

Index

a

abeopicrasanes 278, 284
Abies sequiterpenoids 243, 247
 acrylate(s) 29, 49, 207, 208
 acrylic acid 207
 acyl-Claisen rearrangement 44, 45, 48, 49
 acyclic monoterpene building blocks 237
 1,4-addition 55, 63, 69–71, 168, 202, 203, 205, 206, 222
 agelasmine C 286–288
 agelasines 287
 agelastatin A 25, 26
 ajudazol 447
 alcohol dehydrogenase (ADH) 177
 aldgamycin-M 169
 aldol condensation 149, 166, 175–177, 243, 250, 370, 569
 aldol reaction 43, 46, 52, 54, 55, 57, 59, 60, 63, 64, 67, 68, 89, 90, 106–107, 169, 170, 173–175, 177, 179, 182, 187, 202, 204, 208, 209, 221, 222, 304, 307, 309
 α-ketoacid-hydroxylamine (KAHA) ligation 34
 alkaloids 297–299 biological activities of 298 biosynthesis of 301 as building blocks in chiral polymer synthesis 338 Cinchona 325 concentration in biological material 301 ephedra 303 lupin 314

tobacco 311
 tropane 335
 uses 298
 δ-alkenyl amines 467
 alkenyl benzimidazoles 533
 alkoxide-directed metallacycle-mediated annulative cross-coupling reaction 375
 alkylammonium cations 524
 allenic macrocycles 496
 allenic Pauson–Khand reaction 511–512
 allenyl acetamides 504
 allenylamine 505
 allenylmetal reagents 491, 493
 allylamines 48, 49, 201, 507, 508
 allylboration 525, 526
 allylgold complexes 504
 allylic alcohols 22, 31, 36, 213, 246, 248, 250, 271
 allylnickel complexes 513
 allyl pyrazoleamides 108
 α,α-difluorinated phosphonate pSer/pThr mimetics 414
 α-aminoallenes 505
 α,β-unsaturated amides 63, 105, 307
 α-chiral aldehyde 183, 492
 α-chiral bicyclo[1.1.1]pentanes 171
 α-chiral monophosphine ligands 404
 α-cyclodextrin (α-CDX) 631, 632
 α-cyclopiazonic acid 26
 α-cyclopropane-α-amino acids (ACCs) 470
 α-epoxy-δ-aminophosphonate 416, 417
 α-hydroxyallenes 501
 α-hydroxyhalimanolides 280
 α-hydroxyphosphine oxides 394

- α-metatalated hydrazones 50
 α-substituted α-isocyanates 477
 altinicline 313
 (+)-ambrisentan 169
 amide alkylation 143, 308
 amidine based organocatalysts 190–191
 amino acid and peptide based organocatalysts 173–174
 aminoalcohols 51, 57, 91, 165, 168, 297, 302–304, 309, 311, 320, 326, 423, 424, 467, 471
 aminobenzoimidazole 93, 97, 105
 (*R*)-1-amino-2-methoxymethylpyrrolidine (RAMP) 43, 50, 51, 55, 166
 (*S*)-1-amino-2-methoxymethylpyrrolidine (SAMP) 43, 50, 51, 55, 166
 aminophosphonic acids 406–407, 409–418
 (*S,Z*)-2-amino-5-phosphono-3-pentenoic acid, (*S,Z*)-APPA 417, 418
 9-amino(9-deoxy)*epi*-quinine 344
 aminoquinazolinone 93, 97
 amprenavir analogs 33, 35
 anabasine 311, 313–314
 anatabine 311
 Andersen's menthyl *p*-toluenesulfinate 442–445, 448–449, 454
 4-androstene-3,17-dione, as chiral building block 378–379
 angeloyl gutierrezianolic acid methyl ester synthesis 274–275
anti-Felkin–Ahn transition state 493
anti-selective conjugate addition 177
 antofine 33, 34
 aplaviroc 147
 (–)-aplyviolene 260, 261
 Appel reaction 238, 261
 D-arabinose 197, 198
 arabinosylamine 200
 ardeemins 153, 154
 (+)-artemone 237
 aryl benzyl sulfoxides 455–456
 aryl *p*-tolyl sulfoxides 442–443
 arylsparteines 325
 arylsulfonamides 468
 aspartate-based peptides 23
 aspartic acid 145, 163, 411, 416
 (+)-aspicilin 167
 asymmetric acyl-Claisen rearrangement 49
 asymmetric addition
 of cyanide 216
 of imine 223
 of organolithiums 321
 of terminal alkynes 305
 asymmetric aldol reaction 60, 66, 187, 222
 asymmetric bromolactonization 463
 asymmetric C–H functionalization 321
 asymmetric cyanation reactions 97
 asymmetric cyanosilylation, of benzylphosphonates 223
 asymmetric Heck reaction 220
 asymmetric imino-Reformatsky reaction 306
 asymmetric Michael addition 33, 47, 177, 223, 339, 341, 529
 asymmetric nucleophilic fluorination 531
 asymmetric Pictet–Spengler reaction 110, 543
 asymmetric radical reactions 49
 asymmetric selenofunctionalization reactions 463–470
 Atherton–Todd reaction 392–394
 atropisomeric phosphine ligands, structure of 397
 atropisomeric structures 447
 Au-catalyzed cycloisomerization 30, 501
 axial chirality 397, 406, 489, 491, 494, 496, 497, 499–501, 504, 505, 509, 512, 514, 524, 533, 551, 623
 aza-Diels–Alder reaction 112, 535–538
 aza-Friedel–Crafts reaction 201, 535, 536
 aza–Morita–Baylis–Hillman reaction 70
 azetidines
 nucleophilic opening 27
 synthesis of 27, 468, 469
 synthetic transformations of 26
 azetidinones 28, 504
 aziridination 25, 26, 64, 65, 494, 497–498
 aziridines 24–26, 38, 50, 64, 201, 202, 450, 498, 505
 formation via nucleophilic displacement 26
 use in teleocidin synthesis 25

