## Index

acyclic
$U$-acyclic, 66
Alexander trick, 16
algebraic boundary
of a quadratic complex, 706
of a symmetric complex, 696
algebraic surgery exact sequence
for closed topological manifolds, 760
for simplicial complexes, 759
intrinsic, 761
algebraic surgery quadratic case
data, 715
effect, 715
algebraic surgery symmetric case
data, 709
effect,709
algebraic surgery transfer map, 754
algebraic Thom Construction
quadratic version, 690
symmetric version,683
annihilator, 260
Arf invariant,269
aspherical, 838
attaching a handle, 19
attaching maps, 25
$b$-structure, 861
$k$-universal, 861
based exact sequence, 46
basis
equivalent basis, 26
stable basis, 394
stably $U$-equivalent, 394
symplectic, 265
$U$-equivalent, 393
Bernoulli numbers, 444
bilinear form
definite symmetric, 263
indefinite symmetric, 263
bordism
formation, 372
normal $\xi$-bordism, 100
normal bordism, 202
normal bordism of normal $\Gamma$-maps of degree one, 225
normal bordism of normal $\Gamma$-maps with cylindrical target of degree one, 227
normal bordism of normal maps of degree one with respect to the tangent bundle relative boundary, 309
normal bordism of normal maps with respect to the tangent bundle, 206
normal bordism of normal maps with cylindrical target with respect to the tangent bundle (of degree one), 207
normal bordism with cylindrical target (of degree one), 204
normal bordism with respect to the tangent bundle of degree one, 207
normal bordisms of rank $k$ normal maps of degree one, 203
tangential $\xi$-bordism, 97
boundary
algebraic boundary of a quadratic complex 706
algebraic boundary of a symmetric complex, 696
formation, 331
of a quadratic complex, 706
of a symmetric complex, 696
of an $(n+1)$-dimensional quadratic pair, 650
of an $(n+1)$-dimensional symmetric pair, 650
of an $\epsilon$-quadratic form, 331
bounded chain complex, 507
Brieskorn variety, 456
cell
closed, 25
open, 25
cellular
basis, 26
cellular $\mathbb{Z} \pi$-chain complex, 25
map, 39
pushout, 39
chain complex
$d$-dimensional, 552
$k$-connected, 552
bounded, 507
bounded below, 552
cellular $\mathbb{Z} \pi$-chain complex, 25
contractible, 45
dual,507
elementary, 400
finite, 45
finite based free, 45
free, 45
handlebody $\mathbb{Z} \pi$-chain complex, 27
positive, 552
projective,45
reduced cellular, 577
reduced singular,577
singular, 577
stably $U$-based finite, 395
chain contraction, 45
chain homotopy
of chain maps of degree $n, 505$
chain homotopy equivalence, 505
chain level Umkehr map, 243
for pairs, 275
chain map,505
$k$-connected, 554
composition chain map, 506
hom, 506
of degree $n, 505$
switch, 506
tensoring, 506
characteristic map,25
Choice
(ABP), 230
(BP), 108
(GBP), 228
(NBP), 224
(SBP), 158
classifying map of a principal $G$-bundle, 59 classifying space
of a group $G, 59$
for a family of subgroups, 775
clutching function, 446
cobordant
cobordant symmetric Poincaré complexes, 666
cobordant quadratic algebraic Poincaré complexes, 667
cobordism, 15
symmetric between Poincaré chain complexes, 666
diffeomorphic relative $M_{0}, 15$
$h$-cobordism, 15
over $M_{0}, 15$
quadratic between Poincaré chain complexes, 666
$s$-cobordism, 52
trivial,15
coconnected
$k$-coconnected map, 860
$k$-coconnected space, 860
cofibration
of chain complexes, 520
cofibration sequence
of chain complexes, 522
cohomology with compact support, 128
collapse map
Hopf, 80
Thom, 165
compatible local orientation of the tangent space, 231
complementary lagrangian, 331
composition chain map, 506
Conjecture
Borel Conjecture, 843
Full Farrell-Jones Conjecture, 779
Inertia Conjecture for closed aspherical manifolds, 847
$K$-theoretic Farrell-Jones Conjecture with coefficients in additive $G$-categories, 775
$L$-theoretic Farrell-Jones Conjecture with coefficients in additive $G$-categories with involution, 776
Manifold Hauptvermutung, 790
Poincaré Conjecture, 16
Rigidity for closed aspherical manifolds, 847
conjugation invariant functor, 286
connected
$k$-connected map, 860
$k$-connected space, 860
connected sum, 84
Construction
Algebraic surgery - quadratic case, 715
Algebraic surgery - symmetric case, 709
Pontrjagin-Thom Construction, 101

