TYPE OF REACTION INDEX

This index lists the preparations contained in this volume in accordance with general types of reactions. Only those preparations that can be classified under the selected heading with some certainty are included. The arrangement of types and of preparations is alphabetical.

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L. HETEROCYCLIC-[M,N]
1,4-Dihydronaphthalene 1,4-oxide, 653
2,4-endo,endo-Dimethyl-8-oxabicyclo[3.2.1]oct-6-en-3-one, 339
Ethyl 5-chloro-3-phenylindole-2-carboxylate, 386
2,3,5,6,8,9-Hexahydrodiimidazo-[1,2-a:2′,1′-c]pyrazine, 667
[(2)-N,O,O′[2,2′-Iminobis[ethanolato]]]-2-butylboron, 613
11-Oxatricyclo[4.3.1.$1^{2,5}$]undec-3-en-10-one, (1α,2β,5β,6α)-, 584
1,4,7,10-Tetraazacyclododecane, 667
syn- and anti-1,4,5,8-Tetrahydroanthracene-1,4:5,8-diepoxide, 678
ARYLATION
2-(4′-Acetylphenyl)thiophene, 9
4-Biphenylcarboxaldehyde, 102
Butyl 4-chlorophenyl sulfide, 147
trans-4,4′-Dibromostilbene, 263
1,3-Dimethyl-6H-benzo[b]naphtho[1,2-d]pyran-6-one, 448
Ethyl 3-(p-cyanophenyl)propionate, 391
4-Methoxy-2′-methylbiphenyl, 501
2-(4-Methoxyphenyl)-2-cyclohexen-1-one, 467
2-(2-Methoxyphenyl)-2-methylpropionitrile, 505
(R)-3-Phenylcyclohexanone, 609
(Phenyl) [2-(trimethylsilyl)phenyl]iodonium triflate, 653
1,2,3,4-Tetrahydrocarbazole, 683
(3,4,5-Trifluorophenyl)boronic acid, 80

CLEAVAGE
A. DEALKYLATION
1-Acetoxy-3-(methoxymethoxy)butane, 492

Diethyl (R)-(−)-(1-amino-3-methylbutyl) phosphonate, 282
O^4,O^5-Isopropylidene-3,6-anhydro-1-deoxy-1-iodo-D-glucitol, 471
B. HYDROLYTIC (*See also* Hydrolysis)
(1S)-(−)-1,3-Dithiane 1-oxide, 378
(S)-5-Hydroxymethylfuran-2(5H)-one, 153
β-Mercaptopropionitrile, 475
3-Phenyl-1-pyrroline, 648
C. OXIDATIVE
2-Amino-3-fluorobenzoic acid, 23
N-Benzyl-2,3-azetidinedione, 41
Meroquinene tert-butyl ester, 36
1-Oxo-2-cyclohexenyl-2-carbonitrile, 591
D. REDUCTIVE
(S)-2-[(4S)-N-tert-Butoxycarbonyl-2,2-dimethyl-1,3-oxazolidin-4-yl]-2-tert-butyldimethylsiloxyethanal, 140
3-Deoxy-1,2:5,6-bis-O-(methylethylidene)-α-D-ribohexofuranose, 240
β-3′,5′-Di-O-benzoylthymidine, 246
Diethyl (R)-(−)-(1-amino-3-methylbutyl) phosphonate, 282
(3R)-1-(Dimethylphenylsilyl)-1-buten-3-ol, 531
2-Fluoro-4-methoxyaniline, 418
(M)-2-Hydroxymethyl-1-(2-hydroxy-4,6-dimethylphenyl)naphthalene, 449
N-(4-Methoxybenzyl)-3-phenylpropylamine, 482
(R)-α-Methylbenzenepropanal, 509
(R)-β-Methylbenzenepropanol, 509
(+)-(1S,2R)- and (−)-(1R,2S)-trans-2-Phenylcyclohexanol, 603
1,4,7,10-Tetraazacyclododecane, 667
E. MISCELLANEOUS
1,3-Diacetylbicyclo[1.1.1]pentane, 86
(R)-2-Methyl-1-phenyl-3-heptanone, 509
1-Phenyl-3-butyn-1-ol, 621
(Z)-4-(2-Propenyl)-3-octen-1-ol, 662
(S)-(+)-p-Toluenesulfinamide, 47
Vitamin D_2 3,5-dinitrobenzoate, 718

CONDENSATION The term "condensation" is used here in a restricted sense and applies to those reactions in which a carbon-carbon bond is formed by the elimination of a simple molecule. *Cyclization* and *Dehydration* reactions are listed separately. Many other reactions that produce a carbon-carbon bond are listed under other headings. (See *Addition: Alkylation, Diazotization: FriedelCrafts Reaction: Grignard Reaction: Rearrangement: Reduction.*) The subheadings illustrate the types of reactions leading to the compounds listed.
A. CARBONYL-YLIDE CONDENSATION
(−)-(E,S)-3-(Benzyloxy)-1-butenyl phenyl sulfone, 66
Ethyl (E)-(−)-4.6-O-ethylidene-(4S,5R,1′R)-4,5,6-trihydroxy-2-hexenoate, 405
Methyl (4S)-4,5-O-isopropylidenepent-(2Z)-enoate, 153
(Z)-1,1,1-Trifluoro-2-ethoxy-5-phenyl-2-pentene, 703
B. ESTER-ACTIVE METHYLENE CONDENSATION
3-Benzoyl-N-vinylpyrrolidin-2-one, 646
Diethyl [2-^{13}C]malonate, 432
Potassium methyl α-[(methoxyethylidene) amino]-β-hydroxyacrylate, 489
C. MISCELLANEOUS
Ethyl 4-hydroxy[1-^{13}C]benzoate, 432
1-Oxo-2-cyclohexenyl-2-carbonitrile, 591

COUPLING
2-(4′-Acetylphenyl)thiophene, 9
6,6′-Bi(3,4-dihydro-2H-pyran) (Bis-DHP), 552
4-Biphenylcarboxaldehyde, 102
4-[(4-Bromophenyl)azo]morpholine, 263
6-Chloro-1-hexene, 222
8-Chloro-1-octene, 222
trans-4,4′-Dibromostilbene, 263
1,3-Dimethyl-6H-benzo[b]naphtho[1,2-d]pyran-6-one, 448
N,N′-Dimethyl-1,2-diphenylethylenediamine, 312
2,7-Dimethylnaphthalene, 332
Ethyl 5-chloro-3-phenylindole-2-carboxylate, 386
Ethyl 3-(p-cyanophenyl)propionate, 391
9-Ethyl-3,6-dimethylcarbazole, 396
4-Methoxy-2′-methylbiphenyl, 501
2-(4-Methoxyphenyl)-2-cyclohexen-1-one, 467
N-[(R)-α-Methylbenzyl-(R)-α-methylbenzenepropanamide, 509
5-Methyl-2,2′-bipyridine, 517
7-Methylene-8-hexadecyn-6-ol, 599