b

(*R*)-baclofen 98, 103, 184
 bacteriochlorins 593
 ball-milling 177
 benzeneselenenic acid 478
 benzothiopyrans 106
 benzoxazole alkaloids 252
 benzphetamine hydrochloride 304
 benzylic coupling 565
 benzylidene pyruvates 103–104
 β-aryl-α-ketophosphonates 101
 β-bromosulfides 531
 β,γ-unsaturated amides 104
 β,γ-unsaturated hydrazones 112
 β,γ-unsaturated nitriles 513
 β-hydroxyhalimanolides 280
 β-ketoesters 59, 99, 109, 112, 210, 251,
 341, 479, 529, 530, 533
 β-keto-sulfoxides 443
 β-lactams 26, 28, 29, 38, 55, 164, 307
 β-sulfinyl-alcohols 443
 β-sulfinyl unsaturated systems 443
 (*R*)-bgugaine 29, 30
 6,5-bicyclic cyclopentenones 511
 bicyclic terpene building blocks 256–261
 bicyclo[1.1.1]pentanes (BCP) 171
 bidentate ligands 396, 567, 569
 bifunctional L-prolinamide-DACH
 catalyst 106
 bifunctional sulfinamido urea derivative
 109
 [1,1'-binaphthalene]-2,2'-diol (BINOL)
 395, 523–550, 569
 binaphthyl-based diphosphines 401
 binaphthyl-based phosphorus ligands
 397
 binaphthyl phosphoric acids (BPAs) 533
 BINAPINE, 5-dehydro-3H-
 dinaphtho[2,1-c
 1',2'-e]phosphepine 397, 404, 407
 BINAPO, intermolecular cyclization of
 398
 BINAP-type ligands, preparation of 397
 BINOL derivatives, with free hydroxyl
 groups 524
 allylboration reactions 525–526
 conjugated addition reactions 526,
 527
 examples 526, 528–529

biocatalysis 13, 87, 177, 298, 567
 6,6'-bipyridine (bipy) chelates 637, 647
 bisalkaloid derivatives 37, 38
 bis(allenyl)macrocycle 496
 bis(allene) macrolactone precursors 496
 bis-formamides 107
 bis-imidazole *N*-oxide 107
 bis-oxazoline (BOX) ligands/complexes
 9, 172, 370
 bis(oxazolo)bacteriocarbachlorin 593
 2,2'-bis(diphenylphosphino)-
 1,1'-binaphthyl (BINAP)
 397–404, 623
 bispidine, [3,7]-diazabicyclo[3.3.1]nonane
 314, 315, 324
 bis(pinacolate)diboron 573
 bis(pinacolatoboryl)alkenes 561
 1,4-bis(trimethylsilyl)-1,4-dihydronicotine
 312
 (–)-bolivianine 259, 260
 bonnanes 639
 branimycin 493
 brasiliolides 308
 bromohelicene 565
 bromohydroxylation 503
 Brown's asymmetric allylation 170
 (S)-brevicoline 313
 bruceol 23
 brucine 564
 bufadienolides 377, 378
 Burke's ArylideneBOX ligands 172

c

calcimimetic (R)-(+)NPS R-568 184,
 186
 (–)-callystatin A 167
 camphor-based chiral heterocyclic
 auxiliaries 60–68
 camphorsulphonate anion 608
 camphorsulfonic acid 608
 camphorsultam 43, 60, 64
 (S)-canadine 446
 caprazamycin A 107
 carbohelicenes 552, 553, 555
 carbohydrate-based Trost ligands 87,
 215, 216
 carbohydrate-derived ligands 218
 carbohydrate iodoarenes 223
 carboxylic acid-thiourea 110

- (+)-cardamon peroxide synthesis 260
 cardenolide synthesis 372
 cardiotonic steroids 371–373
 $(1S,6R)$ -(+)-2-carene 256, 258, 396
 $(1S,6R)$ -(+)-3-carene 237, 256, 257, 396
 (R) -(-)-carvone 237, 241–248, 368
 carvone-derived chiral building blocks 245
 catenanes 623–631, 634–635, 638–640, 646–649
 chaetochalasin A 308
 charge-transfer (CT) complexes 564
 chettaphanins 278, 279, 281
 chiral 1-alkyl-3-arylallene 509
 chiral 1,2-allenic sulfoxides 503
 chiral allenylzinc reagents 492
 chiral allylamines 48
 chiral aminophosphonic acids 406
 chiral auxiliary
 definition 165
 history of 197
 chiral bidentate diphosphines 567
 chiral BINAP-based porous organic polymers 401, 402
 chiral bisphosphepine ligand 404
 chiral boronic acids 316, 528
 chiral carbo[n]helicenes 552, 553, 567
 aromaticity and optoelectronic properties 554–557
 asymmetric syntheses 565–567
 chirality of helcene 557–559
 helicenes, in biochemistry 571
 helicenes, in catalysis 567–569
 helicenes, in organic electronics 569–570
 racemic synthesis and optical resolution methods 559
 Diels–Alder cycloaddition 560
 Friedel–Crafts type cyclization 560
 metal-catalyzed reactions 561–564
 metal-free photocyclization reactions 559–560
 optical resolution 564
 structure and properties of, helicenes 553
 topological description 553–554
 chiral cyclic triamides 419
 chiral 6,6'-dibromodiphenylphosphines 404
 chiral dihydropirans, synthesis of 445
 chiral diphosphine compounds 215
 chiral 3,4-disubstituted pyrrolidines 31
 chiral enone 5, 371
 chiral epoxides 21, 23
 chiral esters 204
 chiral ethers 211
 chiral graphene nanoribbons 572
 chiral hydrazones 50, 51, 53
 chiral imines 70, 198, 394
 chiral Michael acceptors 472
 chiral molecular diversity 298, 328, 331
 chiral nanobelts 572–575
 chiral *N*-confused[4]calixphyrins 593
 chiral *N*-nucleophile α -alkylation/ α -aldol reaction 55
 chiral *N*-phosphinyl auxiliary 72
 chiral phosphine oxides 393, 497
 chiral phosphines 310, 395, 397, 509, 533, 623
 chiral phosphoric acids 27, 524, 533–544
 Diels–Alder reaction 535–538
 1,3-dipolar cycloaddition 538–539
 examples 543–544
 Friedel–Crafts reaction 534–535
 Michael reaction 533–534
 multicomponent reactions 539–543
 chiral poly(phenylacetylenes) 341
 chiral pool 148, 161, 162, 191, 235, 237, 238, 243, 244, 256, 267, 298, 304, 367, 368, 390, 472, 623
 auxiliaries 390
 monocyclic monoterpenes as 244
 reagents 472
 terpenes 237
 chiral pyrrolidine auxiliaries
 Enders auxiliaries 166–167
 Yamada auxiliary 166
 chiral [2]rotaxanes 631–634
 chiral saturated heterocycles 43
 chiroptical methods 587
 chloromethyl ($1R,2S,5R$)-(-)-menthyl ether 395
 chrysolic acid 269–271
 Cinchona alkaloid(s) 91, 94, 297, 325, 524
 acidic rearrangement reaction of 328
 biologically active diversified 335
 CH-alkylation of 333