The algebraic boundary of a quadratic complex, 704
The algebraic boundary of a symmetric complex,693
The algebraic Thom Construction quadratic case, 690
The algebraic Thom Construction symmetric case, 683
The quadratic construction, 596
The symmetric construction, 578
The symmetric construction - equivariant version, 579
The symmetric construction - pointed version, 579
The symmetric construction - pointed equivariant version, 579
contragredient representation, 769
degree
of a map between $w$-oriented finite Poincaré complexes, 138
of a map of lens spaces, 60
democratic invariant, 267
determinant line bundle, 111
diffeomorphism
orientation preserving, 798
orientation reversing, 798
stable, 850
direct sum
of structured chain complexes, 623
disk bundle, 98
dual
chain complex, 51
$m$-dual, 179
$R$-module, 50
$S$-dual, 179
dual chain complex, 507
duality
m-duality, 179
duality map
m-duality map, 179
effect of the algebraic surgery
quadratic case, 716
symmetric case, 712
Eilenberg-MacLane space, 423
elementary
chain complex, 400
collapse, 53
expansion,52
embedding
standard, 85
trivial, 23
Euler characteristic, 131
evaluation chain map, 508
even
even $\boldsymbol{\epsilon}$-symmetric form, 255
even non-singular symmetric form over $\mathbb{Z}$,

## 255

exact sequence
abelian, 420
additive, 420
exotic $N, 805$
exotic sphere, 17
extended homotopy cofibration sequence, 535
fake space
(simple smooth fake $N, 804$
(simple) PL fake $N, 804$
fake $N, 804$
simple fake $N, 804$
family of subgroups, 774
Farrell-Jones group, 779
fibration
coreducible, 182
normal, 164
of chain complexes, 529
orientable, 144
fibration sequence
of chain complexes, 529
fibre homotopy, 142
strong, 142
fibre homotopy equivalence
strong, 142
Figure
Bordism W, 374
Dual cell complex, 126
Elementary expansion, 53
Handle cancellation, 22
Handle subtraction, 283
Handlebody, 19
Handlebody decomposition, 20
Intersection pairing, 230
Manifold $W$ with boundary $\partial W=\partial_{0} W \cup \partial_{1} W \cup \partial_{2} W$, 310
Mapping cylinder and mapping cone, 55
Outward normal vector field, 118
Poincaré Conjecture, 17
Pontrjagin-Thom construction, 99
Quadratic construction, 598
Schematic drawing of a Heegaard splitting,

## 362

Self-intersections, 233
Source of a surgery step for $M=T^{2}, 81$
Surgeon's suitcase, 83
Surgery along $S^{0} \times D^{1} \hookrightarrow S^{1} \sqcup S^{1}, 82$
Surgery Program, 18

The $E_{8}$-graph, 264
Wall realisation, 320
Whitney trick, 236
first Stiefel-Whitney class
of a finite Poincaré complex, 125
of a spherical fibration, 144
flat manifold, 839
form
Q-non-singular $\epsilon$-quadratic, 354
Q-non-singular $\epsilon$-symmetric, 354
$\epsilon$-quadratic, 253
$\epsilon$-symmetric, 245
linear $\epsilon$-quadratic form, 254
non-singular $\epsilon$-quadratic, 253
non-singular $\epsilon$-symmetric form, 245
standard hyperbolic $\epsilon$-quadratic form, 254
standard hyperbolic $\epsilon$-symmetric form, 245
$U$-based non-singular $\epsilon$-quadratic form, 395
formation
Q-trivial $\epsilon$-quadratic formation, 344
bordism formation, 372
boundary formation, 331
$\epsilon$-quadratic formation, 330
$\varepsilon$-symmetric formation, 637
kernel formation, 365
split $\varepsilon$-quadratic, 643
stably $U$-based $\epsilon$-quadratic, 396
stably isomorphic $\epsilon$-quadratic formations,