COUPLING (*Continued*)
Methyl methanethiosulfonate, 546
(Z)-4-(2-Propenyl)-3-octen-1-ol, 662
Tetrakis(dimethylamino)diboron, 116
Tris[(2-perfluorohexyl)ethyl]phenyltin, 712
CYCLIZATION
A. CONDENSATION
(4aS), (8aR)-2-Benzoyl-1,3,4,4a,5,8a-hexahydro-6(2H)-isoquinolinone, 37
N-Benzyl-3-(1-hydroxyethyl)azetidin-2-one, 42
4-(2-Bromo-2-propenyl)-4-methyl-γ-butyrolactone, 135
(5S)-(5-O-tert-Butyldimethylsiloxymethyl)furan-2(5H)-one, 152
(4R-trans)-2-Butyl-N,N,N′,N′-tetramethyl[1,3,2]dioxaborolane-4,5-dicarboxamide, 613
(S,S)-1,2,3,4-Diepoxybutane, 297
(R,R)-1,2:4,5-Diepoxypentane, 276
6,7-Dihydrocyclopenta-1,3-dioxin-5(4H)-one, 293
3-(1,1-Dimethylethyl) 4-methyl (S)-2,2-dimethyl-3,4-oxazolidine dicarboxylate, 320
(R,R)-Dimethyl O,O-isopropylidenetartrae, 349
3,3-Dimethyl-1-oxaspiro[3.5]nonan-2-one, 339
(4R,5S)-4,5-Diphenyl-2-oxazolidinone, 374
9,10-Diphenylphenanthrene, 359
5,15-Diphenylporphyrin, 370
Ethyl 5-chloro-3-phenylindole-2-carboxylate, 386
Ethyl 4-hydroxy[1-^{13}C]benzoate, 432
(1′R)-(−)-4,6-O-Ethylidene-D-glucose, 405
(±)-3-Ethyl-1-oxaspiro[3.5]nonan-2-one, 341
1-(2-Fluoro-4-iodophenyl)-2,5-dimethyl-1H-pyrrole, 418
7-Fluoroisatin, 24
2,3,5,6,8,9-Hexahydrodiimidazo[1,2-a:2′,1′-c]pyrazine, 667
N-Hydroxy-4-(p-chlorophenyl)thiazole-2(3H)-thione, 437
(S)-5-Hydroxymethylfuran-2(5H)-one, 153
[(2-)-N,O,O′[2,2′-Iminobis[ethanolato]]]-2-butylboron, 613
(1S,2R)-Indene oxide, 30
(3R*,4R*)- and (3R*,4S*)-4-Isopropyl-4-methyl-3-octyl-2-oxetanone, 343
4-Methoxycarbonyl-2-methyl-1,3-oxazole, 488
(1′S,2′S)-Methyl-3O,4O-(1′,2′-dimethoxycyclohexane-1′,2′-diyl)-α-D-mannopyranoside, 523
[R-(R*,S*)]-β-Methyl-α-phenyl-1-pyrrolidineethanol, 556
Methyl (S)-2-phthalimido-4-methylthiobutanoate, 562
2-Methyl-4H-pyran-4-one, 567
1-Oxo-2-cyclohexenyl-2-carbonitrile, 591
2-Phenyl-1-pyrroline, 648
1,4,7,10-Tetraazacyclododecane, 667
(1R,2S,6R,7S)-1,10,10-Trimethyl-4-oxo-5-aza-3-oxatricyclo[5.2.1.0]decane, 306
B. CYCLOADDITION
7α-Acetoxy-(1Hβ, 6Hβ)-bicyclo[4.4.1]undeca-2,4,8-triene, 1
3-Acetyl-6-butoxy-2H-pyran-2,4(3H)-dione, 567
(1R*,6S*,7S*)-4-tert-Butyldimethylsiloxy)-6-(trimethylsilyl)bicyclo[5.4.0]undec-4-en-2-one, 156
tert-Butyl 3a-methyl-5-oxo-2,3,3a,4,5,6-hexahydroindole-1-carboxylate, 188
4-Carbomethoxy-3-dimethylamino-1-tert-butyldimethylsiloxy-1-cyclohexene, 442
1,4-Dihydronaphthalene 1,4-oxide, 653
2,4-endo,endo-Dimethyl-8-oxabicyclo[3.2.1]oct-6-en-3-one, 336
2-Methyl-4H-pyran-4-one, 567
11-Oxatricyclo[4.3.1.1^{2,5}]undec-3-en10-one, (1α,2β,5β,6α)-, 584
2-Phenyl-2,3-dihydrofuran, 621
syn- and anti-1,4,5,8-Tetrahydroanthracene-1,4:5,8-diepoxide, 678
endo-Tricyclo[3.2.1.0^{2,4}]oct-6-ene, 231
C. FREE RADICAL-CARBENOID/NITRENOID
1,1-Dibromo-2,2-bis(chloromethyl)cyclopropane, 658
1-Cyclopropylcyclopropanol, 88
(2S,3S)-(+)-(3-Phenylcyclopropyl) methanol, 613
D. REDUCTIVE CYCLIZATION
Ethyl 5-chloro-3-phenylindole-2-carboxylate, 386

[1.1.1]Propellane, 658
E. MISCELLANEOUS
4a(S),8a(R)-2-Benzoyl-1,3,4,4a,5,8a-hexahydro-6(2H)-isoquinolinone, 37
Bis(pinacolato)diboron, 115
ε-Caprolactam, 207
3-Cyclopentene-1,1-dicarboxylic acid, 228
Cyclopropene, 231
Cyclopropylacetylene, 234
1,3-Dimethyl-6H-benzo[b]naphtho[1,2-d] pyran-6-one, 448
9,10-Diphenylphenanthrene, 359
Ethyl glycidate (Ethyl (R)-(+)-2,3-epoxypropanoate), 401
1-Hydroxy-1,2-benziodoxol-3(1H)-one 1-oxide, 696
O^4,O^5-Isopropylidene-3,6-anhydro-1-deoxy-1-iodo-D-glucitol, 471
[R-(R*,S*)]-β-Methyl-α-phenyl-1-pyrrolidineethanol, 556
2-Pentyl-3-methyl-5-heptylfuran, 598
2-Phenyl-2,3-dihydrofuran, 621
1,2,3,4-Tetrahydrocarbazole, 683
CYCLOPROPANATION
1,1-Dibromo-2,2-bis(chloromethyl) cyclopropane, 658
1-Cyclopropylcyclopropanol, 88
(2S,3S)-(+)-(3-Phenylcyclopropyl)methanol, 613

DEACYLATION
L-Allylglycine, 12
N-Boc-L-allylglycine, 12
(3R)-1-(Dimethylphenylsilyl)-1-buten-3-ol, 531
(1S)-(−)-1,3-Dithiane 1-oxide, 378
β-Mercaptopropionitrile, 475
3-(Methoxymethoxy)-1-butanol, 492
DECARBOXYLATION
2-Amino-3-fluorobenzoic acid, 23
3-Chloro-2-(chloromethyl)-1-propene, 212
3-Cyclopentene-1-carboxylic acid, 228
Dec-9-enyl bromide, 237
2-Methyl-4H-pyran-4-one, 567
2-Phenyl-1-pyrroline, 648
DEPROTECTION
A. NITROGEN
Diethyl (R)-(−)-(1-amino-3-methylbutyl)-phosphonate, 282
N,N′-Dimethyl-1,2-diphenylethyl-enediamine, 312
2-Fluoro-4-methoxyaniline, 418
N-(4-Methoxybenzyl)-3-phenylpropyl) amine, 482
B. OXYGEN
(2S,3R)-2,4-Dimethyl-1,3-pentanediol, 343
Ethyl 5-(3-oxocyclohexyl)pentanoate, 411
4-Hydroxymethyl-2-cyclohexen-1-one, 442
DIAZOTIZATION
(S)-(−)-2-Bromo-3-hydroxypropanoic acid, 401
4-[(4-Bromophenyl)azo]morpholine, 263
2-Hydroxy-5-methylpyridine, 517
DIELS-ALDER REACTIONS (including ENE REACTIONS)
3-Acetyl-6-butoxy-2H-pyran-2,4(3H)-dione, 567
tert-Butyl 3a-methyl-5-oxo-2,3,3a,4,5,6-hexahydroindole-1-carboxylate, 188
4-Carbomethoxy-3-dimethylamino-1-tert-butyldimethylsiloxy-1-cyclohexene, 442
1,4-Dihydronaphthalene 1,4-oxide, 653
11-Oxatricyclo[4.3.1.$1^{2,5}$]undec-3-en-10-one, (1α,2β,5β,6α)-, 584
syn- and anti-1,4,5,8-Tetrahydroanthracene-1,4:5,8-diepoxide, 678
endo-Tricyclo[3.2.1.$0^{2,4}$]oct-6-ene, 231

ELIMINATION
A. DEHYDRATION
N-Benzyl-3-(Z/E)-ethylideneazetidin-2-one, 42
9,10-Diphenylphenanthrene, 359
α-Tosylbenzyl Isocyanide, 692
B. DEHYDROHALOGENATION
Bicyclopropylidene, 88
Cyclopropene, 231
Cyclopropylacetylene, 234
(S,S)-1,2,3,4-Diepoxybutane, 297
(R,R)-1,2:4,5-Diepoxypentane, 276
Ethyl glycidate (Ethyl (R)-(+)-2,3-epoxypropanoate), 401
O^4,O^5-Isopropylidene-1,2:3,6-dianhydro-D-glucitol, 471
Lithium pentafluoropropen-2-olate, 460

ELIMINATION (*Continued*)
Methyl (S)-2-isocyanato-3-phenylpropanoate, 544
Penta-1,2-dien-4-one, 595
1-Propynyllithium, 627
C. MISCELLANEOUS
3-Acetyl-6-butoxy-2H-pyran-2,4(3H)-dione, 567
N-Benzyl-3-(Z/E)-ethylideneazetidin-2-one, 42
4-Bromo-3-penten-2-one (in situ), 595
(tert-Butyldimethylsilyl)allene, 165
3-Chloro-2-(chloromethyl)-1-propene, 212
3-Cyclopentene-1-carboxylic acid, 228
(S,S)-1,2,3,4-Diepoxybutane, 297
1,4-Dihydronaphthalene 1,4-oxide, 653
(E)-4-Dimethylamino-3-buten-2-one, 301
9,10-Diphenylphenanthrene, 359
(4R,5S)-4,5-Diphenyl-3-vinyl-2-oxazolidinone, 374
4-Hydroxymethyl-2-cyclohexen-1-one, 442
2-Methyl-4H-pyran-4-one, 567
[1.1.1]Propellane, 658
anti- and syn-1,4,5,8-Tetrahydroanthracene-1,4:5,8-diepoxide, 678

