7, 679, 685, 695–7
 fineness of denarius under 167, 183–4
 mints of 175–6
 output under 173–5, 184, 190, 250, 615
 PONTIF MAXIM type 169–70, 172, 175, 177, 178–9, 182–7, 339, 341, 388
 Syrian coinage of 553
 Tarsus tetradrachms of 495
 titles 511
 weight standards under 169–70, 172, 388, 453, 538, 604, 616–17, 620, 635, 669–73, 678, 696
 Tiberius Julius, financial secretary under the Flavians 385
 tin
 for plating copper coinage 61
 major component 267, 279, 280
 minor or trace element 4, 12, 63, 104, 112, 123, 168, 181, 186, 188, 223–4, 285–6, 290, 297–8, 300–1, 308, 310, 311, 315, 316–18, 323, 325, 335, 345, 373, 576, 586, 589, 602
 ‘tipping point’ xxiv, 7, 15, 68, 73, 395, 426
 Titus, as reverse type 576, 579, 582, 649
 Titus, emperor 348, 426
 aureus of 65, 350–2, 354–5, 359, 379, 387, 426, 449, 454
 Caesarean coinage of 522, 524
 character 351
 chronology of issues 350, 352–5
 cistophori of 466, 471–4, 482, 486–9, 671, 676, 683

- Titus, emperor (*cont.*)
 Cypriot coinage of 498
 denarius of 11, 139, 348, 350–60, 362–3,
 377–9, 381, 404, 453, 475–6, 478
 denarius of, under Vespasian 321–6, 338–50,
 367, 373–5
 Egyptian coinage of 611, 654–8, 664, 671,
 676
 financial difficulties 330, 351, 379–80
 fineness of denarius under 350, 353–7, 381,
 385, 387, 433, 475
 hiatus in production 350, 354–5, 473
 output under 350, 353, 654
 Syrian coinage of, under Vespasian 576, 579,
 582, 587, 676
 titles 338–40, 342–3, 345, 354
 weight standards under 350–1, 361, 381,
 453, 471, 473–5, 654, 671
- token coinage *see* fiduciary money
 touchstone 60–1
 Tower of London 35, 88
 trace elements 4, 36, 88, 101–2, 104, 112, 116,
 120–1, 126, 128, 164, 167–8, 175, 178,
 197, 199, 223–5, 247, 261, 263, 270,
 285–6, 290, 298–301, 310, 311–12,
 315–18, 323–5, 331, 335–6, 345, 351–2,
 359–60, 362–3, 368–70, 372–6, 397–8,
 404–7, 415–18, 428, 433, 439–42, 446,
 476–9, 481–5, 487–8, 491, 493, 495–7,
 502–4, 516–17, 520–1, 525, 531–4, 546,
 551–2, 556, 560–1, 566–7, 570–1, 574–5,
 580, 583, 585–6, 588–9, 594, 597–8, 602,
 619–20, 623–6, 628–30, 636–7, 644–6,
 649, 652–3, 655–7, 659–61, 681–6, 688–9,
 691, 693, 698–9
 ‘fingerprint’ 4, 89, 397–8, 428, 476, 521, 531,
 620, 629–30
see also under individual elements
- trade coins 44, 660, 688
- Trajan, emperor xxiii, xxv, 11, 65, 216, 396–7,
 422, 424, 428, 433, 447, 596, 605, 691
 as point of change 68–9, 70–1, 229, 397,
 423–8, 458–60, 694, 699
 aureus of 58, 70, 76, 377, 389, 420, 423–6,
 432, 454, 459–60, 694
 Caesarea, Cappadocia, coinage of 506–7,
 519–20, 529–38, 671, 676–7
 centralised minting under 685
 chronology of issues 420, 426–7, 430
 cistophori of 466, 474, 479, 482–9, 495–6,
 671, 676, 684
 Cyrenaican coinage of 531
 Dacian war 431
 denarius of 64–5, 67–9, 72–4, 76, 87, 144,
 326, 396, 418–33, 458–60, 482–5, 495–6,
 531–2, 602, 684, 694, 699
 Egyptian coinage of 598, 611, 657–8
 finances 379, 431, 458, 460
 fineness of denarius under 408, 418, 422–4,
 427, 458–60, 482, 699
 Lycian drachms of 492–6, 531, 671, 676, 684,
 686, 698
 pre-reform denarius 65, 73–4, 418–22,
 428–30, 458–9
 recall of Republican silver 66, 70–1, 73–5,
 227, 320, 396, 408, 424–8, 432, 447, 459,
 694, 699
