
Contents

Preface	xi
Introduction	xiii
About the Author	lix
1 Cayley-Hamilton Algebras	1
1.1 Conjugacy classes of matrices	1
1.2 Simultaneous conjugacy classes	14
1.3 Matrix invariants and necklaces	18
1.4 The trace algebra	25
1.5 The symmetric group	30
1.6 Necklace relations	33
1.7 Trace relations	42
1.8 Cayley-Hamilton algebras	47
2 Reconstructing Algebras	55
2.1 Representation schemes	55
2.2 Some algebraic geometry	58
2.3 The Hilbert criterium	64
2.4 Semisimple modules	69
2.5 Some invariant theory	75
2.6 Geometric reconstruction	82
2.7 The Gerstenhaber-Hesselink theorem	89
2.8 The real moment map	99
3 Etale Technology	109
3.1 Etale topology	109
3.2 Central simple algebras	119
3.3 Spectral sequences	123
3.4 Tsen and Tate fields	127
3.5 Coniveau spectral sequence	132
3.6 The Artin-Mumford exact sequence	136
3.7 Normal spaces	145
3.8 Knop-Luna slices	155

4	Quiver Technology	163
4.1	Smoothness	163
4.2	Local structure	174
4.3	Quiver orders	185
4.4	Simple roots	197
4.5	Indecomposable roots	203
4.6	Canonical decomposition	213
4.7	General subrepresentations	226
4.8	Semistable representations	231
5	Semisimple Representations	241
5.1	Representation types	241
5.2	Cayley-smooth locus	249
5.3	Reduction steps	258
5.4	Curves and surfaces	271
5.5	Complex moment map	285
5.6	Preprojective algebras	291
5.7	Central smooth locus	294
5.8	Central singularities	303
6	Nilpotent Representations	315
6.1	Cornering matrices	315
6.2	Optimal corners	322
6.3	Hesselink stratification	326
6.4	Cornering quiver representations	335
6.5	Simultaneous conjugacy classes	342
6.6	Representation fibers	350
6.7	Brauer-Severi varieties	362
6.8	Brauer-Severi fibers	368
7	Noncommutative Manifolds	377
7.1	Formal structure	377
7.2	Semi-invariants	385
7.3	Universal localization	396
7.4	Compact manifolds	404
7.5	Differential forms	414
7.6	deRham cohomology	429
7.7	Symplectic structure	438
7.8	Necklace Lie algebras	445
8	Moduli Spaces	451
8.1	Moment maps	452
8.2	Dynamical systems	456
8.3	Deformed preprojective algebras	464
8.4	Hilbert schemes	469

<i>Contents</i>	xi
8.5 Hyper Kähler structure	482
8.6 Calogero particles	487
8.7 Coadjoint orbits	493
8.8 Adelic Grassmannian	497
References	505
Index	515