

# References

## A. Collections

- [AAT] Algebra, algebraic topology and their interaction / Ed.: J.-E. Roos, Lect. Notes Math. v. 1183, Berlin – Heidelberg: Springer, 1986.
- [AN] Algebraic number theory / Eds. J.W.S. Cassels, A. Fröhlich, London – New York: Academic Press, 1967.
- [ES] Analyse et topologie sur les espaces singuliers, II–III / Eds.: B. Teissier, J.-L. Verdier, Astérisque, 1983, v. 101–102.
- [HG] Homological group theory ( Ed.: C.T.C. Wall, London Math. Soc. Lect. Notes, v. 36, Cambridge: Cambridge Uni.-Press, 1979.
- IH] Seminar on intersection homology / Ed.: A. Borel, Boston: Birkhäuser, 1984.
- [KT1] Algebraic  $K$ -theory. I, II, III / Lect. Notes Math., v. 341, 342, 343, Berlin – Heidelberg: Springer, 1973.
- [KT2] Applications of algebraic  $K$ -theory to algebraic geometry and number theory. Parts 1, 2 / Contemporary Math., v. 55, 1986.
- [SD] Systèmes différentiels et singularités / Eds.: A. Galligo, M. Granger, Ph. Maisonobe, Astérisque, 1985, v. 130.

## B. Books and Papers

André M.

1. Categories of functors and adjoint functors / Am. J. Math., 1966, v. 88, no. 3, p. 529–547.
2. Méthodes simpliciales en algèbre homologique et algèbre commutative / Lect. Notes Math. v. 34, Berlin – Heidelberg: Springer, 1973.

Artin M.

1. Grothendieck topologies / Lect. Notes Math. Dept. Harvard Univ., 1962
2. Algebraic spaces / Preprint Yale Univ., 1969.

Artin M., Tate J.

1. Class field theory / Lect. Notes Math. Dept. Harvard Univ., 1961.

Avramov L., Halperin S.

1. Through the looking glass: a dictionary between rational homotopy theory and local algebra, in: [AAT], p. 1–27.

Bass H.

1. Algebraic  $K$ -theory / New York – Amsterdam: Benjamin Inc., 1968.

Beilinson A.

1. Coherent sheaves in  $P^n$  and problems of linear algebra / Funkts. Anal. Prilozh. 1978, v. 12, no. 3, p. 68–69 [Russian].
2. Higher regulators and values of the  $L$ -function / Itogi Nauki Tekh., Ser. Sovrem. Probl. Mat., Novejshie Dostizh. 1984, v. 24, p. 181–238 [Russian].

Beilinson A., Bernstein J., Deligne P.

1. Faisceaux pervers / Astérisque, 1982, v. 100.

Bernstein J.N., Gelfand I.M., Gelfand S.I.

1. Algebraic bundles on  $P^n$  and problems of linear algebra / Funkts. Anal. Prilozh. 1978, v. 12, no. 3, p. 66–67 [Russian].

Bernstein J.N., Gelfand I.M., Ponomarev V.A.

1. Coxeter functors and Gabriel theorem / Usp. Mat. Nauk., 1973, v. 28, no. 1, p. 19–38 [Russian].

Berthelot P.

1. Cohomologie cristalline des schémas de caractéristique  $p > 0$  / Lect. Notes Math. v. 407, Heidelberg – Berlin: Springer, 1974.

Boardman J., Vogt R.

1. Homotopy invariant algebraic structures on topological spaces / Lect. Notes Math. v. 347, Heidelberg – Berlin: Springer, 1973.

Borel A., Wallach N.

1. Continuous cohomology, discrete subgroups, and representations of reductive groups / Princeton: Princeton Univ. Press, 1980.

Bott R., Tu I.

1. Differential forms in algebraic topology / New York: Springer, 1982.

Bourbaki N.

1. Algèbre, Ch. 10. Algèbre homologique / Paris: Masson, 1980.

Bousfield A.K., Gugenheim V.K.A.M.

1. On  $PL$  de Rham theory and rational homotopy type / Mem. Am. Math. Soc., 1976, v. 8, no. 179.

Bredon G.

1. Sheaf theory / New York: McGraw-Hill, 1967.

Brenner Sh., Butler M.C.P.

1. Generalization of the Bernstein – Gelfand – Ponomarev reflection functors / Lect. Notes Math., Berlin – Heidelberg: Springer, 1980, v. 832, p. 103–170.

Brown K.S.

1. Cohomology of groups / New York: Springer, 1982.

Cartan H.

1. Variétés algébriques complexes et cohomologie / Colloque sur les fonctions de plusieurs variables, Bruxelles, Mars 11–14, 1953, Liège – Paris, 1953.

Cartan H., Chevalley C.

1. Géométrie algébrique, Sem. Cartan – Chevalley / Paris: Secrétariat Math. 1955/56.

Cartan H., Eilenberg S.