## 331

stably isomorphic $\varepsilon$-symmetric formations, 638
trivial $\epsilon$-quadratic formation, 330
trivial $\varepsilon$-symmetric formation, 638
trivial $\varepsilon$-symmetric formation, 638
trivial $\epsilon$-quadratic formation, 330
split $\varepsilon$-quadratic boundary, 738
framing
almost stable, 436
stable, 435
free
free unitary representation, 57
functor
half-conjugation invariant functor, 290
fundamental class
intrinsic, 117
of a Poincaré pair, 132
fundamental groupoid, 107
$G$-signature, 769
$G$-signature homomorphism, 770
generalised lens space, 58
generator
componentwise, 197
geometric
surgery exact sequence, 413
surgery obstruction, 489
surgery obstruction group, 482
group
Farrell-Jones group, 779
of homotopy spheres, 433
half-conjugation invariant functor, 290
handle, 19
boundary of the core, 19
cocore, 19
core, 19
dual, 34
transverse sphere, 19
handlebody $\mathbb{Z} \pi$-chain complex, 27
handlebody decomposition, 20
dual, 33
Heegaard splitting, 362
hessian, 336
hom chain map, 506
homological aspherical, 846
homology
reduced, 178
stably U-based, 398
with coefficients in $\mathbb{Z}^{w}$, 122
with coefficients in a coefficient system, 107
with coefficients in a module, 123
homotopy
regular, 88
homotopy $N, 805$
homotopy $n$-dimensional symmetric complex,

$$
633
$$

homotopy $n$-dimensional quadratic complex,

$$
633
$$

homotopy cartesian square of chain complexes, 539
homotopy cocartesian square of chain complexes, 526
homotopy cofibration sequence
extended, 535
of chain complexes, 522
homotopy cofibre
of a chain map, 522
homotopy colimit, 150
of a sequence of chain maps, 545
homotopy equivalence
normal, 256
simple, 53
homotopy fibration sequence
of chain complexes, 529
homotopy fibre
of a chain map, 528
homotopy $n$-sphere, 431
homotopy pullback
of chain complexes, 538
homotopy pushout
of chain complexes, 524
Hopf collapse map, 80
Hopf construction, 443
hyperbolic manifold, 839
hyperbolisation, 840
hyperquadratic
complex,570
hyperquadratic structure, 570
immersion
group of regular homotopy classes, 228
pointed, 228
inertia subgroup, 831
intersection pairing
for kernels, 249
for manifolds with boundary, 135
geometric, 229
on singular cohomology, 130
on singular cohomology with coefficients in $R, 129$
on singular homology, 130
on singular homology with coefficients in $R$, 130
intrinsic algebraic surgery exact sequence, 761
intrinsic surgery obstruction
in even dimension, 293
in odd dimension, 386
involution
of rings, 120
$w$-twisted involution of a group ring, 50
irreducible 3-manifold, 839
$J$-homomorphism, 443
join, 60
fibrewise join of spherical fibrations, 143
of (generalised) lens spaces and (fake) complex projective spaces, 811
join construction, 811
$k$-connected map, 76
$k$-smoothing, 861
$k$-universal $b$-structure, 861
kernel formation, 365
kernel groups
relative boundary,272
Kervaire invariant, 439
Kervaire invariant problem,449
Kronecker pairing
for chain complexes, 246
for spaces, 134
$L$-class, 301
$L$-group
(free) quadratic $L$-groups in terms of chain complexes, 676
(free) symmetric $L$-groups in terms of chain complexes, 676
projective quadratic $L$-group, 766
decorated quadratic $L$-groups in even dimensions, 395
decorated quadratic $L$-groups in odd dimensions, 396
decorated quadratic $L$-groups in terms of chain complexes, 751
projective quadratic $L$-groups in even dimensions, 558
projective quadratic $L$-groups in terms of chain complexes, 675
projective symmetric $L$-groups in terms of chain complexes, 675
quadratic $L$-groups in even dimensions, 259
quadratic $L$-groups in odd dimensions, 333
reduced simple $L$-group, 767
simple quadratic $L$-groups, 397
simple quadratic $L$-groups in terms of chain complexes, 752
simple symmetric $L$-groups in terms of chain complexes, 752
lagrangian, 260
complementary lagrangians, 331
sublagrangian of a quadratic form, 260
sublagrangian of a symmetric form, 260