ENAMINE OR IMINE FORMATION
(S)-(+)-N-(Benzylidene)-p-toluenesulfinamide, 47
(R,R)-N,N′-Bis-(3,5-di-tert-butylsalicylidene)-1,2-cyclohexanediamine, 98
6-Chloro-1-pyrrolidinocyclohexene, 584
N-Methylbenzimine, 312
N-[(1R)-Phenyl-(2R)-methoxyethyl]isovaleraldehyde imine, 283
2-Phenyl-1-pyrroline, 648

ENZYMATIC REACTIONS
1-Chloro-(2S,3S)-dihydroxycyclohexa-4,6-diene, 217
(3S)-1-(Dimethylphenylsilyl)-1-buten-3-ol, 531
(3R)-1-(Dimethylphenylsilyl)-1-buten-3-ol acetate, 531

EPOXIDE FORMATION
(S,S)-1,2,3,4-Diepoxybutane, 297
(R,R)-1,2:4,5-Diepoxypentane, 276
(1S,2R)-Indene oxide, 30
O^4,O^5-Isopropylidene-1,2:3,6-dianhydro-D-glucitol, 471
trans-2-Methyl-2,3-diphenyloxirane, 537
Potassium glycidate, 401
1,1,1-Trifluoro-2-ethoxy-2,3-epoxy-5-phenylpentane, 703

ESTERIFICATION
A. OF UNSUBSTITUTED MONOBASIC ACIDS
1-Acetoxy-3-(methoxymethoxy)butane, 492
2-(N-Benzyl-N-mesitylenesulfonyl)amino-1-phenyl-1-propyl propionate, 56
(R)-(+)-2-Hydroxy-1,2,2-triphenylethyl acetate, 464
Phenyl 2-methylpropanoate, 339
N-(10-Undecenoyloxy)pyridine-2-thione, 237
B. OF SUBSTITUTED MONOBASIC ACIDS
Benzyl (S)-2-(N,N-dibenzylamino)-3-phenylpropanoate, 256
N-Benzyloxycarbonyl-L-serine 3-methyl-3-(hydroxymethyl)oxetane ester, 73
(±)-1,1′-Bi-2-naphthyl ditriflate, 112
N-[(1,1-Dimethylethoxy)carbonyl]-L-serine methyl ester, 320
3,5-Dimethylphenyl 1-bromo-2-naphthoate, 448
Ethyl (R)-(+)-2,3-epoxypropanoate, 401
Ethyl glycidate (Ethyl (R)-(+)-2,3-epoxypropanoate), 401
1,3,5-O-Tribenzoyl-2-O-[(3-trifluoromethyl)benzoyl]-α-D-ribofuranose, 246
C. MISCELLANEOUS
2-Chlorophenyl phosphorodichloridothioate, 226
[(2-)-N,O,O′[2,2′-Iminobis[ethanolato]]]-2-butylboron, 613

ETHERIFICATION
(R)-(−)-1-Amino-1-phenyl-2-methoxyethane, 282
2,4-Bis(trimethylsilyloxy)-5-methylpyrimidine, 246
(Z)-1,1,1-Trifluoro-2-ethoxy-5-phenyl-2-pentene, 703

HALOGENATION
A. BROMINATION
Bicyclo[1.1.1]pentane-1,3-dicarboxylic acid, 86
Bis(2,4,6-trimethylpyridine)bromine(I) hexafluorophosphate, 122

ω-Bromo-p-chloroacetophenone, 437
1-Bromo-2-fluoro-2-phenylpropane, 128
Bromomalononitrile, 271
4-Bromo-3-penten-2-one (in situ), 595
Bromotris(perfluorohexylethyl)tin, 712
Dec-9-enyl bromide, 237
Dibromotriphenylphosphorane, 88, 595
Methyl (Z)-2-(bromomethyl)-4-methyl-pent-2-enoate, 541
Methyl N-(p-methoxyphenyl)carbamate, 549
B. CHLORINATION
Bis(1,5-dichloro-2,4-pentanedione) copper(II) complex, 276
2-Chloropentan-3-one, 336
Methyl (S)-2-phthalimido-4-oxobutanoate, 562
2-Trimethylsilylethanesulfonyl chloride, 707
C. FLUORINATION
1-Bromo-2-fluoro-2-phenylpropane, 128
D. IODINATION
Bis(2,4,6-trimethylpyridine)iodine(I) hexafluorophosphate, 122
Indium(I) iodide, 170
Indium(III) iodide, 170
2-Iodo-2-cyclohexen-1-one, 467
(Phenyl) [2-(trimethylsilyl)phenyl]iodonium triflate, 653
HYDROLYSIS (The subheadings indicate the kinds of compounds hydrolyzed.)
A. ACETALS AND KETALS
Methyl (4S)-4,5-O-isopropylidenepent-(2Z)-enoate, 153
2-Methyl-4H-pyran-4-one, 567
3-(tert-Butyldimethylsilyl)-2-propyn-1-ol, 165
(E)-1-(tert-Butyldimethylsilyl)-3-trimethylsilyl-2-propen-1-one, 158
L-Threitol 1,4-bismethanesulfonate, 297
B. AMIDES (including lactams)
L-Allylglycine, 12
N-Boc-L-allylglycine, 12
2-Phenyl-1-pyrroline, 648
C. ESTERS AND LACTONES
4a(S),8a(R)-2-Benzoyl-1,3,4,4a,5,8a-hexahydro-6(2H)-isoquinolinone, 37
(R)-(−)-2-Diphenylphosphinyl-2′-hydroxy-1,1′-binaphthyl, 363
4-Hydroxy[1-^{13}C]benzoic acid, 432
3-(Methoxymethoxy)-1-butanol, 492
2-Phenylpropionic acid, 640
Vitamin D_2, 718
D. NITRILES
2-Phenylpropionic acid, 640
E. MISCELLANEOUS
(S)-2-[(4S)-N-tert-Butoxycarbonyl-2,2-dimethyl-1,3-oxazolidin-4-yl]-2-tert-butyldimethylsiloxyethanal, 140
1,5-Dichloro-2,4-pentanedione, 277
(1S)-(−)-1,3-Dithiane 1-oxide, 378
N-(2-Fluorophenyl)-2-(hydroxyimino) acetamide, 24
β-Mercaptopropionitrile, 475
Methyl (R)-(+)-β-phenylalanate, 47
11-Oxatricyclo[4.3.1.1^{2,5}]undec-3-en-10-one, (1α,2β,5β,6α)-, 584
Vitamin D_2, 718

METALATION REACTIONS
A. BORON
(2-Bromoallyl)diisopropoxyborane, 135
Butylboronic acid, 613
Dicyclohexylborane, 273
Lithium phenyltrimethoxyborate (in situ), 609
(3,4,5-Trifluorophenyl)boronic acid, 80
B. CHROMIUM
Tricarbonyl(η^6–cycloheptatriene)chromium(0), 1
Tris(acetonitrile)chromium tricarbonyl, 1
C. COPPER
Bis(1,5-dichloro-2,4-pentanedione)copper(II) complex, 276
Ethyl 5-(3-oxocyclohexyl)pentanoate, 411
Lithium dibutylcuprate, 662
D. INDIUM
Methyl 3-(hydroxymethyl)-4-methyl-2-methylenepentanoate, 541
E. IRON
(+)-(E,1R,3S)-Tetracarbonyl[(3-benzyloxy)-1-(phenylsulfonyl)-η^2-but-1-ene]iron(0), 672
F. LITHIUM
6,6′-Bi(3,4-dihydro-2H-pyran) (Bis-DHP), 552
2,3-Dihydro-5-furyllithium, 621
3,4-Dihydro-2-pyranyllithium, 552
Lithium dimethylcyanocuprate, 411