- chiral building blocks from 330
 chiral catalysts derived from 22
 derivatives, applications of 327
 nucleophilic substitution of 332
 research in medicinal chemistry 335
 ring cleavages and rearrangements of 329
 substituted quinuclidine core 37
 Cinchona alkaloid-based polymers 338–344
 Cinchona alkaloid-based quaternary ammonium salts 38
 Cinchona alkaloid-based thioureas 37, 480
 Cinchona alkaloid-catalyzed Michael addition 478
 Cinchona alkaloids derived 1,2,3-triazoles 334
 Cinchona 9-amino-9-epialkaloids 326, 341
 Cinchona organocatalysts, immobilization of 338, 343, 344
 Cinchona squaramide-based polymers 341, 342
 Cinchona squaramides 343
 Cinchona sulfonamide-based polymers 341
 cinchonidine 297, 325, 326, 328, 329, 335, 340, 502, 564, 565
 cinchonine 1, 297, 325–329
 cinchotoxines 328
 circularly polarized luminescence (CPL) 570
 citronellal 237, 238, 241–243, 251, 252
 (R) - $(+)$ -citronellene 237, 238, 241
 clathsterol synthesis 381–382
 click chemistry/click reaction 298, 300, 314, 334, 344, 479
 cobalt–chiral porphyrin catalysis 10
 cobimetinib 27
 cocaine 298, 299, 302, 335–338, 449
 Comins’ reagent 376, 377
 configurational instability 587
 confused pyrrole 585–587, 592, 593, 596, 597, 599, 601, 607, 609
 $(+)$ - α -conhydrine 309
 $(-)$ - β -conhydrine 309
 coordinating chiral ionic liquids preparation 311
 corannulene-[*n*]helicenes 555
 Corey–Bakshi–Shibata (CBS) catalyst 172
 Corey–Bakshi–Shibata (CBS) reduction of ketones 172
 cotinine 311, 313
 (R) -crispine A 320, 445
 C_2 -symmetric bisoxazoline (BOX) derivatives 217
 C_2 -symmetric bis-thiourea 107, 112
 C_2 -symmetric chiral ligands 94
 C_2 -symmetric pyrrolidines 47, 49
 C-terminal domain of DhpH enzyme (DhpH-C) 408
 $(+)$ -cubitene synthesis 243, 246
 Cu-catalyzed aziridination 25, 26
 Cu(I)-catalyzed Huisgen 1,3-dipolar cycloaddition/click reaction 314, 334, 479
 Cu-catalyzed Kinugasa reaction 28
 cyanation 97, 513, 560, 600
 α -cyanoketones 108
 cyanosililation reaction 216
 cyclic *tert*-butyl- β -ketoesters 479
 cycloacenes 572
 cyclocitrinol synthesis 377, 378
 cyclodipeptides 139, 145
 cyclodipeptide synthases (CDPSs) 145
 cycloenantiomerism 631
 cycloisomerization 29, 246, 500–502, 510–513, 561, 567
 cyclopamine 376, 377
 cyclopentadiene 203, 208, 212, 515, 516, 567
 cyclopentenone 500, 510, 511, 514
 cyclopropenes 1
 biocatalysis 13
 donor-acceptor 2
 metal-catalyzed enantioselective syntheses of 3–13
 polymerization of 2
 reactivity of 2–3
 strain energy of 1
 synthesis of 1
 synthetic routes and derivatizations of enantioenriched 13–15
 cyclo-trimerization of arynes 561

- (+)-cymbodiacetal 248, 249
 (+)-cyperolone 246, 248
 (-)-cytisine 298, 300, 314–315, 324–325
- d**
- DACH-derived primary amine-thioureas 103
 DACH-thiourea analogs 90
 DAG (diacetoneglucose) chemistry 454–455
 Danishefsky's diene 201, 212
 (–)-debmoflustramine B 31, 32
 decatwistacene 571, 572
 5-dehydro-3*H*-dinaphtho[2,1-*c*1',2'-*e*]phosphepine (BINAPINE) 397, 404, 407
 dehydrophos (DHP) 408
 demetalation 587, 588, 629, 630
 dendritic BIPHEP 404
 (–)-deoxoapodine 34, 36
 deoxynucleotide derivatives 409, 410
 5,5'-diacetamido-BINAP 401
 dialkyl zinc reagents 463
 diamidochloridites 419
 5,5'-diamino-BINAP 402
 diarylphosphine oxides 533
 diarylprolinol 173, 179
 diarylprolinol silyl ether 174, 179–181
 diastereoisomeric
 menthylphosphinite-boranes 395
 diastereomeric macrolactones 496
 diastereomeric oxazaphosphorinane (SP) 70
 diastereomeric pyrrolines 505
 diastereomeric rotaxanes 632
 diastereomeric vinylallenes 513
 diastereoselective alkylation, of ephedrine amides 307
 diastereoselective Diels–Alder reaction 443
 diastereoselective Michael reaction 371
 diastereoselective *ortho*-lithiation, of ferrocene 425
 diastereoselective thio–Claisen rearrangement 48
 1,3-diaxial interactions 59
 dicyclohexylidene-D-glucose 209
 dideoxyverticillin 152
 Diels–Alderases 302
- Diels–Alder reaction/cycloaddition 6, 46, 62, 63, 65, 105, 151, 152, 173, 174, 203, 207, 208, 212, 213, 248, 249, 373, 443, 513–515, 533, 535–538, 553, 557–560, 565, 569, 573
 diethylaminosulfur trifluoride (DAST) 164
 dihydroerythronolide A 496
 dihydroxylation 206, 207, 258, 298, 326, 327, 339, 383, 469, 496
 2,5-diketopiperazines (2,5-DKPs)
 biotechnological methods 145
 description 139
 dimerization of α -haloacetamides 144
 in drug synthesis 145
 aplaviroc 147
 retosiban 147–148
 tadalafil 145–146
 trofinetide 146–147
 features 139
 natural products containing 140
 natural product synthesis 148
 N₁–C₂ and N₁–C₆ bonds formation 144
 N₁–C₆ and N₄–C₃ bonds formation 144
 N₁–C₂ bond creation 140
 cyclisation of dipeptides 140
 cyclisation of Ugi reaction products 141, 142
 intramolecular aza-Wittig reactions 143
 Pictet–Spengler condensation 143
 N₁–C₆ bond creation by aza-Michael additions 144
 N₁–C₆ bond creation from α -haloacyl amino acids 143
 solid-phase synthesis techniques 141
 dimethyl phosphite 392, 393
 dimers and oligomers of *N*-confused porphyrin (NCP)
 coordinating oligomers 602, 603, 605, 606
 covalently linked dimers 606–611
 4-dimethylaminopyridine (DMAP) 24, 35, 96, 107, 154, 156, 190, 240, 242, 257, 331, 337, 377, 378, 381, 382, 411, 414, 497