 recycles Julio-Claudian denarii 428–33, 456,
 458–9, 526, 694
 reform as fiscal debasement 431, 433, 458,
 460, 694
 reform as monetary adjustment 425,
 459–60, 694
 reform misdated to AD 107 xxiv, 11, 15, 17,
 70, 73, 75, 425–8
 reform of AD 99/100 xxiv, 3, 7, 19, 66, 68,
 70, 72, 240–1, 256, 264, 377, 387–9, 408,
 418–19, 424, 428, 430–3, 448, 458, 495,
 600, 694, 697, 699
 removes Julio-Claudian denarii 397, 431–3,
 662–3, 694
 restored issues 424–7
 significance of reforms 66, 70, 425–8,
 458–60, 600, 694, 699
 Syrian coinage of 531, 552, 555, 593,
 598–605, 671, 676, 681, 684, 686, 697
 Tarsus tetradrachms of 495, 531
 titles 418, 420, 531, 600
 weight standards under 419–20, 457–60,
 482–3, 486–7, 489, 492, 495, 519–20, 530,
 599–603, 671
- Trajan Decius, emperor, coinage of 64
- Tralles, cistophori of 466
- transaction costs 50
- transfer from Lugdunum to Rome 175–6, 178,
 180, 188, 201, 211, 223, 232, 440, 442,
 446, 689
 problems with concept 175–6, 211, 689
 under Caligula 175, 188
 under Nero 175, 201, 223, 232, 442, 446,
 689
- Trebonianus Gallus, emperor, coinage of 69, 72
- tridrachms 568, 599–600, 602
- Tripolis, Syria 576, 581
 coinage of 547, 581
- Troxell, Hyla 491–2

- Turkey, hoards from 467–9, 486, 490, 509, 520, 662
- twelve Italian as coins of Caesarea 505, 509, 514–15, 538, 680
- twenty-four Italian as coins of Caesarea 505, 509, 514–15, 538, 680
- Tyche of Antioch, as coin type 554–7, 559, 570–1, 580, 603, 614, 672
- Tyre
 era of autonomy 546
see also silver
- Tyre, coinage of 25, 517–18, 540, 546–53, 585, 603–5, 607, 609, 660–1, 667, 671–2, 675–9, 686, 695–6
- chronology 546
- circulation 547–9, 553, 605, 662, 672, 696
- end of 546, 548–9, 551–3, 578, 604, 662, 672, 675, 679, 696
- fineness 550, 603, 604, 609, 695
- history of 547–8, 551
- inscriptions on 547–8
- Jerusalem as mint 548
- overvaluation of 551
- relationship to Attic-standard coins 679
- relationship to denarius 548–9, 679
- relationship to Egyptian coinage 609, 660–2, 667, 671–2, 676
- relationship to other Syrian coinages 547–9, 551–2, 578, 585, 604–5, 671, 676
- types 546–7
- weight standard of 549, 603, 609, 667, 671–2
- uncia *see* ounce
- undervaluation 37–8, 45, 47–9, 66, 71, 73, 448, 450, 645
- United States coinage 46, 50
- University of Durham 123
- University of Liverpool xxviii, 149
- University of Nottingham xxviii
- University of Oxford, Department of Materials 123
- Uranus Antoninus, emperor 8–9
- Vaillant, Jean-Foi 56, 61
- Valerian, emperor, coinage of 63
- Valerius Flaccus 674
- Varus, P. Quinctilius 554
- Venice 35, 44, 88, 95
- Vespasian, emperor 157, 202, 209, 239, 246, 281, 330, 426
- antiquarian types 331, 341–3, 345
- as point of change 57, 59, 202, 330, 662, 672
- aureus of 57, 267, 296–8, 308, 326, 328–9, 364, 370, 372, 373–4, 379, 387, 426, 449, 452–4, 587
- Caesarea, Cappadocia, coinage of 365, 368–9, 372, 374–6, 505, 519–24, 526–9, 531–8, 570, 604, 662, 669–72, 676–7, 682–4, 696
- character 330
- chronology of issues 333–4, 336–43, 345, 348–9, 364–5
- cistophori of 364, 472
- countermarks of 467
- Cypriot coinage of 370–1, 375–6, 463, 497–504, 536, 539, 590, 607, 671, 673, 675–6, 683, 686, 695
