

References

- [Al; 86]Alperin J.: Local Representation Theory, Cambridge University Press, 1986.
- [A-M; 69]Atyah M., I.G. Macdonald: Introduction to commutative algebra, Oxford 1969.
- [Ar; 84]Artin E.: The orders of the classical groups, *Comm. Pure Appl. Math.* 8 (1984), 446–460.
- [Asch; 87]Aschbacher M.: Finite Group Theory, Cambridge Studies in Math. 1987.
- [Atl; 85]Conway J., R. Curtis, S. Norton, R. Parker, R. Wilson: Atlas of Finite Groups, Oxford University Press, Oxford 1985.
- [Ba; 64]Bass H.: The stable structure of quite general linear groups, *J. AMS* 70 (1964), 429–433.
- [B-M-S; 67]Bass H., J. Milnor, J.P. Serre: Solution of the congruence subgroup problem for SL_n ($n \geq 3$) and Sp_{2n} ($n \geq 2$); *Publ. IHES* 33 (1967), 59–137.
- [Ben; 84]Benson D.: Modular Representations, New Trends and Methods, Springer Lecture Notes in Mathematics 1081 (1984).
- [Ber; 53]Berman S.D.: On certain properties of integral group rings; (Russian) *Dokl. Akad. Nauk SSSR (N.S.)* 91 (1953), 7–9.
- [Ber; 55]Berman S.D.: On the equation $x^m = 1$ in an integral group ring, *Ukrain. Mat. Zh.* 7 (1955), 253–261.
- [Bes; 89]Bessenrodt C.: The isomorphism type of an abelian defect group of a block is determined by its modules. *J.London Math.Soc.(2)* 39 (1989), 61–66.
- [Bo; 60]Bourbaki N.: *Éléments de mathématique première partie, topologie générale, chapitre 3 groupes topologiques (théorie élémentaire)*; *Actualités sci. et ind.* 1143, 1960.
- [Bra; 63]Brauer R.: Representations of finite groups. Lectures on modern mathematics, Vol.I, 133–175, Wiley New York, 1963. reproduced in Vol.II of: Richard Brauer: collected papers. MIT press, Cambridge MA, 1980.
- [Br; 87]Brown K.S.: Cohomology of Groups, Springer Graduate Texts in Mathematics 87, (1987).
- [C-S-W; 81]Cliff G.H., S.K. Sehgal, A.R. Weiss: Units of integral group rings of metabelian groups; *J. of Algebra* 73 (1981), 167–185.
- [C-H; 80]Camina A., M. Herzog: Character tables determine abelian Sylow 2 – subgroups, *Proc. AMS* 80 (1980) 533–535.
- [C-E; 56]Cartan H., S. Eilenberg: Homological Algebra; Princeton University Press, 1956.
- [Col; 64]Coleman D.: On the modular group ring of a p -group, *Proc. AMS*, 15 (1964), 511–514.