- 1,3-dimethylindole 509
 dinuclear copper(I) complexes 636, 646
 dinuclear lutetium complex 648
 dipeptide-based bifunctional tertiary amine 96
 dipeptide esters 2,5-DKPs from 141
 diphosphine synthesis 404
 diphosphinite hexapyranoside 214
 1,3-dipolar cycloaddition 29, 30, 46, 188, 189, 208, 213, 314, 474, 516, 533, 538–539, 592
 diphenyltriflylimidazolidinone (DPTI) ligand 5, 6
 disparlure 21, 22
 diterpenes 22, 235, 241, 243, 246, 251, 252, 256, 258, 268, 269, 271, 274–278, 280, 284, 286–288, 290
 diterpenoids 269, 271–272
 diversity-oriented synthesis (DOS) 298, 472
 dithiosquaramides 93, 99
 DMAP-thiourea bifunctional catalyst 96
 domino reactions 474
 domino Ugi-aza-Michael sequence, DKPs synthesis 144
 (–)-domoic acid 513
 donor-acceptor cyclopropenes 2
 double helical dinuclear complex 644
 double intramolecular C–H arylation (DHA reaction) 561
 drimanes 269, 272–273, 285
 dynamic kinetic resolution 315
 dynamic thermodynamic resolution 315
 dysidiioide, sesterterpenolide analogues of 282
 dysoxylactam A 318
- e**
 ecteinascidin 743, 155, 156
 (+)-elaeokanine A 320
 electrophilic addition reaction 463, 464
 embedding 401, 624–627, 629, 634
 empagliflozin analogs 33, 35
 enamide-type Overman rearrangement 153, 154
 enantiodiscrimination 326, 567
 enantiomerization barrier 558
 Enders auxiliaries/hydrazine methodology 43, 50–52, 55, 74, 166, 167
6-endo-trig ring formation 503
 5-*endo*-trig selenocyclizations 466, 467
 (–)-englerin A 243, 252, 254
ent-halimanes 268
 abeopicrasanes from 284
ent-labdanes from 283–284
 [4.3.3]propellanes from 285
ent-halimic acid 268, 276
 chettaphanins from 281
 natural *ent*-halimanolides from 278
 quinone/hydroquinone sesquiterpenes from 285
 sesqui- and diterpene-alkaloids synthesis 286
 sesquiterpenyl-indoles from 289
 sesterterpenolides synthesis from 281
 (+)-thiersindole C from 288
ent-labdane derivatives 268, 278, 283–284
ent-nanolobalolide 254, 256
ent-steroids 374–375
 ephedra alkaloids, use in asymmetric synthesis 304
 ephedra-based 1,2-aminothioethers 306
Ephedra sinica 304
 ephedrine-assisted formation, of chiral phosphorous stereocenters 423
 ephedrine-based oxazolididine bearing phosphines 306
 ephedrines 297, 298, 300–307, 309, 311, 423
 epi-agelasine C 287, 288
 epibatidine 99, 336
 2-*epi*-deoxoprosopinine 52
 episulfonium ion 531
 epoxidation 495
 of allenylsilanes 496
 of allyl alcohol 23
 of cyclic enones 24
 of unsaturated ketone 25
 5,6-epoxy-5,6-secoesteroid 380
 ergosterol, as chiral building block 378–381
 erythrynlolide macrolactone synthesis 496, 497
 Eschenmoser-Claisen rearrangement 48

- estrogenic skeleton 374
 estrone synthesis 369, 419
 Evans' chiral auxiliary (Evans'
 oxazolidinones) 43, 47–48, 57,
 59, 60, 65, 66, 74, 168–172
 5-exo-trig radical cyclization 36
- f**
 (1S,4R)-(+)-fenchone 256, 260, 261, 396
 ferracyclopropane ring 600
 Fischer indolization 288
 fluoresceine-functionalized
 polyoxotungstate scaffold
 (R,R)-FITC-PW₉ 408
 fluorescent bioimaging probes 551
 fluorinated aspartic acid, keto analogue of
 416
 fluorinated phosphotyrosine analogue
 415
 FR901464 164
 Friedel–Crafts reaction 102, 104, 109,
 373–375, 533–535, 560, 569
 L-fucose 198
 Fukaiyama's total synthesis of
 ecteinascidin 156
 functionalization of vinyl selenones
 472–474
 furan-linked heterocycles 473
 furanose-derived dihydrofurans 493
 furo-*ent*-halimanolides 278, 280–281
 furolabdanes 269, 284
 (–)-fusaproliferin 308
- g**
 galacto-configured ligand 214
 galactopyranose 206
 galactose 197–198, 224, 408
 galactosides, synthesis of 408, 409
 γ-butyrolactams 177
 γ,δ-unsaturated-β-ketoesters 99
 γ-nitroketone 99
 Garner aldehyde 501
 gem-difluorinated pyrrolidine 181
 gem-dimethylcyclopropyl moiety 258
 gem-dimethyl unit 178, 179
 glucosamine 203, 217–219
 D-glucose 209, 214–216, 407, 474, 632
 glucopyranose 211
 glucopyranoside 205
- glucosides, synthesis of 408, 409
 glutamic acid 33, 50, 163, 166
 glutamine synthetase 416
 glycidol 22
 glycine 47, 48, 72, 73, 101, 106, 147, 167,
 340, 530
 glycine aldimino esters 106
 glycine enolate equivalents 167
 gold catalysis 10, 12, 509
 gold-catalyzed allene hydroamination
 508
 Grignard reagents 46, 51, 62, 70, 71, 215,
 252, 261, 309, 325, 327, 332, 394,
 441–443, 451, 455, 491, 494, 495,
 497, 501, 503, 507
 Groebke–Blackburn reaction 313
 guadial 258
 guaiane sesquiterpene aciphylene 246
 guaiane-type sesquiterpenoides 248, 249
- h**
 Hajos–Parish–Eder–Sauer–Wiechert
 reaction 173, 174
 Hajos–Parish ketone 367, 368
 Halimium viscosum 268
 harmicine 110, 162, 302
 harmonic oscillator model of aromaticity
 (HOMA) 555
 helical chirality 551, 552, 570, 571, 623
 helical chiral oligotriazole 111
 helical graphenes 555
 helical poly(phenylacetylene)s 343
 helically chiral oligotriazole 96
 helicene topological descriptors 554
 heptaethyleneglycol tether 646
 herbarulide synthesis 379–380, 382
 heterocycles 21
 medium-ring aliphatic 29–37
 small-ring 21–29
 heterocyclic hydrazones 50–57
 hetero-Diels–Alder reaction 151, 152,
 154, 201, 213
 heterohelicenes 552
 hexahydro-1*H*-pyrrolizines 468
 1,6-hexanediamine 87
 hexa-*peri*-hexabenzocoronene (HBC)
 555
 5-hexenoic acids 112
 Hofmann elimination 1