1. Homological algebra / Princeton, New Jersey: Princeton Univ. Press, 1956.

Cartier P.

1. Homologie cyclique: Rapport sur les travaux récents de Connes, Karoubi, Loday, Quillen, ... Sém. Bourbaki, no. 621 / Astérisque, 1985, v. 121–122., p. 123–146.

Connes A.

1. Non-commutative differential geometry / Publ. Math. IHES., 1986, v. 62, p. 41–144.

Curtis C.W., Reiner I.

1. Representation theory of finite groups and associative algebras. New York – London: Interscience Publ., 1982.

Dedeker P.

1. Sur la cohomologie non-abélienne I, II / Can. J. Math., 1960, v. 12, p. 231–251; 1963, v. 15, p. 84–93.

Deligne P.

1. Théorie de Hodge, II, III / Publ. Math. IHES, 1971. v. 40, p. 5–58; 1974, v. 44, p. 5–77.
2. La conjecture de Weil, I, II / Publ. Math. IHES, 1974, v. 43, p. 273–307; 1980, v. 52, p. 137–252.

Deligne P., Griffiths Ph., Morhan J., Sullivan D.

1. Real homotopy theory of Kähler manifolds / Invent. Math., 1975, v. 29, no. 3, p. 245–274.

Demazure M., Gabriel P.

1. Groupes algébriques, v. 1 / Paris: Masson, 1970.

Dieudonné J.

1. Panorama des mathématiques pures. La choix bourbachique / Paris: Gauthier–Villars, 1977.

Dold A.

1. Lectures on algebraic topology / Berlin – Heidelberg: Springer, 1972.

Dold A., Puppe D.

1. Homologie nicht-additiver Funktoren: Anwendungen / Ann. Inst. Fourier, 1961, v. 11, p. 201–312.

Dubrovin B.A., Novikov S.P., Fomenko A.T.

1. Contemporary geometry: methods of homology theory / Moscow: Nauka, 1984 [Russian].

Duskin J.

1. Simplicial methods and the interpretation of triples cohomology / Mem. Am. Math. Soc., 1975, no. 163.
2. Higher dimension torsors and the cohomology of topoi: the abelian theory / Lect. Notes Math., Heidelberg – Berlin: Springer, 1977, v. 753, p. 255–279.

Eckmann B., Hilton P.J.

1. Exact couples in an Abelian category / J. Algebra, 1966, v. 3, no. 1, p. 38–87.
2. Composition functors and spectral sequences / Comment. Math. Helv., 1966, v. 41, no. 3, p. 187–221.

Faith C.

1. Algebra: modules, rings and categories / Berlin – Heidelberg: Springer, 1973.

Feigin B.L., Tsygan B.L.

1. Cohomology of the Lie algebra of generalized jacobian matrices / Funkts. Anal. Prilozh., 1983, v. 17, no. 2, p. 86–87 [Russian].
2. Additive  $K$ -theory / Lect. Notes Math., Berlin – Heidelberg: Springer, 1970, v. 1289, p. 67–209.

Fuks D.B.

1. Homotopic topology / Moscow: Idz. MGU, 1969 [Russian].
2. Cohomology of infinite-dimensional Lie algebras / Moscow: Nauka, 1984 [Russian].

Fulton W., MacPherson R.

1. Categorical framework for the study of singular spaces / Mem. Am. Math. Soc., 1981, v. 31, no. 243.

Gabriel P., Zisman M.

1. Calculus of fractions and homotopy theory / Berlin – Heidelberg: Springer, 1967.

Gelfand I.M., Shilov B.E.

1. Commutative normed rings / Moscow: Fizmatgiz, 1960 [Russian].

Giraud J.

1. Cohomologie non Abéliennes / Lect. Notes Math., Berlin – Heidelberg: Springer, 1971.

Godement R.

1. Topologie algébrique et théorie des faisceaux / Paris: Hermann, 1958.

Goldblatt R.

1. Topoi. The categorical analysis of logic / Amsterdam – New York – Oxford: North-Holland, 1979.

Golovin V.D.

1. Homology of analytic sheaves and duality theorems / Moscow: Nauka, 1986 [Russian].

Goresky M., MacPherson R.

1. Intersection homology. II / Invent. Math., 1983, v. 72, no. 1, p. 77–130.

Gorodentsev A.L., Rudakov A.N.

1. Exceptional bundles on projective spaces / Duke Math. J., 1987, v. 54, p. 115–130.

Govorov V.E.

1. On flat modules / Sib. Math. J., 1965, v. 6, no. 2, p. 300–304.

Grey J.W.

1. Fragments of the history of sheaf theory / Lect. Notes Math., Heidelberg – Berlin: Springer, 1979, v. 753, p. 1–79.

Grothendieck A.