METALATION REACTIONS (*Continued*)
5-Methyl-2,2′-bipyridine, 517
1-Propynyllithium, 627
G. MAGNESIUM
Allylmagnesium bromide, 222
Butylmagnesium bromide, 613
2-Naphthylmagnesium bromide, 349
(Perfluorohexyl)ethylmagnesium iodide, 712
H. MANGANESE
(R,R)-N,N′-Bis-(3,5-di-tert-butylsalicylidene)-1,2-cyclohexanediamino manganese(III) chloride, 96
I. PLATINUM
Bis(η-divinyltetramethyldisiloxane)tri-tert-butylphosphineplatinum(0), 531
J. SILICON
1,2-Bis(trimethylsilyl)benzene, 653
1-(tert-Butyldimethylsilyl)-1-(1-ethoxyethoxy)-1,2-propadiene, 157
3-(tert-Butyldimethylsilyl)-2-propyn-1-ol, 166
(E)-1-(tert-Butyldimethylsilyl)-3-trimethylsilyl-2-propen-1-one, 158
(±)-1-(Dimethylphenylsilyl)-1-buten-3-ol, 531
K. SILVER
Bis(2,4,6-trimethylpyridine)silver(I) hexafluorophosphate, 122
L. TIN
Crotonyltributyltin, 496
(S,E)-1-(Methoxymethoxy)-1-tributylstannyl-2-butene, 496
Tris[(perfluorohexyl)ethyl]phenyltin, 712
M. TITANIUM
Dimethyltitanocene, 355
N. ZINC
4-Cyanophenylzinc bromide, 392
Ethyl 5-(3-oxocyclohexyl)pentanoate, 411
5-Methyl-2,2′-bipyridine, 517
METAL-CATALYZED REACTIONS (exclusive of reductions)
A. BORON
N-Benzyl-4-phenylbutyramide, 80
(1′R)-Phenyl-(2′S)-[(phenylmethyl)[2,4,6-trimethylphenyl)sulfonyl]amino]propyl (3R)-hydroxy-(2R), 4-dimethylpentanoate, 343
B. CERIUM
1-Butyl-1,2,3,4-tetrahydro-1-naphthol, 200
C. CHROMIUM
Tricarbonyl(η^6–cycloheptatriene) chromium(0), 1
D. COPPER
2-(4′-Acetylphenyl)thiophene, 9
6,6′-Bi(3,4-dihydro-2H-pyran) (Bis-DHP), 552
2-(3,4-Dimethoxyphenyl)-N,N-dimethylacetamidine, 327
Ethyl 5-(3-oxocyclohexyl)pentanoate, 411
1-(2-Fluoro-4-methoxyphenyl)-2,5-dimethyl-1H-pyrrole, 418
3-Phenyl-2-propynenitrile, 645
E. INDIUM
(2R,3S,4S)-1-(tert-Butyldiphenylsilyloxy)-2,4-dimethyl-5-hexyn-3-ol, 170
Methyl 3-hydroxymethyl-4-methyl-2-methylenepentanoate, 541
F. IRON
2-(3-Oxobutyl)cyclopentanone-2-carboxylic acid, ethyl ester, 588
G. LANTHANUM
(2S,3S)-2-Nitro-5-phenyl-1,3-pentanediol, 571
H. MANGANESE
2-Benzyl-6-methylcyclohexanone, 59
(1S,2R)-Indene oxide, 30
I. MOLYBDENUM
2-Phenyl-2,3-dihydrofuran, 621
J. NICKEL
(R)-(+)- and (S)-(−)-2,2′-Bis(diphenylphosphino)-1,1′-binaphthyl, 112
2,7-Dimethylnaphthalene, 332
Ethyl 3-(p-cyanophenyl)propionate, 391
9-Ethyl-3,6-dimethylcarbazole, 396
K. PALLADIUM
2-(4′-Acetylphenyl)thiophene, 9
6,6′-Bi(3,4-dihydro-2H-pyran) (Bis-DHP), 552
4-Biphenylcarboxaldehyde, 102
Butyl 4-chlorophenyl sulfide, 147
(R)-(+)-2-Diphenylphosphinyl-2′-trifluoromethanesulfonyloxy-1,1′-binaphthyl, 363
(2R,3S,4S)-1-tert-Butyldiphenylsilyloxy)-2,4-dimethyl-5-hexyn-3-ol, 170
trans-4,4′-Dibromostilbene, 263
1,3-Dimethyl-6H-benzo[b]naphtho[1,2-d]pyran-6-one, 448
N-Hexyl-2-methyl-4-methoxyaniline, 423

4-Methoxy-2′-methylbiphenyl, 501
2-(4-Methoxyphenyl)-2-cyclohexen-1-one, 467
5-Methyl-2,2′-bipyridine, 517
N-Methyl-N-(4-chlorophenyl)aniline, 423
7-Methylene-8-hexadecyn-6-ol, 599
1,2,3,4-Tetrahydrocarbazole, 683
L. PLATINUM
(±)-(E)-1-(Dimethylphenylsilyl)-1-buten-3-ol, 531
M. RHODIUM
(R)-3-Phenylcyclohexanone, 609
N. SILVER
(S)-3-(tert-Butyloxycarbonylamino)-4-phenylbutanoic acid), 194
2-(4-Methoxyphenyl)-2-cyclohexen-1-one, 467
2-Pentyl-3-methyl-5-heptylfuran, 599
O. TITANIUM
1-Cyclopropylcyclopropanol, 88
(2R-cis)-2-[[1-[3,5-Bis(trifluoromethyl)-phenyl]ethenyl]oxy]-3-(4-fluorophenyl)-4-benzylmorpholine, 357
(S)-1-(Phenylmethoxy)-4-penten-2-ol, 632
P. ZINC
Methyl 5,5-dimethyl-4-oxohexanoate, 526

OXIDATION (The subheadings indicate the types of oxidation.)
A. $CH_2 \rightarrow C{=}O$
Camphorquinone, 204
B. $C{=}C \rightarrow CHOH\text{-}CHOH$
1-Chloro-(2S,3S)-dihydroxycyclohexa-4,6-diene, 217
(+)-(1R,2R)-1-Phenylcyclohexane-cis-1,2-diol, 603
C. $C{=}C \rightarrow 2\ C{=}O$
N-Benzyl-2,3-azetidinedione, 41
1-Oxo-2-cyclohexenyl-2-carbonitrile, 590
D. $C{=}N \rightarrow$ 
(+)-(2R,8aR*)-[(8,8-Dimethoxycamphor-yl)sulfonyl]oxaziridine, 380
E. $CH_2OH \rightarrow CHO$
1-[N-Benzyloxycarbonyl-(1S)-1-amino-2-oxoethyl]-4-methyl-2,6,7-trioxabicyclo[2.2.2]octane, 74
(S)-2-(N,N-Dibenzylamino)-3-phenylpropanal, 256
1,1-Dimethylethyl (S)-4-formyl-2,2-dimethyl-3-oxazolidinecarboxylate, 320
F. $CH_2OH \rightarrow CO_2H$
3-Chloro-2,2-bis(chloromethyl)propanoic acid, 213
G. $CHOH \rightarrow C{=}O$
Quininone, 36
H. $CHOH\text{-}CHOH \rightarrow CHO$
(1′R)-(−)-4,6-O-Ethylidene-D-erythrose, 405
I. $COCH_3 \rightarrow CO_2H$
Bicyclo[1.1.1]pentane-1,3-dicarboxylic acid, 86
J. $S \rightarrow SO$
(1S)-(2,2-Dimethylpropanoyl)-1,3-dithiane 1-oxide, 378
K. $S \rightarrow SO_2$
Diethyl [(phenylsulfonyl)methyl]phosphonate, 289
L. MISCELLANEOUS
2-Amino-3-fluorobenzoic acid, 23
N-Benzoylmeroquinene tert-butyl ester, 36
Dicyclohexylboron trifluoromethanesulfonate, 273
(1′R)-(-)-2,4-O-Ethylidene-D-erythrose, 405
1-Hydroxy-1,2-benziodoxol-3(1H)-one 1-oxide, 696
(1S,2R)-Indene oxide, 30
trans-2-Methyl-2,3-diphenyloxirane, 537
Methyl (S)-2-phthalimido-4-oxobutanoate, 562
OXIMATION
ω-Bromo-p-chloroacetophenone oxime, 437
Camphorquinone monoxime, 204
N-(2-Fluorophenyl)-2-(hydroxyimino) acetamide, 24

PHOSPHONATION (formation of C-P, N-P, and O-P bonds)
2-Chlorophenyl phosphorodichloridothioate, 226
Diethyl (R)-(−)-[1-((N-(R)-(1-phenyl-2-methoxyethyl)amino)-3-methylbutyl)]phosphonate, 282
Diethyl [(phenylthio)methyl]phosphonate, 290
(R)-(+)-2-Diphenylphosphinyl-2′-trifluoromethanesulfonyloxy-1,1′-binaphthyl, 363