- homoallylamines 200
 homoallylic alcohols 107, 309
 homochiral knots 642
 homochiral open knot dicopper complex 646
 homophymine A 308
 homopropargyl alcohols 309, 491
 Hoveyda–Grubbs catalyst 29, 30, 369, 469
 (+)-hupeol 325
 hydrazones 43, 50–57, 112, 167, 260, 309
 hydroalkoxylation, of allenes 508
 hydroarylation, of allenes 504, 507, 509, 512
 hydronickelation 513
 14-hydroxyantofine 33
 (+)-hydroxyphthioceranic acid 318
 (−)-hygroline 320
- i**
- ibrexafungerp 450, 451
 imidazole-thiourea catalyst 96
 imidazolidinones 5, 173, 174, 187
 indacrinone 38
 inhibitor prodrug 413
 intermediate allenylzinc 492
 intermediate allylpalladium complexes 509
 intermolecular hydroamination 508
 interplanar angle 553, 554
 intramolecular allene–diene Diels–Alder cycloaddition 515
 intramolecular amide alkylation 2,5-DKPs synthesis 143
 intramolecular aza-Wittig reactions 142, 143, 480
 intramolecular [2+2+2] cyclization 561
 intramolecular double Diels–Alder reaction 558
 intramolecular hydroarylation, of chiral benzylallenes 504
 intramolecular π–π interaction 555
 intramolecular reductive amination 52
 (+)-intricarene 22
 iodohydroxylation 503
 iodonium cation/salt 188, 189, 401, 503, 560
 Ir-catalyzed dearomatization of indoles 31, 32
- iridium-catalyzed borylation and bromination 313
 (*R*)-irnidine 29, 30
 isatin-based boronic esters 528
 isatin-derived Michael acceptors 104–105
 isatins, reactions of 107–108
 IsButBOX 172
 (−)-isochrysotricine 501
 (−)-isocyclocapitelline 501
 isodrimeninol 269, 270, 273–274
 isofregenedol synthesis 269–271
 (+)-isomenthone 396
 isoprenoids, biosynthesis of 235, 237
 isopulegol 243, 244, 252, 254, 255
 iterative lithiation–borylation 318
- j**
- Jacobsen’s epoxidation 21, 23
 Jacobsen’s thiourea catalyst 88, 91, 93, 96, 97, 108–111, 173, 174
 jiadifenolide 243, 251, 252
 Julia-Coloma epoxidation 23
- k**
- (−)-kainic acid 320
 (+)-kalkitoxin 318
 Keggin-type polyoxotungstates 408
 kendomycin 241
 ketimines 97, 184, 543
 ketiminium intermediate 45
 ketone-derived benzoylhydrazones 309
 kinetic resolution 14, 25, 36, 173, 183, 190, 315, 324, 390, 511, 564, 569
 knotanophanes 644
 knot-stoppered dumbbell molecules 642, 643
 koumine alkaloids 164, 165
 Kunz auxiliary 198, 199
 (+)-kuraramine 325
- l**
- labdanes/labdane diterpenoids 268–272, 274, 283
 labdanolides 269, 274, 275
 (*R*)-lacosamide 163
 (−)-laurenditerpenol 250
 leubethanol 252, 254
 (*R*)(+)-limonene 237, 243, 246, 248–250

- (*R*)-(+)-limonene oxide 237, 243, 244, 249
 (*S*)-(–)-limonene 250
 limonene-derived allylic alcohol 250
 (+)-limonidilactone synthesis 274, 275
 (*R*)-(–)-linalool 237–239
 linear acenes 551
 lirinine 449, 450
 lithiation–borylation method 317–318
 lithium-coordinated intermediate 70
 lithium hexamethyldisilazane (LiHMDS) 449
 lupanine (2-oxosparteine) 314, 315, 325
 lupin alkaloids 314
 lycopoclavamine-A 169
- m**
 maackiamine 320
 macrocyclic aromaticity 593
 macrocyclization 10, 573
 (*S*)-macrostomine 313
 (–)-malyngolide 503
 Mannich reaction 38, 70, 108, 111, 176, 186, 188, 189, 200, 201, 307, 392, 533, 539–541
 D-manno-configured derivative 214, 216, 217
 D-mannopyranose 206, 224
 mannosamine 219
 D-mannose 213
m-CBPA (*m*-chloroperbenzoic acid) 23, 48, 155, 211, 224, 247, 249, 271, 274, 275, 280, 281, 331, 378, 379, 382–384, 469, 494, 495, 499
 (+)-membrenone C 493
 menthol 4, 235, 236, 389–396, 442–443, 454
 (–)-menthone 243, 244, 254, 256, 396
 L-menthyl bromoacetate 394
 L-menthyl chloroacetate 394
 L-menthyl H-phosphinite-boranes 395
 menthyl *p*-bromophenylsulfinate 451
 (–)-menthyl phenylphosphinate 391, 394
 (1*R*,2*S*,5*R*)-menthyl phosphinate (L-menthyl phosphinate) 391–393, 396
 (1*S*,2*R*,5*S*)-menthyl (*S*)-*p*-bromophenylsulfinate, 451–452
 methylphosphine-boranes 395
 menthyl *p*-toluenesulfinate 442–445, 447–448
 MeO-BIPHEP 397, 402, 405
 2-mercaptopbenzaldehydes 106
meso-tetraaryl-2-aza-21-carbaporphyrin 584, 585
meso-tetraphenyl-2-aza-21-carbaporphyrin 587
 metalation 400, 444, 593, 606, 609–612
 metallacycle-mediated annulative cross-coupling reaction 374, 375
 metallonitrenes 497
 methoxybenzamides 512
 4-methoxyphenylboronic acid 451
 methylcopper reagents 504
 methyleneindolinones 539
 methyl *p*-tolyl sulfoxide 444
 Michael acceptors 70–71, 96, 102, 104, 105, 113, 470–473
 Michael addition 36, 37, 43, 47, 49, 50, 52, 54, 57, 88, 89, 91, 97–105, 166, 177, 180, 190, 205, 217, 306, 311, 326, 339, 341, 343, 344, 369–372, 384, 411, 475, 477–481, 490, 529, 533–535
 of benzylidene pyruvates 103–104
 of enolizable ketones and aldehydes to nitrostyrene 99–101
 of enones 102–103
 of heteronucleophiles to nitrostyrene 102
 of maleimides 105–106
 of other carbon nucleophiles to nitrostyrene 101–102
 of other 1,3-dicarbonyls to nitrostyrene 98–99
 reactions of isatin-derived Michael acceptors 104–105
 Michael-Initiated Ring Closure Reactions (MIRC) 470–472
 Michael/Michael reaction 105, 180
 Michael-type reactions 475
 mitomycin K 25, 26
 Mitsunobu reaction 164, 252, 514