## Lemma

Elimination Lemma, 23
Franz' Independence Lemma, 71
Normal Form Lemma, 33
lens space, 57
generalised, 58
linking form
$\epsilon$-quadratic linking form, 346
$\epsilon$-symmetric linking form, 346
decomposable $\epsilon$-quadratic linking form, 355
indecomposable $\epsilon$-quadratic linking form, 355
non-singular $\epsilon$-quadratic linking form, 346
non-singular $\epsilon$-symmetric linking form, 346
local coefficient system, 107
infinite cyclic, 108
local orientation coefficient system, 114
m-dual, 179
manifold
flat, 839
hyperbolic, 839
Kervaire manifold, 801
Milnor manifold, 801

Manifold Hauptvermutung, 790
manifold set
simple, 408
manifold structure, 408
simple,407
manifold triad, 311
mapping cone
of a chain map, 45|514
of a cochain map, 239
of a map of spaces, 55
mapping cylinder
of a chain map, 45
of a map of spaces, 54
mapping telescope, 544
metabolic
quadratic form, 262
symmetric form, 260
module
stably finitely generated free, 246
stably $U$-based, 394
$U$-based, 393
Mostow rigidity, 844
non-degenerate symmetric bilinear form, 130
non-singular, 245
normal $\xi$-bordism, 100
normal $\xi$-map, 100
normal $k$-type, 862
normal bordism,202
$(k+1)$-normal bordism, 368
$(k+1)$-trace normal bordism, 368
normal bordism of normal maps with respect to the tangent bundle, 206
normal bordism of normal maps with cylindrical target with respect to the tangent bundle (of degree one), 207
normal bordism with cylindrical target (of degree one), 204
normal bordism with respect to the tangent bundle of degree one, 207
normal bordisms of rank $k$ normal maps of degree one, 203
normal bundle, 98
of an immersion, 88
normal fibration, 164
normal homotopy equivalence, 256
normal invariant
rank $k$ normal invariant, 198
set of normal invariants, 198
set of rank $k$ normal invariants, 198
normal map
normal $\Gamma$-map of degree one, 223
of degree one with reference, 481
of degree one with respect to the tangent bundle, 205
of degree one with respect to the tangent bundle relative boundary, 309
rank $k$ normal map, 201
rank $k$ normal map of degree one, 202
with respect to the tangent bundle, 205
normal splitting along submanifold, 795
null space of a symmetric $\mathbb{R}$-bilinear pairing, 131
nullhomology, 554
orbit category, 774
orientable, 124
orientation
conventions, 119
orientation homomorphism
of a finite Poincaré complex, 125
of a spherical fibration, 144
orientation preserving diffeomorphism, 798
orientation reversing diffeomorphism, 798
outward normal vector field, 118
pair
quadratic, 650
symmetric, 650
PL rigid, 847
Poincaré torsion, 127
Poincaré triad, 311
Poincaré complex
$n$-dimensional polarised quadratic Poincaré complex, 618
$n$-dimensional polarised symmetric complex Poincaré complex, 618
$n$-dimensional quadratic complex Poincaré complex, 618
$n$-dimensional symmetric complex Poincaré complex, 618
$w$-oriented finite $n$-dimensional, 124
oriented connected finite $n$-dimensional, 123
connected finite $n$-dimensional, 122
connected simple, 123
finite $n$-dimensional, 123
finite of formal dimension $n, 125$
oriented, 124
simple, 124
$w$-oriented connected finite $n$-dimensional, 123
with reversed orientation, 124
Poincaré pair
finite $n$-dimensional, 132
simple finite $n$-dimensional, 133
special, 483
Poincaré $\mathbb{Z} \pi$-chain homotopy equivalence, 122
pointed
free $\Gamma$-space, 579
immersion, 228
regular homotopy, 228
polarisation, 570
Pontrjagin classes, 301
Pontrjagin dual, 817
$p q$-condition, 72
prime 3-manifold, 839