- [Con; 72]Conlon S.B.: A basis for monomial algebras; *J. of Alg.* 20 (1972), 396–415.
- [C-R; 62]Curtis C.W. I. Reiner: *Representation Theory of finite Groups and Associative Algebras*, John Wiley (1962).
- [C-R1; 82]Curtis C.W., I. Reiner: *Methods of Representation Theory*, Vol. 1, John Wiley Interscience (1982).
- [C-R2; 87]Curtis C.W., I. Reiner: *Methods of Representation Theory*, Vol. 2, John Wiley Interscience (1987).
- [Da; 64,1]Dade E.: Deux groupes finis ayant la même algèbre de groupe sur tout corps, *Mathematische Zeitschrift* 119 (1964), 345–348.
- [Da; 64,2]Dade E.: Answer to a question of R. Brauer; *J. of Algebra*, 1 (1964), 1–4.
- [De; 77]Dennis K.: The structure of the unit group of a group ring; *Proceedings Ring Theory Conference*, University of Oklahoma (1976), 103–130.
- [Di; 01]Dickson L.E.: *Linear Groups*, B.G. Teubner, Leipzig 1901; republished by Dover, N.Y. 1958.
- [Er; 90]Erdmann K.: *Blocks of tame representation type and related algebras*; *Lecture Notes in Math.* 1428, Springer, Berlin 1990.
- [Fe; 80]Feit W.: Some consequences of the classification of finite simple groups. The Santa Cruz conference on finite groups, 175–181, *Proc.Sympos.Pure Math.*37, Amer.Math.Soc.,Providence, 1980.
- [Fr; 73]Fröhlich A.: The Picard groups of noncommutative rings, in particular of orders, *Trans. Amer. Math. Soc.*, 180 (1973), 1–46.
- [F-R-U; 74]Fröhlich A., I. Reiner, S. Ullom: Class groups and Picard groups of orders, *Proc. London Math. Soc.* (3) 29 (1974), 405–434.
- [F-K-W; 74]Fröhlich A., M.E. Keating, S.M.J. Wilson : The class group of quaternion and dihedral 2–groups, *Mathematika* 21 (1974), 64–71.
- [Ga; 79]Gallagher P.X.: Invariants for finite groups, *Adv. Math.* 34 (1979), 46–57.
- [Gl; 65]Glauberman G. as quoted in [Pa; 65].
- [G-L; 83]Gorenstein D., R. Lyons: The local structure of finite groups of characteristic 2 type. *Memoirs AMS*, Vol. 42, No. 276, Providence R.I. 1983.
- [Gr; 67]Gruenberg K.: *Profinite Groups*; Cassels, Fröhlich, *Algebraic Number Theory*, *Proceedings of an International Conference held at Brighton*, Academic Press (1967).
- [G-R; 88]Gustafson W., K.W. Roggenkamp: A Mayer – Vietoris sequence for Picard groups with applications to integral group rings of dihedral and quaternion groups, *Ill. J. Math.* (1988) I. Reiner memorial volume, 375–406.
- [H-L; 90]Hiss G., K.Lux: *Brauer Trees of sporadic groups*, Oxford University Press 1990
- [Has; 49]Hasse H.: *Zahlentheorie*, Akademie-Verlag, Berlin 1949.

- [Har; 77]Hartshorne R.: Algebraic Geometry, Graduate Texts in Mathematics 52, Springer (1977).
- [Hig; 39]Higman G.: Units in group rings, D. phil. theses, Oxford Univ. (1939).
- [Hil; 1897]Hilbert D.: Die Theorie der algebraischen Zahlkörper, Gesammelte Abhandlungen Band 1, Springer 1970.
- [H-S; 70]Hilton D., U. Stammbach: A Course in Homological Algebra, Springer, 1970.
- [Hu; 67]Huppert B., Endliche Gruppen I, Springer Verlag 1967.
- [H-B2; 82]Huppert B., N. Blackburn, Finite Groups II, Springer 1982.
- [H-B3; 82]Huppert B., N. Blackburn, Finite Groups III, Springer 1982.
- [H-P; 72]Hughes I., K.E. Pearson: The group of units of the integral group ring $\mathbb{Z}S_3$, Can. Math. Bull 15 (1972), 529–534.
- [Is; 76]Isaacs M.: Character Theory of Finite Groups. Academic Press, N.Y. 1976.
- [J-M; 87]Jackowski S., Z. Marciniak: Group automorphisms inducing the identity map on cohomology; J. of Pure and Appl. Algebra 44 (1987), 241–250.
- [Ja; 69]Jackson D.A.: The group of units of the integral group rings of finite metabelian and finite nilpotent groups, Quart. J. Math. Oxford (2) 20 (1969), 313–319.
- [Ka; 74]Kaplansky I.: Commutative Rings, Queen Mary College Mathematics Notes. 1974
- [Ki; 91]Kimmerle W.: Beiträge zur ganzzahligen Darstellungstheorie endlicher Gruppen, Bayreuther Math. Schr. Heft 36 (1991).
- [K-L-S-T; 90]Kimmerle W., R. Lyons, R. Sandling, D. Teague: Composition factors from the group ring and Artin's theorem on orders of simple groups; Proceedings LMS (3) 60 (1990), 89–122.
- [K-R; 91]Kimmerle W., K. Roggenkamp: A Sylowlike Theorem for Integral Group Rings of Finite Solvable Groups, appears in Arch. d. Math.
- [K-S; 91]Kimmerle W., R. Sandling: A group theoretic and group ring theoretic determination of certain Sylow and Hall subgroups and the resolution of a question of Brauer; preprint.
- [Kl; 91]Klingler L.: Construction of a counterexample to a conjecture of Zassenhaus, Comm. Alg., 19 (8), (1991), 2303–2330.
- [Mic; 86]Michler G.: Brauer's conjectures and the classification of finite simple groups. Groups and orders (Ottawa 1984), Lecture Notes in Math., Springer, Berlin 1986, 129 – 142
- [Mil; 71]Milnor J.: Introduction to algebraic K -theorie, Ann. of Math. Studies 72 1971, Princeton N.J.
- [Mo; 58]Morita K.: Duality for modules and its applications to the theory of rings with minimum condition; Sci. Rep. Tokyo Kyoiku Daigaku, Section A, 6, no. 150, (1958), 83–142.