- Mizoroki–Heck reaction 339, 340, 341, 373
modified hybrid phase-transfer catalysts 530
molecular-defined nanocarbons 575
molecular knots 624
 composite knots 644–648
 covalent linking of trefoil knot building blocks 642–644, 648
 molecular or supramolecular structures 586
monoamine oxidase variants 302
monodentate BINAPINES 397
(–)-monomorine 337
monosaccharides 91, 225
Morita–Baylis–Hillman reaction 107
morpholine N-oxides 23, 304, 383
morpholin-3-ones 304, 309
multifunctionalized (tetrahydro)helicenes 561
multisubstituted pyrrolidines 539
mycestericin C 107
Myers’ alkylation 307
 natural products, total synthesis of 308
(1*R*,5*S*)(–)-myrtenal 256, 260
- N**
- N*-acetylardeemin 153, 154
N-acyl hydrazones 56
N-acyl oxazolidinethiones 59
N-acyl oxazolidinones 59
N-acyl thiazolidinethiones 59
N-alkynones, nickel-catalyzed
 regiospecific and enantioselective reductive cyclization of 36
nanographene 551, 555, 556
naphthalenediimide 630, 637
naphthalenes 212
Nazarov cyclization 90, 499–500, 533
N-Boc-pyrrolidine 33, 318–320, 323
N,*C*3-bridged tricyclic tropaquinuclidines 338
N-confused porphyrin (NCP) 586
*N*¹⁴-desacetoxytubulysin *H* 165
Negishi cross coupling reactions 162, 163, 317, 319–321, 565
(+)–neopeltolide synthesis 240, 241
- neurokinin-1 receptor antagonist (–)-L-733,060 320
NHC induced hydrosilylation of ketones 220
Ni-catalyzed synthesis, of piperidine building block 37
Nicotiana rustica 311
Nicotiana tabacum 311
(S)-nicotine 298, 300, 301, 311–314, 320, 324
nicotinic acetylcholine receptors (nAChRs) 315
nicotinic receptor modulator 313
Nishiyama PyBox ligands 172
N-methylephedrine 304
N-methylmorpholine (NMM) 146, 178, 179, 206
N-methylpyrrolidone (NMP) 60, 61, 176, 179
*N*1,*N*1-dialkyl-cyclohexane-1,2-diamines 89, 106
norleucine 408
nornicotine 311
norvaline 408
Nozaki–Hiyama–Kishi reaction 169
N-phenylselenophthalimide (N-PSP) 467
N-phosphinoyl oxazolidinones, diastereoselective formation of 422
N-protected amino alcohols 471
nucleophilic cyclization, of allene derivatives 500–509
nucleophilic substitution, of Cinchona alkaloids 332
nylon 87
- O**
- octalactins 444
O’Donnell Schiff base 326, 340, 341
oligo(oxyethylene) 629, 635
Olofsson diaryliodonium salt 188, 189
one-pot Michael–Michael–aldol reaction sequence 369
one-pot Mukaiyama Michael/Michael reaction 180
onium salts as charged catalysts, in PTC 524, 529–532
(+)–onoseriolide 259, 260

- ophiobolins 238, 239
O-phosphorylated amino acids 413
 optoelectronic organic materials 551
 organic field-effect transistors (OFET) 551, 569
 organic light-emitting diodes (OLEDs) 569, 570
 organic photovoltaics (OPVs) 569, 570
 organoboron compounds 525
 organocatalysts 89, 341
 amino acid and peptide based
 organocatalysts 173, 174
 definition 172
 diarylprolinol silyl ether and analogous systems 179
 proline 174–176
 proline amides and peptides 177–179
 proline analogues 184
 organocatalytic allylboration 525
 organocatalytic desymmetrizing opening,
 of racemic azetidines 27
 organocatalytic epoxidation of alkenes 24
 of unsaturated aldehydes and ketones 24
 organocatalytic synthesis
 of chiral pyrrolidines 32
 of spirooxindol intermediate 33
 organocerium reagents 51
 organocupper reagent 205, 496
 organolithium-(*–*)sparteine complexes 316
 organophosphorus compounds
 with axial chirality 397–406
 with incorporated chiral terpene moieties 389–397
 ouabagenin 371–372
 oxazaborolidines 172
 1,3,2-oxazaphospholidine boranes 310, 423
 oxazaphospholidines 310, 424, 425
 oxazaphosphorinane 70
 1,3-oxazinanes 319, 321
 1,3-oxazinan-2-one 477, 478
 oxazolidine-based chiral auxiliaries 57–60
 oxazolidines 57–60, 67, 68, 173, 204, 304, 306, 319
 oxazolidinones 43, 55–57, 202
 Evans' chiral auxiliary 43, 47–48, 57, 59, 60, 65, 66, 74, 168–172
 SuperQuat chiral auxiliaries 170–172
 oxidative rearrangement 246, 375, 376
 oxidative spirolactonization 223
 oxo-Diels–Alder (oxa-Diels–Alder)
 reaction 151, 537
 oxy-functionalized steroids,
 enantioselective synthesis of 370–371
 oxygenation 588, 597, 600
 ozonolysis 70, 248, 250, 256, 261, 337
- p**
- palladium-catalyzed 5-*endo*-trig cyclization 504
 P and C-stereogenic aminophosphines 306
 Pauson–Khand reaction 2, 6, 14, 252, 256, 510–512
 P-chiral compounds 322
 P-chiral phosphines 310
 Pd-catalyzed allylic substitution 36
 Pd-catalyzed Negishi cross-coupling 319
 pentacene 551
 pentacyclindole analogues 289, 290
 peptide ligation, building block for 35
 peptidomimetics 73, 414, 415
 pereniporin A 269, 270, 273
 pereniporin B 269, 270, 273
 (*R*)-(+)-perillyl alcohol 243, 244, 250, 251
 (*S*)-(–)-perillyl alcohol 243, 244, 250, 251
 Petasis reaction 111, 330, 526, 528
 phakellin 153, 154
 phase transfer catalysis (PTC) 225, 327, 524, 529–532
 phellodonin 154–155
 phenanthroline 628, 629, 646
 phenanthro[3,4-*c*]phenanthrene 552
 phenanthroindolizidine alkaloids 33
 8-phenyl-3-aza lactam 65
 phospha-Mannich reactions 393–394
 phosphatase-stable analogue, of
 phosphothreonine (pThr) 414
 phosphine boranes 322, 395
 phosphinous acid-borane amides 422