PHOSPHONATION (*Continued*)
3-Phenylpropyltriphenylphosphonium bromide, 703
PHOTOCHEMICAL REACTIONS
7α-Acetoxy-(1Hβ, 6Hβ)-bicyclo[4.4.1] undeca-2,4,8-triene, 1
ε-Caprolactam, 207
Dec-9-enyl bromide, 237
1,3-Diacetylbicyclo[1.1.1]pentane, 86
β-3′,5′-Di-O-benzoylthymidine, 246
(4R,5S)-4-Hydroxymethyl-(5-O-tert-butyldimethylsiloxymethyl)furan-2(5H)-one, 153
Quininone, 36
Vitamin D_2 3,5-dinitrobenzoate, 718
PROTECTION
A. NITROGEN
Benzyl (S)-2-(N,N-dibenzylamino)-3-phenylpropanoate, 256
1-(2-Fluoro-4-iodophenyl)-2,5-dimethyl-1H-pyrrole, 418
N-(4-Methoxybenzyl)-2-nitrobenzenesulfonamide, 482
Methyl (S)-2-phthalimido-4-methylthiobutanoate, 562
B. OXYGEN
1-[N-Benzyloxycarbonyl-(1S)-1-amino-2-hydroxyethyl]-4-methyl-2,6,7-trioxabicyclo[2.2.2]octane, 74
2,4-Bis(trimethylsilyloxy)-5-methylpyrimidine, 247
(S)-2-{[(4S)-N-tert-Butoxycarbonyl-2,2-dimethyl-1,3-oxazolidin-4-yl]-tert-butyldimethylsiloxy}-1,3-thiazole, 141
(5S)-(5-O-tert-Butyldimethylsiloxymethyl)furan-2(5H)-one, 153
(R)-3-(tert-Butyldiphenylsilyloxy)-2-methylpropanal, 171
(−)-(S)-Ethyl 2-(benzyloxy)propanoate, 66
3-(Methoxymethoxy)-1-butanol, 492
(S,E)-1-(Methoxymethoxy)-1-tributylstannyl-2-butene, 496
Methyl (R)-3-(tert-butyldiphenylsilyloxy)-2-methylpropionate, 171
(1′S,2′S)-Methyl-3O,4O-(1′,2′-dimethoxycyclohexane-1′,2′-diyl)-α-D-mannopyranoside, 523
2-Propargyloxytetrahydropyran or Tetrahydro-2-(2-propynyloxy)-2H-pyran, 165
3-Phenylpropyltriphenylphosphonium bromide, 703
C. NITROGEN AND OXYGEN
3-(1,1-Dimethylethyl) 4-methyl-(S)-2,2-dimethyloxazolidine-3,4-dicarboxylate, 321

REARRANGEMENTS
1-[N-Benzyloxycarbonyl-(1-S)-1-amino-2-hydroxyethyl]-4-methyl-2,6,7-trioxabicyclo[2.2.2]octane, 73
(1R*,6S*,7S*)-4-tert-Butyldimethylsiloxy)-6-(trimethylsilyl)bicyclo[5.4.0] undec-4-en-2-one, 156
2-Butyl-6-ethenyl-5-methoxy-1,4-benzoquinone, 178
tert-Butyl 3a-methyl-5-oxo-2,3,3a,4,5,6-hexahydroindole-1-carboxylate, 188
(S)-3-(tert-Butyloxycarbonylamino)-4-phenylbutanoic acid, 194
ε-Caprolactam, 207
(±)-N,N′-Dimethyl-1,2-diphenylethylenediamine, 312
3-Ethenyl-4-methoxycyclobutene-1,2-dione, 178
1-(1-Ethoxyethoxy)-1,2-propadiene, 157
Furan-2-ylcarbamic acid tert-butyl ester, 188
Methyl Z-2-(bromomethyl)-4-methylpent-2-enoate, 541
Methyl 3(R)- and (3S-)](4E)- 3-(dimethylphenylsilyl)-4-hexenoate, 541
Methyl 3-(hydroxymethyl)-4-methyl-2-methylenepentanoate, 531
Methyl N-(p-methoxyphenyl)carbamate, 549
Methyl (S)-2-phthalimido-4-methylthiobutanoate, 562
2-Pentyl-3-methyl-5-heptylfuran, 599
2-Phenyl-2,3-dihydrofuran, 622
(Z)-4-(2-Propenyl)-3-octen-1-ol, 662
Vitamin D_2 3,5-dinitrobenzoate, 718
REDUCTION
A. C=C → HC-CH
4a(S),8a(R)-2-Benzoyloctahydro-6(2H)-isoquinolinone, 34
B. C=O → CHOH
(2R,4R)-1,5-Dichloro-2,4-pentanediol, 277
1-Hydroxy-2-butenyltributyltin, 496
(S,E)-1-(Methoxymethoxy)-1-tributylstannyl-2-butene, 496
3-Nitropropanol, 577

C. $CO_2R \rightarrow CHO$
(−)-(S)-2-(Benzyloxy)propanal, 67
(R)-3-(tert-Butyldiphenylsilyloxy)-2-methylpropanal, 170
D. $CO_2R \rightarrow CH_2OH$
2-(N-Benzyl-N-mesitylenesulfonyl)amino-1-phenyl-1-propanol), 56
(S)-2-(N,N-Dibenzylamino)-3-phenyl-1-propanol, 257
N-[(1,1-Dimethylethoxy)carbonyl]-N,O-isopropylidene-L-serinol, 321
(2S,3R)-2,4-Dimethyl-1,3-pentanediol, 343
(3R)-1-(E)-(Dimethylphenylsilyl)-1-buten-3-ol, 531
4-Hydroxymethyl-3-dimethylamino-1-tert-butyldimethylsiloxy-1-cyclohexene, 442
(M)-2-Hydroxymethyl-1-(2-hydroxy-4,6-dimethylphenylmaphthalene, 448
E. $CONR_2 \rightarrow CH_2OH$
(R)-α-Methylbenzenepropanol, 509
F. $CONR_2 \rightarrow CHO$
(R)-α-Methylbenzenepropanal, 509
G. $CX \rightarrow CH$
Diethyl (R)-(−)-(1-amino-3-methylbutyl)-phosphonate, 282
(+)-(1S,2R)- and (−)-(1R,2S)-trans-2-Phenylcyclohexanol, 603
Tris[(perfluorohexy)lethyl]tin hydride, 712
H. $C{=}N \rightarrow CH_2NH_2$
(2S)-(−)-3-exo-Aminoisoborneol, 306
I. MISCELLANEOUS
(S)-2-[(4S)-N-tert-Butoxycarbonyl-2,2-dimethyl-1,3-oxazolidin-4-yl]-2-tert-butyldimethylsiloxyethanal, 140
3-Deoxy-1,2:5,6-bis-O-(methylethylidene)-α-D-ribohexofuranose, 240
β-3′,5′-Di-O-benzoylthymidine, 246
(2S)-(−)-3-exo-(Dimethylamino)isoborneol, 305
N,N′-Dimethyl-1,2-diphenylethylenediamine, 312
N,N-Dimethylhomoveratrylamine, 327
(R)-2-Diphenylphosphino-2′-methoxy-1,1′-binaphthyl, 363
Ethyl 5-chloro-3-phenylindole-2-carboxylate, 386
Methyl methanethiosulfonate, 546
1,4,7,10-Tetraazacyclododecane, 667

REPLACEMENT REACTIONS
A. ALKOXY BY CARBON
Butylboronic acid, 613
3-Ethenyl-4-methoxycyclobutene-1,2-dione, 178
B. ALKOXY BY NITROGEN
(E)-4-Dimethylamino-3-buten-2-one, 301
(4R,5S)-3-(1-Methoxyethyl)-4,5-diphenyl-2-oxazolidinone, 374
C. ALKOXY BY OXYGEN
(4R-trans)-2-Butyl-N,N,N′,N′-tetramethyl[1,3,2]dioxaborolane 4,5-dicarboxamide, 613
D. (1′S,2′S)-Methyl-3O,4O-(1′,2′-dimethoxycyclohexane-1′,2′-diyl)-α-D-mannopyranoside, 523
E. AMINO BY CARBON
(R)-2-Methyl-1-phenyl-3-heptanone, 509
F. AMINO BY HALOGEN
Bromobis(dimethylamino)borane, 115
(S)-(−)-2-Bromo-3-hydroxypropanoic acid, 401
G. AMINO BY OXYGEN
Bis(pinacolato)diboron, 115
2-Hydroxy-5-methylpyridine, 517
H. HALOGEN BY AMINO
N-Hexyl-2-methyl-4-methoxyaniline, 423
o-Nitrobenzenesulfonyl hydrazide, 170
Tris(dimethylamino)borane, 115
I. HALOGEN BY BORON
Tetrakis(dimethylamino)diboron, 116
J. HALOGEN BY CARBON
9-Ethyl-3,6-dimethylcarbazole, 396
2-(2-Methoxyphenyl)-2-methylpropionitrile, 505
K. HALOGEN BY HALOGEN
Ethyl 3-iodopropionate, 391
Ethyl 5-iodovalerate, 411
L. HALOGEN BY HYDROGEN
Tris[(perfluorohexyl)ethyl]tin hydride, 712
M. HALOGEN BY OXYGEN
1-Acetoxy-3-(methoxymethoxy)butane, 492
1-(2-Fluoro-4-methoxyphenyl)-2,5-dimethyl-1H-pyrrole, 418
Potassium (R)-(+)-2.3-epoxypropanoate, 401
N. HALOGEN BY VARIOUS GROUPS
1,2-Bis(trimethylsilyl)benzene, 653
(2-Bromoallyl)diisopropoxyborane, 135