- [Pa; 65]Passman D.S.: Isomorphic Groups and Group Rings, Pacific Journal of Mathematics (2) 35 (1965), 561–583.
- [Pa; 77]Passman D.S.: Algebraic structure of group rings; Interscience, N.Y. 1977.
- [Pe; 76]Peterson G.: Automorphisms of the integral group rings of S_n , Proceedings AMS Vol. 59, No.1, (1976), 14–18.
- [Pl; 91]Plesken W.: Some applications of representation theory; in Representation Theory of Finite Groups and Finite-Dimensional Algebras, ed. by G.O. Michler and C.M. Ringel, Birkhäuser Progress in Math. Vol. 95, 477–496.
- [Pu; 81]Puig L.: Pointed groups and construction of characters, Math. Z. 176 (1981), 165–292.
- [Qui; 71]Quillen D.: The spectrum of an equivariant cohomology ring: I and II, Annals of Math. 94 (1971), 549–602.
- [Que; 80]Queyrut J.: S-groupes de Grothendiecket structure galoisienne des anneaux d'entiers, Springer Lecture Notes in Math. 882, pp.219–239, 1980.
- [Re; 75]Reiner I.: Maximal Orders, Academic Press (1975).
- [R-R; 79]Reiner I., K.W. Roggenkamp: Integral Representations, Springer Lecture Notes in Mathematics 744, (1979).
- [R-U; 74]Reiner I., S. Ullom: Mayer Vietoris sequence for class groups; J. of Alg. 31 (1974), 305–342.
- [Ro; 72 1]Roggenkamp K. W.: Integral Representations of Finite Groups, Presses Universités Montreal, (1972).
- [Ro; 72 2]Roggenkamp K. W.: An extension of the Noether–Deuring Theorem, Proc. AMS 31 (1972), 423–426.
- [Ro; 80]Roggenkamp K. W.: Groupings of Metabelian Groups and Extension Categories; Canadian Journal of Mathematics XXXII, No.2 (1980), 449–459.
- [Ro; 81]Roggenkamp K.W.: Units in integral metabelian group rings I, Jackson's unit theorem revisited; Quart. J. of Math. Oxf. (2), 32, No. 126 (1981), 209–224.
- [Ro; 92]Roggenkamp K.W.: Subgroup rigidity of p -adic group rings (Weiss' arguments revisited); to appear J. Lon. Math. Soc. (1992).
- [R-S; 83]Roggenkamp K.W., L.L. Scott: Units in Metabelian Group Rings: Non-Splitting Examples for Normalized Units; J. of Pure and Appl. Algebra 27 (1983), 299–314.
- [R-S; 85]Roggenkamp K.W., L.L. Scott: Units in Group Rings: Splittings and the Isomorphism Problem; J. of Algebra, Vol. 96, No. 2 (1985), 397–417.
- [R-S; 86]Roggenkamp K. W., L.L.Scott: The Isomorphism Theorem for Integral Group Rings of Nilpotent by Abelian Groups, manuscript, (1986).
- [R-S; 87 1]Roggenkamp K. W., L.L. Scott: Isomorphisms of p -adic group rings;