- denarius of 10–11, 57, 59–60, 64–5, 138, 258, 267–8, 296–301, 314–15, 318–19, 321–51, 363–76, 377–9, 381, 404, 452–3, 502–3, 520–1, 523, 527, 532, 539, 576, 580, 583, 585–6, 589, 683, 692
- eastern mints for denarii 166, 296, 325–6, 363–76, 453, 472, 498, 502–4, 576, 583, 585–6, 589, 695
- Egyptian coinage of 539, 576, 580, 590, 608, 610–11, 615, 649–58, 662–4, 671, 676, 683
- finances 15, 330, 453, 538
- fineness of denarius under 298–300, 321–2, 326, 333–49, 365–8, 371–5, 381, 385, 387, 433, 453, 692
- IVDAEA denarius type 333, 335, 497
- Judaea capta coinage 364, 576, 587
- mints of 30
- output under 208, 262, 321, 326, 333–4, 342, 519, 538, 577–8, 582, 584, 649
- portrait types 333, 372–3, 374, 586
- provincial coinage of 331, 364, 365, 368–9, 370–2
- reform a phantom 17
- reform attributed to AD 70 10–11, 15
- Syrian coinage of 364, 370–6, 502–4, 539, 552, 555, 575–91, 595, 597, 603–4, 626, 649, 662, 671, 676, 680, 683, 686
- titles of 305, 333–4, 336–43, 345, 348–9, 354
- weight standards under 251, 258, 361, 364–5, 419, 452–3, 579–88, 590, 603, 649–50, 669–72, 692
- western mints of 233, 267–8, 296–301, 308, 314–15, 318–19, 324–6, 363–4, 372, 375–6, 444, 452, 695
- see also* debasement; Divus Vespasianus
- Vesta, as coin type 309–11, 314

- Vesuvius 355, 449
 Victoriatus 157, 159
 Victorinus, emperor 250
 Victory, as type
 on anonymous civil war issues 303, 305, 307–9
 on Egyptian coinage 649
 under Galba 305
 under Otho 245–6, 248, 250
 under Vitellius 289, 295, 308
 Viebrock, James 112
 Vienna (Gaul), mint of 269, 271, 277–8, 285, 304, 314–16
 Villalpandus, Juan Bautista 55
 Vindex, C. Julius 239, 267, 269, 278, 301–2, 304–5, 314
 Vipsca (Aljustrel) 32
 Virtus, as coin type 193, 195
 Vitellius, emperor 10, 62, 239, 242, 246, 249, 254, 257, 263, 295–6, 301, 309, 314, 331, 333, 692
 aureus of 59, 239, 255, 257, 259, 261, 267, 288, 294–5, 308, 318, 328, 451–2, 454
 chronology of issues 255–7, 295–6, 314–15
 denarius of 65, 68, 138, 226, 247, 254–68, 287–96, 299, 302, 303, 305, 309–11, 313–16, 318, 320–1, 323, 326, 330, 336, 373–4, 384, 392, 451, 454
 Egyptian coinage of 638, 646–9, 651–3, 662, 671, 676
 fineness of denarius under 260–1, 289–90, 318, 320–1, 384, 433, 453
 output under 208, 239–41, 248, 255–6, 262, 336, 572, 646
 portrait types 255, 288–9, 291, 293, 295–6, 310
 titles 255–7, 287, 294–6
 weight standards under 251, 257–9, 291, 293–4, 384, 451–2, 647, 671
 western mints of 233, 239, 257, 267–8, 277, 287–96, 297–303, 308, 310–11, 313, 314–16, 318, 320, 324, 373–4, 384, 392, 444, 451–2, 454, 695
 Vitellius, L., brother of emperor 257
 Volteius, M., denarius of 158
 Volusian, emperor
 coinage of 72
 von Kaenel, Hans-Markus 169, 175, 188–90
 von Rauch, Adolph 64–5, 67, 73
 251, 259, 268, 360–1, 378, 384–7, 390, 398, 424–5, 427–8, 443, 455, 466–7, 470, 472–3, 475, 486–7, 490–3, 495–6, 500–2, 506, 508, 513–14, 522, 545, 547, 559, 568, 610, 613, 615–16, 619, 622, 627, 641, 643–4, 646, 665–6
 Warburton, D. 612