REPLACEMENT REACTIONS (*Continued*)
1-Butyl-3-methylimidazolium hexafluorophosphate, 184
1-Butyl-3-methylimidazolium tetrafluoroborate, 184
2-Cyanoethylthiouronium chloride, 475
Diethyl [(phenylthio)methyl]phosphonate, 289
O-Ethyl S-[oximino-2-(p–chlorophenyl) ethyl] dithiocarbonate, 438
Furan-2-ylcarbamic acid tert-butyl ester, 189
2-(2-Methoxyphenyl)-2-methylpropionitrile, 505
O. HYDROXY BY ACYLOXY AND ALKOXY
[(2-)-N,O,O′[2,2′-Iminobis[ethanolato]]]-2-butylboron, 613
P. HYDROXY BY AZIDE
Ethyl (R)-2-azidopropionate, 382
Q. HYDROXY BY HALOGEN
1-Bromo-1-cyclopropylcyclopropane, 89
4-Bromo-2-methyl-1-butene, 189
3-Chloro-2,2-bis(chloromethyl)propan-1-ol, (Pentaerythritol trichlorohydrin), 212
Methyl Z-2-(bromomethyl)-4-methylpent-2-enoate, 539
Pentaerythrityl trichlorohydrin, 213
2-Trimethylsilylethanesulfonyl chloride, 707
R. SULFONATE BY AMINO
N-Methyl-N-(4-chlorophenyl)aniline, 423
S. SULFONATE BY OXYGEN
N-Benzyloxycarbonyl-L-serine 3-methyl-3-(hydroxymethyl)oxetane ester, 73
T. SULFONATE BY SULFUR
Butyl 4-chlorophenyl sulfide, 147
U. MISCELLANEOUS
N, N′-Bis(tert-butoxycarbonyl)-N″-benzylguanidine, 266
4,4′-Bis(chloromethy)-2,2′-bipyridine, 107
(R)-(+)- and (S)-(−)-2,2′-Bis(diphenylphosphino)-1,1′-binaphthyl, 112
Bromotris[perfluorohexyl)ethyl]tin, 712
Butylboronic acid, 613
1-Butyl-3-methylimidazolium hexafluorophosphate, 184
1-Butyl-3-methylimidazolium tetrafluoroborate, 184
Dec-9-enyl bromide, 237
3-Deoxy-1,2:5,6-bis-O-(methylethylidene)-α-D-ribohexofuranose, 240
3′,5′-Di-O-benzoyl-2′-O-[(3-trifluoromethyl)benzoyl]-5-methyluridine, 246
trans-4,4′-Dibromostilbene, 263
Dicyclohexylboron trifluoromethanesulfonate, 273
2,7-Dimethylnaphthalene, 332
(R)-(+)-2-Diphenylphosphinyl-2′-trifluoromethanesulfonyloxy-1,1′-binaphthyl, 363
[(2-)-N,O,O′[2,2′-Iminobis[ethanolato]]]-2-butylboron, 613
O^4,O^5-Isopropylidene-3,6-anhydro-1-deoxy-1-iodo-D-glucitol, 471
Methyl α-[(methoxyethylidene)amino] acetate, 488
3-Phenylpropyltriphenylphosphonium bromide, 703
3-Phenyl-2-propynenitrile, 645
(Phenyl) [2-(trimethylsilyl)phenyl]iodonium triflate, 653
(1R,2S,3R)-Tetracarbonyl[1-3η)-1-(phenylsulfonyl)-but-2-en-1-yl]iron(1+) tetrafluoroborate, 672
(S)-(+)-p-Toluenesulfinamide, 47
p-Toluenesulfinic acid, 692
RESOLUTION
(1S,2R)-1-Aminoindan-2-ol, 29
(R)- and (S)-1,1′-Bi-2-naphthol, 93
(R,R)-1,2-Diaminocyclohexane, 96
(R,R)- and (S,S)-N,N′-Dimethyl-1,2-diphenylethylenediamine, 312
(3R)- and (3S)-1-(Dimethylphenylsilyl)-1-buten-3-ol, 531
RING EXPANSION REACTIONS
1-[N-Benzyloxycarbonyl-(1S)-1-amino-2-hydroxyethyl]-4-methyl-2,6,7-trioxabicyclo[2.2.2]octane, 74
2-Butyl-6-ethenyl-5-methoxy-1,4-benzoquinone, 178
ε-Caprolactam, 207
1,4,7,10-Tetraazacyclododecane, 667
RING OPENING REACTIONS
1-Acetoxy-3-(methoxymethoxy)butane, 492
(1S,2R)-1-Aminoindan-2-ol, 29
N-Benzoylmeroquinene tert-butyl ester, 36
Bicyclo[1.1.1]pentyl phenyl sulfide, 658
tert-Butyl 3a-methyl-5-oxo-2,3,3a,4,5,6-hexahydroindole-1-carboxylate, 188

(2S,3S)-Dihydroxy-1,4-diphenylbutane, 297
(2S)-(−)-3-exo-(Dimethylamino)isoborneol [(−)-DAIB], 305
(1′R)-(−)-2,4-O-Ethylidene-D-erythrose, 405
2-Fluoro-4-methoxyaniline, 418
O^4,O^5-Isopropylidene-3,6-anhydro-1-deoxy-1-iodo-D-glucitol, 471
Meroquinene tert-butyl ester, 36
2-Methyl-4H-pyran-4-one, 567
1-Oxo-2-cyclohexenyl-2-carbonitrile, 591
2-Phenyl-1-pyrroline, 648
(Z)-4-(2-Propenyl)-3-octen-1-ol, 662
1,4,7,10-Tetraazacyclododecane, 667
L-Threitol 1,4-bismethanesulfonate, 297
Vitamin D_2, 718

SILYLATION
1,2-Bis(trimethylsilyl)benzene, 653
4,4′-Bis[(trimethylsilyl)methyl]-2,2′-bipyridine, 107
2,4-Bis(trimethylsilyloxy)-5-methylpyrimidine, 248
(S)-2-[(4S)-N-tert-Butoxycarbonyl-2,2-dimethyl-1,3-oxazolidin-4-yl]-tert-butyldimethylsiloxy}-1,3-thiazole, 140
(5S)-(5-O-tert-Butyldimethylsiloxymethyl)-furan-2(5H)-one, 152
1-(tert-Butyldimethylsilyl)-1-(1-ethoxyethoxy)-1,2-propadiene, 157
3-(tert-Butyldimethylsilyl)-2-propyn-1-ol, 165
(E)-1-(tert-Butyldimethylsilyl)-3-trimethylsilyl-2-propen-1-one, 156
(R)-3-(tert-Butyldiphenylsilyloxy)-2-methylpropanal, 170
1-Dimethylamino-3-tert-butyldimethylsiloxy-1,3-butadiene, 301
N,N′-Dimethyl-1,2-diphenylethylenediamine, 312
(±)-(E)-1-(Dimethylphenylsilyl)-1-buten-3-ol, 531
Ethyl 5-(3-oxocyclohexyl)pentanoate, 411
1-Triisopropylsilyloxycyclohexene, 207

STEREOSELECTIVE REACTIONS
A. DIASTEREOSELECTIVE
(1S,2R)-1-Aminoindan-2-ol, 29
(2S)-(−)-3-exo-Aminoisoborneol, 305
(S)-2-[(4S)-N-tert-Butoxycarbonyl-2,2-dimethyl-1,3-oxazolidin-4-yl]hydroxymethyl}-1,3-thiazole, 140
(2R,3S,4S)-1-(tert-Butyldiphenylsilyloxy)-2,4-dimethyl-5-hexyn-3-ol, 170
3′,5′-Di-O-benzoyl-2′-O-[(3-trifluoromethyl)benzoyl]-5-methyluridine, 246
Diethyl (R)-(−)-[1-((N-(R)-(1-phenyl-2-methoxyethyl)amino)-3-methylbutyl)]-phosphonate, 282
(±)-(E)-1-(Dimethylphenylsilyl)-1-buten-3-ol, 531
(1S,2S)-N-(2-Hydroxy-1-methyl-2-phenylethyl)-N-methylpropionamide, ((1S,2S)-pseudoephedrinepropionamide), 456
Methyl (4S)-4,5-O-isopropylidenepent-(2Z)-enoate, 153
(S_s,R)-(+)-Methyl N-(p-toluenesulfinyl)-3-amino-3-phenylpropanoate, 48
(2S,3S)-2-Nitro-5-phenyl-1,3-pentanediol, 571
(+)-(1R,2R)-1-Phenylcyclohexane-cis-1,2-diol, 603
(+)-(1S,2R)- and (−)-(1R,2S)-trans-2-Phenylcyclohexanol, 603
(2S,3S)-(+)-(3-Phenylcyclopropyl)methanol, 612
(1′R)-Phenyl-(2′S)-[(phenylmethyl)[2,4,6-trimethylphenyl)sulfonyl]propyl (3R)-hydroxy-(2R),4-dimethylpentanoate, 344
(R,R)-(−)-Pseudoephedrine L-allylglycinamide, 14
B. ENANTIOSELECTIVE
(1S,2R)-1-Aminoindan-2-ol, 29
(2S)-(−)-3-exo-Aminoisoborneol, 305
(S)-(−)-2-Bromo-3-hydroxypropanoic acid, 401
(2R,4R)-1,5-Dichloro-2,4-pentanediol, 278
Diethyl (R)-(−)-(1-amino-3-methylbutyl)-phosphonate, 282
Diethyl (R)-(−)-[1-((N-(R)-(1-phenyl-2-methoxyethyl)amino)-3-methylbutyl)]-phosphonate, 282
(1S)-(2,2-Dimethylpropanoyl)-1,3-dithiane 1-oxide, 378
(1S)-(−)-1,3-Dithiane 1-oxide, 378
Ethyl (R)-2-azidopropionate, 382
1-Hydroxy-2-butenyltributyltin, 496
(M)-2-Hydroxymethyl-1-(2-hydroxy-4,6-dimethylphenyl)naphthalene, 448
(1S,2R)-Indene oxide, 30