product
slant, 178
pullback, 143
of chain complexes, 527
pushout
of chain complexes, 512
quadratic
$n$-dimensional polarised quadratic Poincaré complex,618
$n$-dimensional quadratic complex Poincaré complex, 618
cobordism, 666
connected complex, 619
evaluation map, 653
pair, 650
Poincaré pair, 663
quadratic complex,570
quadratic structure, 570
signature of a degree one normal map, 680
quadratic construction, 611
equivariant, 617
relative, 662
relative equivariant, 662
regular homotopy, 88
pointed, 228
Reidemeister stable $U$-equivalence class of stable $\mathbb{Z} \pi$-bases, 466
Reidemeister torsion
of a contractible finite based free chain complex, 45
of a finite $C \bar{W}$-complex with respect to an acyclic representation, 66
of a generalised lens space, 65
Reidemeister $U$-torsion of a contractible finite $U$-stably based chain complex, 395
Reidemeister $U$-torsion of a stably $U$-based finite chain complex with stably $U$-based homology, 398
representation
contragredient, 769
representation of the surgery kernel, 361
Rho-invariant for finite groups, 815
rigid
PL, 847
smoothly, 419
topologically, 419
ring
with involution, 50
with property (IBN), 329
rotation trick, 535
$S$-dual, 179
$S$-Г-duality, 620
self-intersection element, 233
self-intersection function, 234
set of equivariant stable homotopy classes, 620
set of normal maps
to a compact manifold, 410
to a Poincaré complex, 204
set of stable homotopy classes, 179
signature
of a finite oriented $4 k$-dimensional Poincaré complex, 132
of a finite Poincaré pair, 135
of a symmetric $\mathbb{R}$-bilinear pairing, 132
quadratic signature of a degree one normal map, 680
symmetric signature of a geometric Poincaré complex, 679
simple
geometric surgery exact sequence, 413
geometric surgery obstruction, 489
geometric surgery obstruction group, 482
homotopy equivalence, 53
manifold set, 408
manifold structure, 407
singular chain complex, 577
slant maps, 509
slant product, 178
smash product, 99
smoothing
$k$-smoothing, 861
smoothing theory, 457
smoothly rigid, 419
space
pointed free, 579
Space Form Problem, 72
special Poincaré pair,483
spectrum, 102
1-connective cover, 834
sphere bundle, 98
spherical fibration, 142
Spherical Space Form Problem, 73
Spivak
normal fibration, 167
normal structure for a finite Poincare complex, 167
normal structure of closed manifold, 167
split $\varepsilon$-quadratic formation, 643
splitting invariant along submanifold, 797
stable
basis, 394
cohomotopy group, 188
diffeomorphism, 850
homotopy groups, 443
homotopy groups of a spectrum, 102
stem, 153
Umkehr map of a normal map of degree one, 621
stable isomorphism
of $\epsilon$-quadratic formations, 331
of $\varepsilon$-symmetric formations, 638
of split $\varepsilon$-quadratic formations, 644
stably
$U$-based $\epsilon$-quadratic formation
$(P, \psi ; F, G), 396$
diffeomorphic, 851
equivalent spherical fibrations, 148
finitely generated free module, 246
parallelisable, 434
prime 4-manifold, 872
$U$-based finite chain complex, 395
stably $U$-based homology, 398
$U$-based module, 394
$U$-equivalent basis, 394
standard embedding, 85
strictly
$n$-dimensional quadratic complex, 633
n-dimensional symmetric complex, 633
strong
fibre homotopy, 142
fibre homotopy equivalence, 142
structure homomorphisms of a formation, 334
structure set, 408
simple, 407
sublagrangian
of a quadratic form, 260
of a symmetric form, 260
surgery
along an embedding, 80
on the boundary, 461
step, 97
step on the boundary, 461
The effect of algebraic surgery