 weight standards 5, 19–20, 41, 53, 62, 64–5, 69–70, 72, 89–96, 98, 190, 193–5, 198–9, 201–8, 215, 217–19, 221, 228, 235–6, 238, 242–4, 250–2, 257–9, 261, 283–4, 291, 293–4, 297, 308, 312–14, 318, 326–9, 350–1, 360–1, 364–5, 377, 380–1, 383–4, 388, 391–4, 409–11, 418–20, 423–4, 432, 434–40, 443–5, 450–4, 456–7, 459–60, 467–75, 480, 482, 485–7, 489–93, 495, 498–501, 508–16, 518–19, 547, 554–5, 563–4, 569–74, 603–4, 609, 614, 616–17, 620–1, 627, 630–2, 635–8, 642, 647–50, 654–61, 666–81, 687–8, 690–6, 698
 Attic 540, 606–7, 667, 672–3, 691
 decline of 168–73, 190–1, 193–5, 199–200, 201–3, 215, 228, 233–4, 236–7, 388, 409–11, 418–20, 434–9, 441–2, 453, 457–8, 467–8, 485–6, 498, 508, 510, 538, 554, 557, 560, 604, 607, 620, 623, 637–8, 647, 667, 676, 678, 687–8, 696, 699
 determination of 90–6, 463, 468, 498–501, 616–17, 695–6
 discrepancy in weight between museum and hoard coins 499
 of aureus 10–11, 20, 23, 47–8, 56–9, 82, 93–6, 172, 195, 198, 201, 204–6, 228, 234–5, 237, 243–4, 252, 259, 261, 284, 294, 297, 308, 313, 318, 328–9, 351, 361, 377–8, 383–4, 388, 391–4, 409, 411, 420, 423–4, 432, 434–5, 437–9, 443–5, 451–4, 456–7, 459, 687, 690, 692–4
 of Caesarian coinage 508–16, 518–19, 523–4, 530, 538, 569, 604, 669–72, 696
 of cistophorus 465, 467–75, 480, 482–3, 485–7, 489, 492, 667, 670–1, 676, 678, 696
 of Cypriot coinage 498–501, 607, 671, 673
 of denarius 7, 20, 22–3, 48, 54, 56–7, 59, 62, 67–8, 71, 82, 90–6, 158, 163–4, 168–73, 193–5, 198–9, 201–8, 217, 218–19, 221, 234, 235–8, 242–3, 250–2, 257–9, 261, 283–4, 291, 293–4, 297, 312–14, 318, 328–9, 350–1, 360–1, 364–5, 378, 380–1, 388, 392–4, 409–11, 419–20, 434–9, 441–5, 450–4, 457–8, 460, 470, 472, 475, 485, 490, 492, 510, 519, 545, 604, 671–2, 676, 687, 690–4, 698

- of Egyptian coinage 607, 614, 616–17,
 620–1, 627, 630–2, 635–8, 642, 647–50,
 654–61, 667, 669–73, 696
- of Lycian coinage 492–3, 495, 669, 671, 673,
 698
- of Pontic drachm 490, 671, 673, 680
- of Ptolemaic coinage 20, 444, 540, 607, 614,
 642, 660, 662, 669–70, 672–3, 691
- of radiate or antoninianus 62, 64, 67, 69
- of Syrian coinage 542–3, 547, 549, 554–5,
 557, 559–60, 563–4, 569–74, 577, 579–88,
 590–1, 594, 596–604, 609, 667, 670–1,
 691, 696
- of Tarsus tetradrachms 496, 671, 673
- of Tyrian coinage 549, 603, 609, 667, 671–2
 Phoenician 540, 607
- weights and measures 93
 Greek 236
 Roman 236
- Weiser, Wolfram 426, 547–8
- West, Louis C. 26, 72, 203, 257–8, 284, 294,
 378, 425–6, 606, 609–10, 615, 622–3
- Winterthur, Münzkabinett xxvii, 149–50, 180,
 273, 545
- withdrawal of coinage 36, 70–1, 73–4, 96, 99,
 320, 424–8, 431–2, 526, 528, 534–6, 605,
 694, 699
- Wolters, Reinhard 231–2, 234, 443, 446, 448
- workshops 516
- Woytek, Bernhard xxix, 87, 377, 383, 409,
 419–20, 422, 424, 426, 428, 431–2, 434–5,
 479–83, 485, 489
- wreath as diagnostic mark on Caligula's
 denarii 188–9
- wreath ties as diagnostic mark on Tiberian
 denarii 182–5
- Wroxeter 28
- X as diagnostic mark on Augustan denarii
 180–1
- x-ray fluorescence *see* analysis
- Xiphilinus 70, 424
- Yale University Collection xxvii, 149, 501
- Zeus Nicephorus, as coin type 542, 554
- Zeus Salaminios, as coin type 497
- Zeus tetradrachms *see* tetradrachm
- zinc 267, 399
 trace element 4, 104, 112, 125, 168, 181, 186,
 188, 223–5, 285, 290–1, 297–8, 300–1,
 308, 310–11, 316–18, 323, 325, 331, 335,
 345, 415–17, 586, 589
- Zurich, Canton of xxvii