STEREOSELECTIVE REACTIONS
(*Continued*)
(S,E)-1-(Methoxymethoxy)-1-tributylstannyl-2-butene, 496
(2S,3S)-2-Nitro-5-phenyl-1,3-pentanediol, 571
(+)-(1R,2R)-1-Phenylcyclohexane-cis-1,2-diol, 603
(+)-(1S,2R)- and (-)-(1R,2S)-trans-2-Phenylcyclohexanol, 603
(R)-3-Phenylcyclohexanone, 609
(2S,3S)-(+)-(3-Phenylcyclopropyl)methanol, 613
(S)-1-(Phenylmethoxy)-4-penten-2-ol, 632
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3′5′-Di-O-benzoyl-2′-O[(3-trifluoromethyl)benzoyl]-5-methyluridine, 247
(3R)-(E)-1-(Dimethylphenylsilyl)-1-buten-3-ol acetate, 531
(R)-(+)-2-Hydroxy-1,2,2-triphenylethyl acetate, 464
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4-Carbomethoxy-3-dimethylamino-1-tert-butyldimethylsiloxy-1-cyclohexene, 442
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Meroquinene tert-butyl ester, 36
Methyl 2-(benzylamino)methyl-3-hydroxybutanoate, 42
Methyl (R)-(+)-β-phenylalanate, 47
Methyl (S)-2-phthalimido-4-methylthiobutanoate, 562
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(S_S,R)-(+)-Methyl N-(p-toluenesulfinyl)-3-amino-3-phenylpropanoate, 48
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Ethyl 5-chloro-3-phenylindole-2-carboxylate, 386
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1,3-Dimethyl-6H-benzo[b]naphtho[1,2-d]pyran-6-one, 448
3,3-Dimethyl-1-oxaspiro[3.5]nonan-2-one, 339
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5′-O-Benzoyl-3′-deoxythymidine, 248
1-[N-Benzyloxycarbonyl-(1S)-1-amino-2-hydroxyethyl]-4-methyl-2,6,7-trioxabicyclo[2.2.2]octane, 74
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(−)-(S)-Ethyl 2-(benzyloxy)propanoate, 66
Ethyl 5-chloro-3-phenylindole-2-carboxylate, 386
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4-Methoxycarbonyl-2-methyl-1,3-oxazole, 488
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Methyl (3R), (4E)-3-(dimethylphenylsilyl)-4-hexenoate, 531
Methyl (3S), (4E)- 3-(dimethylphenylsilyl)-4-hexenoate, 531
Methyl (S)-2-isocyanato-3-phenylpropanoate, 544
Methyl (4S)-4,5-O-isopropylidenepent-(2Z)-enoate, 153
Methyl α-[(methoxyethylidene)amino] acetate, 488
(S_S,R)-(+)-Methyl N-(p-toluenesulfinyl)-3-amino-3-phenylpropanoate, 48
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O^4,O^5-Isopropylidene-1,2:3,6-dianhydro-D-glucitol, 471
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(S)-2-{[(4S)-N-tert-Butoxycarbonyl-2,2-dimethyl-1,3-oxazolidinyl]-tert-butyldimethylsiloxy}-1,3-thiazole, 141
(5S)-(5-O-tert-Butyldimethylsiloxymethyl)furan-2(5H)-one, 152
(2R,3S,4S)-1-(tert-Butyldiphenylsilyloxy)-2,4-dimethyl-5-hexyn-3-ol, 170
(R)-3-(tert-Butyldiphenylsilyloxy)-2-methylpropanal, 171
4-Carbomethoxy-3-dimethylamino-1-tert-butyldimethylsiloxy-1-cyclohexene, 442
1-Dimethylamino-3-tert-butyldimethylsiloxy-1,3-butadiene, 301
(4R,5S)-4-Hydroxymethyl-(5-O-tert-butyldimethylsiloxymethyl)furan-2(5H)-one, 153
4-Hydroxymethyl-3-dimethylamino-1-tert-butyldimethylsiloxy-1-cyclohexene, 442
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(−)-(E,S)-3-(benzyloxy)-1-butenyl phenyl sulfone, 66, 672
N-Benzyloxycarbonyl-L-serine 3-methyl-3-(hydroxymethyl)oxetane ester, 74
(−)-(S)-2-(Benzyloxy)propanal, 67
6,6′-Bi(3,4-dihydro-2H-pyran) [Bis-DHP], 552
(2R-cis)-2-[[1-[3,5-Bis(trifluoromethyl)-phenyl]ethenyl]oxy]-3-(4-fluorophenyl)-4-benzylmorpholine, 357
2-Butyl-6-ethenyl-5-methoxy-1,4-benzoquinone, 178
Diethyl (R)-(−)-[1-((N-(R)-(1-phenyl-2-methoxyethyl)amino)-3-methylbutyl)]-phosphonate, 283
1,4-Dihydronaphthalene 1,4-oxide, 653
2-(3,4-Dimethoxyphenyl)-N,N-dimethylacetamidine 327
N,N-Dimethylhomoveratrylamine, 327
2,4-endo,endo-Dimethyl-8-oxabicyclo[3.2.1]oct-6-en-3-one, 336
Dimethyl squarate, 178
(R)-2-Diphenylphosphino-2′-methoxy-1,1′-binaphthyl, 363
(R)-(+)-2-Diphenylphosphinyl-2′-methoxy-1,1′-binaphthyl, 364
3-Ethenyl-4-methoxycyclobutene-1,2-dione, 178
(−)-(S)-Ethyl 2-(benzyloxy)propanoate, 66
2-Fluoro-4-methoxyaniline, 418
1-(2-Fluoro-4-methoxyphenyl)-2,5-dimethyl-1H-pyrrole, 418
N-Hexyl-2-methyl-4-methoxyaniline, 423
N-(4-Methoxybenzyl)-2-nitrobenzenesulfonamide, 482
N-(4-Methoxybenzyl)-3-phenylpropylamine, 482
N-(4-Methoxybenzyl)-3-phenylpropylamine hydrochloride, 485
N-(4-Methoxybenzyl)-N-(3-phenylpropyl)-2-nitrobenzenesulfonamide, 483
(4R,5S)-3-(1-Methoxyethyl)-4,5-diphenyl-2-oxazolidinone, 375
4-Methoxy-2′-methylbiphenyl, 501
2-(4-Methoxyphenyl)-2-cyclohexen-1-one, 467
2-(2-Methoxyphenyl)-2-methylpropionitrile, 505
Methyl N-(p-methoxyphenyl)carbamate, 549
3-Methyl-3-(toluenesulfonyloxymethyl) oxetane, 73
11-Oxatricyclo[4.3.1.$1^{2,5}$]undec-3-en-10-one, (1α,2β,5β,6α-), 584
2-Phenyl-2,3-dihydrofuran, 621
(S)-1-(Phenylmethoxy)-4-penten-2-ol, 632
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(+)-(E,1R,3S)-Tetracarbonyl[(3-benzyloxy)-1-(phenylsulfonyl)-η^2-but-1-ene]iron(0), 672
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(Z)-1,1,1-Trifluoro-2-ethoxy-5-phenyl-2-pentene, 703