- quadratic case, 716

The effect of algebraic surgery
— symmetric case, 712
trivial surgery, 86
trivial surgery with trivial framing, 86
surgery exact sequence
algebraic for closed topological manifolds, 760
algebraic for simplicial complexes, 759
geometric, 413
geometric for the PL category and the topological category, 416
intrinsic algebraic, 761
simple geometric,413
surgery kernel, 240
representation of the surgery kernel, 361
surgery obstruction
for manifolds with boundary and simple homotopy equivalences, 402
geometric, 489
intrinsic surgery obstruction in even dimension, 293
intrinsic surgery obstruction in odd dimension, 386
simple geometric, 489
total, 427, 763
surgery obstruction group
geometric, 482
simple geometric, 482
surgery on the boundary, 461
surgery problem, 214
Surgery Program, 17
Surgery Program recognising manifolds, 217
suspension
for (generalised) lens spaces, 812
of a chain complex, 45, 515
of a pointed space, 99
of a spherical fibration, 148
suspension map
for hyperquadratic structures, 585
for quadratic structures, 585
for symmetric structures, 585
switch chain map,506
symmetric
$n$-dimensional polarised symmetric complex Poincaré complex,618
$n$-dimensional symmetric complex Poincaré complex, 618
Poincaré pair, 663
cobordism, 666
connected complex, 619
definite symmetric bilinear form, 263
evaluation map, 653
indefinite symmetric bilinear form, 263
pair, 650
signature of a geometric Poincaré complex, 679
structure, 570
symmetric complex, 570
symmetric construction, 578
pointed relative, 661
equivariant symmetric construction, 579
pointed, 579
pointed equivariant symmetric construction, 580
pointed relative equivariant, 661
relative, 661
symmetrisation map, 576
symplectic basis,265
tangential
$\xi$-map, 97
$\xi$-bordism, 97
Tate cohomology, 127
tensor product
over a category, 107
tensoring chain map, 506
Theorem
$G$-signature homomorphism, 770
$L_{4 k+2}(\mathbb{Z}), 269$
$L_{4 k}(\mathbb{Z}), 263$
$\mathbb{Q}$-trivial formations versus boundary formations, 345
TOP/PL is an Eilenberg-MacLane, 423
Algebraic $L$-theory of $\mathbb{Z} G$ for finite groups, 768
Algebraic Rothenberg sequence, 755, 757
Algebraic Shaneson splitting, 757
Aspherical closed manifolds with exotic fundamental groups, 842
Aspherical closed non-PL manifolds, 841
Basic properties of Whitehead torsion, 39
Bordism invariance of the degree,211
Bordism invariance of the intrinsic surgery obstruction in even dimensions, 299
Bordism invariance of the intrinsic surgery obstruction in odd dimensions, 387
Bordism invariance of the signature, 134
Browder's Theorem about the Arf invariant, 449
Browder-Novikov Theorem, 417
Characterisation of Poincaré duality in terms of the normal fibration, 175
Classification of closed topological 4-dimensional spin manifolds with infinite cyclic fundamental group, 873
Classification of Homotopy Spheres, 432
Classification of spherical fibrations, 145
Classification of stable homotopy classes of spherical fibrations over finite $C W$ complexes, 151