- phosphonamide based chiral auxiliaries 68–72
 phosphonamides 43, 69
 phosphonate BINAP derivatives 398
 phosphonoalanine 407, 409
 phosphonoglutamic acid 410, 413
 L-phosphonomethylphenylalanine (L-Pmp) di-*t*-butyl ester 414
 phosphonovaline 407
 phosphoserine 413, 414
 4-phosphothiophen-2-yl alanine 162, 163
 phosphotreonine 414
 photocatalytic deracemization 516
 photochemical cyclodehydrogenation 558
 photomediated CH-heteroarene alkylation 333
 picrasanes 278, 279, 284
 Pictet–Spengler reactions 33, 109, 143, 146, 156, 301, 409, 501, 543, 544
 pinnigorgiol B synthesis 380–382
 pinnigorgiol E synthesis 380–382
 piperidines 34, 36, 37, 43, 52, 73, 146, 182, 201, 248, 250, 251, 307, 313, 319, 336, 505, 536, 568
 planar chiral cyclophanes 321
 planar chirality 321, 322, 586
 (–)-platensimycin 308
 platinahelicene complex 570
 pleurocin A/matsutakone synthesis 378, 380
 plinol A 237–238
 plumbemycin A 417–418
 polygodial 269, 273
 polyalthenol analogues 289–290
 polyBINOL-BINAP-B bifunctional polymeric ligand 402
 polyEster-BINAP 402
 polymer supported 4,4'-substituted-BINAP-based ligands 400
 polyoxygenated steroids 381
 polystyrene-supported bis-Cinchona ether 344
 porphyrin systems 583
 Povarov reaction 109, 112, 201
 pregnenolone, as chiral building block 377–378
 presaccharotriolide Z 169
 primary aminophosphines 422
 prolinamides 106, 177, 221
 proline 31, 43–45, 49, 50, 55, 95, 100, 147, 162, 166, 172–189, 311, 320, 392, 393, 401
 proline-derived chiral auxiliaries 43–45
 (S)-prolinol 44–46, 424
 propargylation, of ketones 525
 propellanes 278, 279, 285
 propindilactone G synthesis 383–384
 pseudo-enantiomeric 215
 pseudo-enantiomeric effect 197
 pseudoenantiomers 326
 pseudoephedrines 57, 298, 299, 302–306, 309–311, 424
 pseudoephephamines 302
Pseudomonas aeruginosa deacetylase 453
 pseudopteroxazole 241
P-stereogenic compounds synthesis (–)-L-menthol 390
 L-Menthyl H-phosphinates 393
P-stereogenic organophosphorus compounds 391
P-stereogenic phosphine oxides 395
P-stereogenic phosphinous acid amides 420, 421
P-stereogenic phosphonium salt 395
(2*R*)-pterosin B 167
(*R*)-*p*-toluenesulfinamide (Davis's reagent) 449–451
pulegone 243, 244, 251–253
P2Y12 antagonists 412
(–)-pyrrolam A 320
pyrrolidine 29, 30, 36, 43
3,3'-pyrrolidonyl spirooxindole scaffolds 539
pyrrolyl Grignard reagent 507
- q**
quaternary α-amino acids 478, 479, 535
quincoridine 329, 330
quincorine 329–330
quinidine 297, 298, 325–330, 334, 477
quinine 57, 297–301, 325–334, 335, 343, 393, 475, 479, 564, 565
(–)-quinocarcin 308

- quinone/hydroquinone, sesquiterpenes from 285
- quaternary ammonium salts 37, 38, 88, 224, 311, 529
- r**
- regioselective *ortho*-lithiation 312, 321
- retosiban 147, 148
- retro-Diels-Alder reaction 1
- (*-*)-rhazinilam 507
- Rh-catalyzed aziridination 498
- Rh(I)-catalyzed enantioselective allenic Pauson-Khand reaction 511
- Rh-catalyzed nitrene addition 498
- Rh-catalyzed synthesis, of pyrrolidine building block 32
- rhizococcin A 417–418
- Rh-Pd-catalyzed formation, of β -lactams 28, 29
- ring-closing olefin metathesis (RCM) 564
- ring distortion
- of quinine 331
 - of yohimbine 299, 300
 - strategy 300, 330–331
- rotaxanes 626, 639–641
- formation 631
- rubriflordilactone B 250, 251
- (+)-ryanodol 251–253
- s**
- saccharide-thiourea 100
- sarcodonin ϵ 154–155
- sarpagine 164, 165
- scanning tunneling microscopy (STM) 573
- Schiff base thiourea 103
- Schöllkopf bis-lactim ether 148, 149, 167, 168
- Schöllkopf's chiral auxiliaries 72–73, 148, 167–168
- scopolamine 302, 335–336
- scopoline 336
- seco-casbane 258
- secondary amine-phosphoramido 95
- secondary amine-thiourea catalyst 100
- selenium-heteroatom nonbonding interaction 465
- serine 25, 162–164, 413, 450
- serine protease inhibitors 450
- sesqui-and diterpene-alkaloids synthesis 286
- sesquiterpene-indoles 290
- sesquiterpenyl indoles, synthesis of 289
- sesterterpenolides and glycerols hybrids 283
- sesterterpenolides synthesis 282
- SfmC peptide synthetase 301
- Sharpless asymmetric epoxidation 14, 21, 22, 238, 271, 501
- Shi epoxidation of olefins 220, 221
- silylene transfer 499
- single-walled carbon nanotubes (SWCNTs) 573
- S_N2' substitution reactions 490, 504, 506, 514
- soluble dendritic BINAP-based organometallic catalysts 402
- soluble polymer-supported catalysts 402
- Sonogashira coupling 321, 327, 490
- (*-*)-sparteine 33, 297, 299–301, 314–325
- (*+*)-sparteine surrogate 314, 315, 317, 319, 320, 322–324
- (*-*)-sparteine surrogate 324
- spirodiepoxides 494, 496
- spiroketal intermediates 453
- spirooxindole 31, 33, 34, 539
- spiropyrrolidines 29
- spirotryprostatin B 29, 30, 139, 150
- squaramides 92, 93, 97, 99, 102, 104, 107, 109, 326, 327, 341, 342, 343, 475
- squaramide organocatalysts 37, 93, 98, 102
- Staudinger reaction 25, 142
- steganone 447
- (*-*)-stemaphylline 318, 323
- stephacidin B 150–151
- stereoisomeric
- 2,5-diazabicyclo[2.2.2]octanes 144
- stereospecific aziridination, of chiral allene 498
- steroidal precursor synthesis 376
- steroid analogue synthesis 375
- steroids as chiral building blocks 367, 376
- core structure 367
- naturally occurring 367