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A. BROMINE COMPOUNDS
Bis(2,4,6-trimethylpyridine)bromine(I) hexafluorophosphate, 122
(2-Bromoallyl)diisopropoxyborane, 135, 137
3-(4-Bromobenzoyl)propanoic acid, 125
Bromobis(dimethylamino)borane, 116
ω-Bromo-*p*-chloroacetophenone oxime, 437
1-Bromo-1-cyclopropylcyclopropane, 89
1-Bromo-2-fluoro-2-phenylpropane, 128
(S)-(−)-2-Bromo-3-hydroxypropanoic acid, 401
Bromomalononitrile, 271
4-Bromo-2-methyl-1-butene, 189
2-Bromo-1-octen-3-ol, 599
4-Bromo-3-penten-2-one (in situ), 595
4-[(4-Bromophenyl)azo]morpholine, 263
4-(2-Bromo-2-propenyl)-4-methyl-γ-butyrolactone, 135
Bromotris(2-perfluorohexylethyl)tin, 714
4-Cyanophenylzinc bromide, 391
Dec-9-enyl bromide, 237
1,1-Dibromo-2,2-bis(chloromethyl)cyclopropane, 658
3,6-Dibromo-9-ethylcarbazole, 396
trans-4,4′-Dibromostilbene, 263
Dibromotriphenylphosphorane, 88, 595
3,5-Dimethylphenyl 1-bromo-2-naphthoate, 448
Methyl (Z)-2-(bromomethyl)-4-methylpent-2-enoate, 541
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N-(2-Benzoyl-4-chlorophenyl)oxanilic acid ethyl ester, 386
O-Benzyl-2,2,2-trichloroacetimidate, 68
4,4′-Bis(chloromethyl)-2,2′-bipyridine, 107
Bis(1,5-dichloro-2,4-pentanedione) copper (II) complex, 276ω-Bromo-*p*-chloroacetophenone oxime, 437
Butyl 4-chlorophenyl sulfide, 147
1-Butyl-3-methylimidazolium chloride, 184
3-Chloro-2,2-bis(chloromethyl)propanoic acid or 3-Chloro-2,2-bis(chloromethyl)-propan-1-ol, 213
3-Chloro-2-(chloromethyl)-1-propene, 212
1-Chloro-(2S,3S)-dihydroxycyclohexa-4,6-diene, 217
6-Chloro-1-hexene, 222
Chloromethyl phenyl sulfide, 289
8-Chloro-1-octene, 222
2-Chloropentan-3-one, 336
2-Chlorophenyl phosphorodichloridothioate, 226
4-Chlorophenyl trifluoromethanesulfonate,147, 423
6-Chloro-1-pyrrolidinocyclohexene, 584
1,1-Dibromo-2,2-bis(chloromethyl)cyclopropane, 658
(2R,4R)-1,5-Dichloro-2,4-pentanediol, 276
1,5-Dichloro-2,4-pentanedione, 277
Ethyl 5-chloro-3-phenylindole-2-carboxylate, 386
O-Ethyl S-[oximino-2-(*p*-chlorophenyl) ethyl] dithiocarbonate, 438
N-Hydroxy-4-(p-chlorophenyl)thiazole-2(3H)-thione, 437
N-(4-Methoxybenzyl)-3-phenylpropylamine hydrochloride, 485
N-Methyl-N-(4-chlorophenyl)aniline, 423
Pentaerythrityl trichlorohydrin, 213
Tris(chloromethyl)acetic acid, 213
C. FLUORINE COMPOUNDS
2-Amino-3-fluorobenzoic acid, 23
(±)-1,1′-Bi-2-naphthyl ditriflate, 112
(R)-2,2′-Bis(trifluoromethanesulfonyloxy)-1,1′-binaphthyl, 363
(2R-cis)-2-[[1-[3,5-Bis(trifluoromethyl)-phenyl]ethenyl]oxy]-
3-(4-fluorophenyl)-4-benzylmorpholine, 357
Bis(2,4,6-trimethylpyridine)bromine(I) hexafluorophosphate, 122
Bis(2,4,6-trimethylpyridine)iodine(I) hexafluorophosphate, 122
Bis(2,4,6-trimethylpyridine)silver(I) hexafluorophosphate, 122
1-Bromo-2-fluoro-2-phenylpropane, 128
Bromotris(2-perfluorohexylethyl)tin, 713
1-Butyl-3-methylimidazolium hexafluorophosphate, 183
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4-Chlorophenyl trifluoromethanesulfonate, 147, 423
3′5′-Di-O-benzoyl-2′-O[(3-trifluoromethyl)benzoyl]-5-methyluridine, 247

N,N′-Di-Boc-N″-triflylguanidine [N,N′ Bis(tert-butoxycarbonyl)-N″-trifluoromethanesulfonylguanidine], 266
Dicyclohexylboron trifluoromethanesulfonate, 273
(R)-(+)-2-Diphenylphosphinyl-2′-trifluoromethanesulfonyloxy-1,1′-binaphthyl, 363
1-(2-Fluoro-4-iodophenyl)-2,5-dimethyl-1H-pyrrole, 418
7-Fluoroisatin, 24
7-Fluoroisatin 3-oxime, 26
2-Fluoro-4-methoxyaniline, 418
1-(2-Fluoro-4-methoxyphenyl)-2,5-dimethyl-1H-pyrrole, 419
N-(2-Fluorophenyl)-2-(hydroxyimino)acetamide, 24
4-Hydroxy-1,1,1,3,3,3-pentafluoro-2-hexanone hydrate, 460
Lithium pentafluoropropen-2-olate, 460
5-Methyl-2-(trifluoromethanesulfonyl)oxypyridine, 518
(Perfluorohexyl)ethylmagnesium iodide, 714
1,3,5-Tribenzoyl-2-O-[(3-trifluoromethyl)benzoyl]-α-D-ribofuranose, 247
1,1,1-Trifluoro-2-ethoxy-2,3-epoxy-5-phenylpentane, 703
(Z)-1,1,1-Trifluoro-2-ethoxy-5-phenyl-2-pentene, 703
Tris[(2-perfluorohexyl)ethyl]phenyltin, 714
Tris[(2-perfluorohexyl)ethyl]tin hydride, 713

D. IODINE COMPOUNDS
Bis(2,4,6-trimethylpyridine)iodine(I) hexafluorophosphate, 122
Ethyl 3-iodopropionate, 391
Ethyl 5-iodovalerate, 411
1-(2-Fluoro-4-iodophenyl)-2,5-dimethyl-1H-pyrrole, 419
1-Hydroxy-1,2-benziodoxol-3(1H)-one 1-oxide, 696
Indium(I) iodide, 172
Indium(III) iodide, 171
2-Iodo-2-cyclohexen-1-one, 467
O^4,O^5-Isopropylidene-3,6-anhydro-1-deoxy-1-iodo-D-glucitol, 471
(Perfluorohexyl)ethylmagnesium iodide, 714
(Phenyl) [2-(trimethylsilyl)phenyl]iodonium triflate, 653
1,1,1-Triacetoxy-1,1-dihydro-1,2-benziodoxol-3(1H)-one, 696

HETEROCYCLES (Benzologs are listed under the ring size of the heterocyclic ring; e.g., indoles under five-membered, one nitrogen)

A. THREE-MEMBERED, ONE NITROGEN, ONE OXYGEN
(+)-(2R,8aR*)-[(8,8-Dimethoxycamphoryl)sulfonyl]oxaziridine, 378

B. THREE-MEMBERED, ONE OXYGEN
(S,S)-1,2,3,4-Diepoxybutane, 297
(R,R)-1,2:4,5-Diepoxypentane, 276
Ethyl glycidate, 401
(1S,2R)-Indene oxide, 30
O^4,O^5-Isopropylidene-1,2:3,6-dianhydro-D-glucitol, 471
trans-2-Methyl-2,3-diphenyloxirane, 537

C. FOUR-MEMBERED, ONE NITROGEN
N-Benzyl-2,3-azetidinedione, 41
N-Benzyl-3-(Z/E)-ethylideneazetidin-2-one, 42
N-Benzyl-3-(1-hydroxyethyl)azetidin-2-one, 42

D. FOUR-MEMBERED, ONE OXYGEN
N-Benzyloxycarbonyl-L-serine 3-methyl-3-(hydroxymethyl)oxetane ester, 74
3,3-Dimethyl-1-oxaspiro[3.5]nonan-2-one, 339
(±)-3-Ethyl-1-oxaspiro[3.5]nonan-2-one, 341
(3R*,4R*)- and (3R*,4S*)-4-Isopropyl-4-methyl-3-octyl-2-oxetanone, 341
Methyl-3-(toluenesulfonyloxymethyl)-oxetane, 73

E. FIVE-MEMBERED, ONE NITROGEN
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3,6-Dibromo-9-ethylcarbazole, 396
Ethyl 5-chloro-3-phenylindole-2-carboxylate, 386
9-Ethyl-3,6-dimethylcarbazole, 396
1-(2-Fluoro-4-iodophenyl)-2,5-dimethyl-1H-pyrrole, 416
7-Fluoroisatin, 24
7-Fluoroisatin 3-oxime, 26
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Methyl (S)-2-phthalimido-4-methylthiobutanoate, 562
Methyl (S)-2-phthalimido-4-oxobutanoate, 562
5-Phenyldipyrromethane, 370
2-Phenyl-1-pyrroline, 648
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This index includes specific warnings concerning the hazards involved in preparing and handling the compounds listed in the General Index. These warnings and cautions are specific to the procedures in *Organic Syntheses* and are usually in addition to those found, for example, in the *Toxic Substance List for 1987*. As far as possible, the specific hazard involved is listed but the user should be aware there may be additional hazards. In all cases the appropriate OSHA bulletins should be consulted.

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