Classification of stable isomorphisms classes of vector bundles over finite $C W$-complexes, 148
Classification of vector bundles, 144
Closed manifolds are Poincaré complexes, 125
Compact manifolds are Poincaré pairs, 133
Comparing geometric and algebraic Whitehead torsion, 56
Complete Intersections, 871
Composition formula in the topological structure set, 806
Computation of $\Theta_{n} / b P_{n+1}, 450$
Computation of $b P_{4 k+2}$ in terms of the Arf-invariant-one-problem,449
Computation of $b P_{4 k}, 448$
Computations of the J-homomorphism, 444
Counterexamples up to homotopy to prime decomposition in dimension 4,873
Diffeomorphism classification of lens spaces, 69
Differentiable Sphere Theorem, 457
Existence and uniqueness of Spivak normal fibrations, 168
Existence of stable diffeomorphisms, 858
Exotic aspherical closed manifolds in dimension 4,841
Exotic aspherical closed manifolds with hyperbolic fundamental group, 842
Exotic universal covering, 842
Extended realisation surgery obstructions, 323
Four-manifolds splitting as a connected sum topologically but not smoothly, 873
Franz' Independence Lemma, 71
Generalised Atyiah duality, 180
Geometric Rothenberg sequence, 496
Geometric Rothenberg sequence for structure sets, 496
Geometric Shaneson splitting, 497
Geometric Shaneson splitting for structure sets,499
Geometric surgery exact sequence, 413
Geometric Surgery Obstruction Theorem, 489
h-Cobordism Theorem, 16
Hirzebruch Signature Theorem, 301
Homogeneous manifolds of dimension 7, 871
Homology isomorphisms and topologically rigidity, 846
Homotopy cartesian and homotopy cocartesian agree for chain complexes, 539

Homotopy classification of (generalised) lens spaces, 60
Homotopy cofibrations and homotopy fibrations agree for chain complexes, 532
Homotopy type of G/TOP, 785
Homotopy type of G/TOP as infinite loop space, 792
Homotopy-theoretic interpretation of the Kervaire-Milnor braid,452
Identification of the form/formation and the chain complex version of quadratic $L$-groups, 558
Identification of the form/formation and the chain complex version of quadratic $L$-groups in the simple case, 752
Identification of the geometric and algebraic surgery exact sequence, 760
Identification of the simple surgery obstruction with the simple quadratic signature, 753
Identification of the surgery obstruction with the quadratic signature, 558
Identifying the geometric surgery obstruction groups with the algebraic $L$-groups, 490
Immersions and bundle monomorphisms, 89
Indecomposable linking forms over $\mathbb{Z}, 355$
Intrinsic surgery obstruction in even dimension, 298
Intrinsic surgery obstruction in even dimension relative boundary, 311
Intrinsic surgery obstruction in odd dimension, 387
Intrinsic surgery obstruction in odd dimension relative boundary, 389
Inverse of the Thom Isomorphism Theorem, 161
Kervaire-Milnor braid,451
Killing the absolute kernels of a normal map of pairs, 275
Killing the surgery kernels of a normal map, 243
Kirby-Siebenmann invariant, 790
Localisation of simply connected spaces, 785
Making a normal $\boldsymbol{\xi}$-bordism highly connected, 102
Making a normal map highly connected], 214
Making a tangential $\xi$-map highly connected, 98
Maslov identity, 341
Non-triangulable aspherical closed manifolds, 841

Normal invariants and G/O, 200
Normal invariant and surgery problems, 204
Normal invariants in the topological category after rationalisation, 793
Normal Maps and G/O, 210
Normal maps, G/PL and G/TOP, 416
Normal splitting along a submanifold, 795
Odd local part of oriented bordism groups, 788
Odd-dimensional $L$-groups via automorphisms, 340
$\pi$ - $\pi$-Theorem, 462
$\pi-\pi$-Theorem for triads, 463
PL and topological structure sets in the simply connected case, 417
Poincaré Conjecture, 16
Poincaré duality and $S$-duality, 180
Pontrjagin Thom construction and oriented bordism, 102
Pontrjagin-Thom Construction, 101
Product formula for surgery obstructions, 753
Products in $L$-groups, 753
Puppe sequences for chain complexes, 533
Realisation of even-dimensional surgery obstructions, 317
Realisation of odd-dimensional surgery obstructions, 390
Realisation of simple surgery obstructions, 405
Recognising the $S$-dual of a map, 180
Reducing the family, 778
Reflection trick, 842
s-Cobordism Theorem, 15
Simple homotopy classification of generalised lens spaces, 65
Simple surgery obstruction for manifolds with boundary,404
Simply connected surgery obstruction maps are surjective, 800
Solution to the simply connected surgery problem in odd dimensions, 388
Solution to the surgery problem in even dimensions, 302
Space Form Problem,72
Spherical Space Form Problem, 73
Stable diffeomorphism classification, 866
Stable Kneser Decomposition for 4-manifolds, 872
Stable parallelisability of homotopy spheres, 440
Stable prime decomposition for 4-manifolds, 872
Status of the Borel Conjecture, 843