- Annals of Mathematics, 126 (1987), 593-647.
- [R-S; 87 2]Roggenkamp K. W., L.L. Scott: A strong answer to the isomorphism problem for finite p -solvable groups with a normal p -subgroup containing its centralizer, manuscript, (1987).
- [R-S; 87 3]Roggenkamp K. W., L.L. Scott: On a Conjecture of Zassenhaus, preprint (1987).
- [R-Z; 90]Roggenkamp K. W., A. Zimmermann: On the Isomorphism Problem for Integral Group Rings of Finite Groups, preprint, (1990).
- [Sah; 68]Sah C.F.: Automorphisms of finite groups, J. Alg. 10 (1968), 47-68.
- [San; 74]Sandling R.: Group rings of circle and unit groups; Math. Z. 140 (1974), 195-202.
- [San; 85]Sandling R.: The isomorphism problem for group rings: a survey, in: Lecture Notes in Math., 1142, Springer Berlin (1985), pp. 256-288.
- [Sak; 71]Saksonov: On the group ring of finite groups I; Publ. Math. Debrecen 18 (1971), 187-209.
- [Sak; 66]Saksonov A.I.: Certain integer-valued rings associated with a finite group; Dokl. Akad. Nauk SSSR 171 (1966), 529-532 = Soviet Math. Dokl. 7 (1966), 1513-1516.
- [Sc; 85]Scott L.L.: Letter to K.W. Roggenkamp from June 13, 1985.
- [Sc; 87]Scott L.L.: Recent Progress on the isomorphism problem. Proc. of Symposia in Pure Math., Vol. 47 1987, 259-273.
- [Sc; 90]Scott L.L.: Représentations linéaires des groupes finis, Proc. Colloq. Luminy, France (1988), Astérisque 181-182, (1990).
- [Se; 78]Sehgal S.K.: Topics in Group Rings, Marcel Decker, N.Y. 1978.
- [Sch; 83]Schmidt P.: Lifting Modular Representations of p -Solvable Groups, J. Alg. 83 (1983), 461-470.
- [Sch; 88 1]Schmidt P.: Clifford Theory of Simple Modules, J. Alg. 119 (1988), 185-212.
- [Sch; 88 2]Schmidt P.: Extensions of lattices over p -solvable groups, Arch. Math. 50 (1988), 492-494.
- [Se; 83]Sehgal S.K.: Torsion units in integral group rings; Proc. Nato Institute on Methods in Ring Theory, Antwerp, D. Riedel, Dordrecht, 1983, pp. 497-504.
- [Th; 89]Thompson G.: On the conjugacy of group bases, Ph.D. theses, Univ. of Virginia, (1989).
- [We; 87]Weiss A.: p -adic rigidity of p -torsion; Annals of Mathematics, 317-332 (1987).
- [Wall; 47]Wall G.E.: Journal of the London Mathematical Society 22, (1947), 315-320.
- [Wallace; 87]Wallace D.: On the center and residual finiteness of the automorphism of a group ring. Proc. of the Edinburgh Math Soc. (1987) 30, 207-213.

-
- [Wh; 68]Whitcomb: The group ring problem. Ph. D. thesis, University of Chicago (1968).
- [Zi; 90]Zimmermann A.: Das Isomorphieproblem ganzzahliger Gruppenringe für Gruppen mit abelschem Normalteiler und Quotienten, der eine Vermutung von Hans Zassenhaus erfüllt, Diplomarbeit, Universität Stuttgart, (1990).

Index

- $Aut(CT(G))$, 100
 $Aut(Cl(G))$, 94
 C -free permutation lattice, 55
 $C_{\mathbb{Z}G}(H_0)$, 64
 $F(G)$, 121
 $F^*(G)$, 122
 $GL(n, q)$, 35
 $LFR(C_{\mathbb{Z}G}(H_0))$, 64
 $LFR_{\mathbb{Z}G}(C_{\mathbb{Z}G}(H_0))$, 64
 M_{11} , 100, 102
 $O_{p'}(G) = 1$, 38
 $O_{p'}(G)$, 9, 109
 $O_{p'}(G) = 1$, 112, 115
 $Out(H_0, \mathbb{Z}G)$, 64
 $Outcent(H_0, \mathbb{Z}G)$, 64
 $Outcent(RG)$, 108
 $PSL(2, q)$, 99
 $Pic(H_0, \mathbb{Z}G)$, 64
 $Picent(H_0, \mathbb{Z}G)$, 64
 $Picent(RG)$, 108
 $SL(n, q)$, 36
 $V(\mathbb{Z}D_8)$, 70
 $V(\mathbb{Z}S_3)$, 69
2-coboundary, 128
2-cocycle, 128
- abelian extension, 104
alternating group, 95, 98
associated to the group sequence,
105
augmentation ideals, 28
augmentation map, 9
augmented group bases, 106
Aut-Variation, 93, 97, 121
- Bass–Milnor–Serre, 36
blocks, 9
Brauer, 101
Brauer character, 102
Brauer pair, 28
Brauer tree, 99, 101
- Cech 1-cohomology, 90
center $\mathcal{Z}(RG)$, 21
central group automorphism, 110
central invertible bimodules, 64
central primitive idempotents, 22
central unit of finite order, 26
character table, 28, 31
chief factor, 118
chief series, 27, 32
class group, 68
class sum, 21
class sum correspondence, 21
class sum of a conjugacy class, 93
class sums of cyclic subgroups, 98
Cliff–Sehgal–Weiss, 36
Clifford’s theorem, 46
Clifford’s theory, 80, 87, 125
coefficient of 1 in x , 9
cohomology, 68
cohomology groups, 12
cohomology rings, 12, 81
cohomology rings $H^*(G, \mathbb{Z})$, 78
cohomology variety, 41, 69
Coleman, 11
Coleman’s result, 65
conjugate module, 126
Continuous cohomology of profinite
 p -groups, 14
contiunous cohomology group, 14
crystallographic groups, 37
- Dade, 101
defect, 77
defect zero, 80
different conjugate representations,
46
dihedral group of order 8, 70
- E. Artin, 32
Eichler condition, 88
eigenfactor, 47