- Strecker reaction 51, 88, 91, 93, 96, 97, 108, 173, 198, 201, 533, 542
Streptococcus Pneumoniae 468
 strophasterol 379, 381
 (–)-strychnofoline 33, 34
 Suarez radical process 384
 2-and 3-substituted β -aminoacids 320
 4,4'-substituted-BINAP derivatives 399
 5,5'-substituted BINAP derivatives 402
 6,6'-substituted BINOLs 402
 1-substituted dihydroisoquinolines 111
 sugar auxiliaries implementation 197
 sugar-derived BOX ligands 218
 sugar-derived DACH ligands 217
 sugar-enol ethers 213
 sulfinylallenes 503
 sulfoxide-oxazoline ligand 448
 sulfoximines 454
 sulfur-containing oxazolidinones 59
 SuperQuat chiral auxiliaries 169–171, 179
 Suzuki/Suzuki–Miyaura coupling 167, 308, 321, 398, 399, 401, 404, 490, 507, 560–562, 571, 573
 swainsonine 33, 35
 (+)-synargentolide A 167
- t**
 tadalafil 145–146, 164
 Takemoto catalyst 88–90, 93, 97, 99, 101, 104–107, 109, 111, 114
 tandem aza-Michael addition/ α -ester enolate alkylation 54
 tartaric acid 21, 87, 88, 324, 642
 taxol 153, 267
 telaprevir 320, 324
 teleocidin B1 25
 (–)-terpestatin 245, 308
tert-butanesulfonamide 452, 453
tert-butylhydroperoxide (TBHP) 22, 224, 239, 380, 456
(R)-*tert*-butyl *tert*-butanethiosulfinate (Ellman's reagent) 452, 453
tert-butyl sulfoxide 452
tert-leucine 88, 91, 93, 95
 tetraarylporphyrin 585
 tetracyclic steroidal core synthesis 374
 3,4,5,6-tetrahydro-2*H*-1,3,4-oxadiazin-2-one 309
 tetrahydro-4*H*-pyran-4-one 107
 tetrahydronaphthalenic system (THN) 271
 tetrahydropalmidine 446
 tetrahydroxyadipic acid 642
 tetraknotane 642, 644
 tetra-O-pivaloyl- β -galactopyranose derivative 208
(–)-thiersindole C 288
(+)-thiersindole C 288
 thiobenzamide 496
 thiourea Schiff bases 91, 93, 96, 103
 threonine 164, 413, 418
 tigogenin, as chiral building block 381, 383, 384
 time-dependent DFT (TD DFT) method 587
 titanium-mediated cyclization 510
 tobacco alkaloids 303, 311–314
 topological chirality 627–631, 648
 topologically chiral molecular knots 634–638
 torqueselectivity 499
trans-1,2-diaminocyclohexane (DACH) 87–137, 217, 218, 324, 515
trans-2,5-dimethylpyrrolidine 46
trans-2,3-disubstituted indolines 321
2,5-trans-disubstituted pyrrolidines 46–49, 467
 transesterification 171, 384, 525, 528
 tri- and tetracyclic diterpenes 275–276
(–)-trigonoliimine A 477
 10-(trimethylsilyl)-9-borabicyclo [3.3.2]decanes 309
 tris(phendanthroline) 629
 trofinetide 146, 147
 tropane alkaloids, members of 335
 tropaquinolides 338
 Trost-type ligands 216
 tryprostatin B 149, 150
 tryptamine 31, 109, 143, 501, 502, 533, 543
 tryptoline 300
 tryptophan 146, 152, 164, 165
 tryptophol 110
 tubulysin U 165, 166
 TunaPhos ligands 402
 turpentine, isoprenoid composition of 237

twistacenes 552, 571–572, 575

two-braid metallo-helicate approach 634

U

α,β -unsaturated carboxylic acid

derivatives 214, 308

(thio)urea Schiff base organocatalysts

88, 91, 93

urea-sulfonamide catalyst 93

uridine derivatives 472

V

valine 72, 95, 149, 167, 168, 170, 172

valine chiral auxiliary 149

variecolortide A 151, 152

(1*R*,5*R*)-(+)verbenone 235, 236, 256,
259, 260

verroculugen 139, 140, 164

versicolamide B 151

vinylcyclopentanones 510, 513

vinylnaphthalene 215

vinyl phosphonamide 70

vinyl selenones 463, 470–481

vulgarobufotoxin 377–379

W

warburganal 269, 270, 273

Weinreb amide 59, 70, 162, 318, 454

Wieland–Miescher ketone 367, 368

X

xishacorene B 246, 248

xylopinine 446

xylose 474

xylose-based auxiliary 204

Y

Yamada auxiliary 44, 166

Z

zamoranic acid 268–278

chrysolic acid and isofregenedol from
269–271

drimanes synthesis from 272–273

isodrimenol synthesis from 273–274

labdane diterpenoids from 271–272

labdanolides and furolabdananes from
274–275

tricyclic key intermediates from 278

zaragozic acid A 167

Zimmerman–Traxler-type cyclic
transition states 59, 525

zinc alkoxide 569