Sullivan splitting of G/O $(p), 424$
Surgery and hyperbolic kernels, 256
Surgery exact sequence for PL and TOP, 416
Surgery obstruction in even dimensions, 270
Surgery obstruction in odd dimensions, 360
Surgery obstruction maps for lens spaces, 826
Surgery step, 94
Surjectivity of the surgery obstruction for PL and TOP, 417
The 2-local homotopy type of bordism spectra, 787
The long exact sequence for homotopy spheres, 440
The simple topological structure set of a generalised lens space with fundamental group of odd order, 822
The structure set for simply connected closed manifolds, 838
The structure set for simply connected manifold times aspherical manifold, 837
The surgery exact sequence for homotopy spheres, 439
The topological classification of fake lens spaces with fundamental groups of odd order, 824
Thom chain homotopy equivalence, 159
Thom Isomorphism Theorem, 160
Topological Browder-Novikov Theorem, 417
Topological rigidity and connected sums, 846
Topological rigidity and homology spheres, 846
Topological rigidity and products of two spheres, 845
Topological structure sets of certain torus bundles over lens spaces, 830
Topological structure sets of closed aspherical manifolds, 828
Topological structure sets of complex projective spaces, 809
Topological structure sets of products of spheres, 807
Topological structure sets of quaternionic projective spaces, 811
Topological structure sets of real projective spaces, 820
Topologically rigid 3-manifolds, 845
Turning an immersion into an embedding, 236
up-down formula for the surgery transfer, 754
Vanishing of $b P_{2 k+1}, 449$

Vanishing of $L_{2 k+1}(\mathbb{Z}), 334$
Vanishing of the surgery transfer, 755
Whitney's Approximation Theorem, 89
Zero criterion for formations, 337
thickening
of an immersion, 91
Thom class
intrinsic, 157
Thom collapse map, 99.165
Thom isomorphism, 161
Thom space
of a spherical fibration, 142
of a vector bundle, 98
topological rigid, 419
torsion dual of a finite abelian group, 346
total surgery obstruction, 427, 763
trace of surgery
along the embedding, 81
on a normal map, 97
transport groupoid, 774
triad
of manifolds, 311
Poincaré, 311
trivial surgery, 86
with trivial framing, 86
$U$-based module, 393
$U$-equivalence class
Reidemeister stable $U$-equivalence class of stable $\mathbb{Z} \pi$-bases, 466
stable $U$-equivalence class of stable bases, 394
$U$-equivalent
basis, 393
$U$-simple, 751
$U$-torsion
of a stable isomorphism of stably $U$-based modules, 394
Umkehr map, 241
chain level Umkehr map,243
chain level Umkehr map for pairs, 275
for pairs, 273
stable Umkehr map of a normal map of degree one, 621
unit disk, 57
unit sphere, 57
universal covering functor, 107
universal principal $G$-bundle, 59
vector bundle reduction of the Spivak normal fibration, 168
vector field
outward normal vector field, 118

Whitehead group, 41
of a space, 49
Whitehead torsion
of a chain homotopy equivalence, 46
of a homotopy equivalence, 49
Whitehead $U$-torsion of a chain homotopy equivalence of stably $U$-based finite $R$-chain complexes, 395
Witt group, 262
wreath product, 7779
Wu class, 625
Wu formula, 167
$\xi$-bordism normal, 100 tangential, 97
$\xi$-map
normal, 100
tangential, 97