- eigenvector, 49
 example, 138, 141, 142
- faithfully flat, 7
 Fröhlich, 60, 62
 Frobenius homomorphism, 129
 Frobenius reciprocity, 43, 48, 56, 133
- G. Thompson, 39
 G.Higman, 15, 32, 35
 G.Hiss, 142
 generalized permutation module, 40
 genus, 8
 Glauberman, 15
 graded R -module, 12
 Green, 102
 Green correspondence, 38
 Grothendieck group, 67
 group extensions, 104
- Hall subgroup, 122–124
 hamiltonian, 123
 height-zero conjecture, 124
 hereditary, 134
 Hughes and Pearson, 63
- idempotent, 16
 inducing the class sum correspondence, 21
 inertia group, 80, 125, 126
 infinite groups, 35
 invertible bimodule, 60, 85
 Ito's theorem, 47
- Jackson, 106
 Jordan-Hölder, 124
- König, Steffen, 111
 Ker-Coker-Lemma, 51
 Krull – Schmidt theorem, 46
 Krull Hauptidealsatz, 7
- L.L. Scott, 38, 106, 109
 linearly independent, 15
 localization, 9
 locally free, 8, 66
- Mackey, 43, 56
 Maschke's theorem, 126
 maximal elementary abelian p -subgroups, 69
 maximal order, 134
 Mayer-Vietoris sequence, 88
 Milnor, 67
 Milnor's Mayer-Vietoris sequence, 67, 72
 morphisms over G , 104
 multiplicative 2-cocycle, 130
- Nakayama's lemma, 46, 50, 108, 114
 nilpotent $[G, G]$, 121
 nilpotent blocks, 142
 Noether-Skolem theorem, 91
 Noether-Deuring theorem, 16, 52, 79
- normal subgroup correspondence, 28
 normalized automorphism, 91, 92
 Normalizers of p -Sylow subgroups of group bases, 11
- Orthogonality relations, 22
- permutation module, 55
 Picard-group, 60
 Pierce decomposition, 137
 Power map, 28
 prime spectrum, 13
 principal block, 9, 78
 profinite p -group, 41
 profinite groups, 13
 Puig, 142
 pullback, 72, 86, 118
 pure sublattice, 17
 pure submodule, 45
- Quillen, 42, 68
- Reiner, 67
 relative trace map, 47
 Rim's Theorem, 71, 72
 root of unity, 18
- Saksonov, 15

- scalar product, 22
- Schur Zassenhaus theorem, 85
- second cohomology group, 128, 129
- small group ring, 104
- source, 58
- splitting problem, 35–37
- subgroup rigidity, 38, 40
- supersoluble group, 117
- Suzuki group, 99
- Sylow subgroup, 121–124
- symmetric group, 96, 97

- tensor product, 135
- trace, 9
- transitive generalized permutation
 module, 40

- Ullom, 67
- unit group of rings, 33, 35
- units in RG of augmentation 1, 9

- variety, 68
- vertices, 45

- weak form of the Zassenhaus con-
 jecture, 89
- Weiss, 39, 40
- Whitcomb, 33, 106
- Whitehead group, 67

- Zariski topology, 13
- Zassenhaus conjecture, 91, 96, 99,
 117
- Zassenhaus conjecture for subgroups,
 63
- ZC-Variation, 93, 97, 117, 118, 121