1. Sur quelques points d'algèbre homologique / Tôhoku Math. J., 1957, v. 9, no. 2, p. 119–183; no. 3, p. 185–221.
2. Fondements de la géométrie algébrique, Sémin. Bourbaki, 1957–1962 / Paris: Secrétariat Math., 1962.
3. Local cohomology / Lect. Notes Math., Heidelberg – Berlin: Springer, 1967, v. 41.
4. Dix exposés sur la cohomologie de schémas / Amsterdam, North Holland, 1968.
5. Récoltes et semailles. Réflexions et témoignage sur un passé de mathématicien / Prepubl. Univ. des Sciences et Techniques de Languedoc, Montpellier, et CNRS, 1985.

Grothendieck A., Dieudonné J.

1. Eléments de Géométrie Algébrique (EGA), I, II, III, IV / Publ. Math. IHES, 1960, v. 4; 1961, v. 8; 1963, v. 17; 1964, v. 20; 1965, v. 24; 1966, v. 28; 1967, v. 32.
2. Eléments de Géométrie Algébrique (new version) / Berlin – Heidelberg: Springer, 1971.

Grothendieck A. et al.

1. Séminaire de géométrie algébrique (SGA)
  - [SGA 2] Cohomologie locale des faisceaux cohérents et théorèmes de Lefschetz locaux et globaux / Amsterdam: North-Holland, 1968.
  - [SGA 4] (with M. Artin, J.-L. Verdier) Théorie des topos et cohomologie étale de schémas / Lect. Notes Math., Berlin – Heidelberg: Springer, 1972, v. 269, v. 270; 1973, v. 305.
  - [SGA 4 1/2] (by P. Deligne, with J.F. Boutot, L. Illusie, J.-L. Verdier) Cohomologie étale / Lect. Notes Math., Berlin – Heidelberg: Springer, 1977, v. 569.
  - [SGA 6] (with P. Berthelot, L. Illusie) Théorie de l'intersection et théorème de Riemann – Roch / Lect. Notes Math., Berlin – Heidelberg: Springer, 1971, v. 225.

Guichardet A.

1. Cohomologie des groupes topologiques et des algèbres de Lie / Paris: Cedec/Fernand Nathan, 1980.

Gulliksen T., Levin S.

1. Homology of local rings / Queen's Pap. Pure Appl. Math., 1969, no. 20.

Halperin S.

1. Lectures on minimal models / Mém. Soc. Math. Fr., 1983, v. 9/10.

Happel D.

1. Triangulated categories in the representation theory of finite-dimensional algebras / Lect. Notes London Math. Soc., 1988, v. 119.

Happel D., Ringel K.M.

1. Tilted algebras / Trans. Am. Math. Soc., 1982, v. 274, no. 2, p. 399–444.

Hartshorne R.

1. Residues and duality / Lect. Notes Math., Berlin – Heidelberg: Springer, 1966, v. 20.
2. Algebraic geometry / Berlin – Heidelberg: Springer, 1977.

Helemsky A.Ja.

1. Homology in Banach and topological algebras / Moscow, Izd. MGU, 1986.

Hilton P.

1. Homotopy theory and duality / New York: Gordon & Breach, 1965.

Hilton P., Stammbach U.

1. A course in homological algebra / Berlin – Heidelberg: Springer, 1970.

Hilton P., Wiley S.

1. Homology theory / Cambridge: Cambridge Univ. Press, 1960.

Hinich V.A., Shechtman V.B.

1. Geometry of a category of complexes and algebraic  $K$ -theory / *Duke Math. J.*, 1985, v. 52, no. 2, p. 399–430.

Hochschild G.

1. On the cohomology groups of an associative algebra / *Ann. Math.*, 1945, v. 46, p. 58–67.

Illusie L.

1. Complexe cotangent et déformations. I / *Lect. Notes Math.*, Berlin – Heidelberg: Springer, 1971, v. 239.

Iversen B.

1. Cohomology of sheaves. Berlin – Heidelberg: Springer, 1986.

Johnson B.E.

1. Cohomology in Banach algebras / *Mem. Am. Math. Soc.*, 1973, no. 127.

Johnstone P.T.

1. Topos theory / London – New York: Academic Press, 1977.

Kan D.M.

1. Adjoint functors / *Trans. Am. Math. Soc.*, 1958, v. 87, p. 294–329.

Kapranov M.M.

1. On the derived category of coherent sheaves on Grassmann manifolds / *Izv. Akad. Nauk SSSR, Ser. Math.*, 1984, v. 48, no. 1, p. 192–202 [Russian].
2. Derived category of coherent sheaves on a quadric / *Funkts. Anal. Prilozh.*, 1986, v. 20, no. 2, p. 67 [Russian].
3. On the derived category of coherent sheaves on some homogeneous spaces / *Invent. Math.*, 1988, v. 92, no. 3, p. 479–508.

Karoubi M.

1. Homologie cyclique des groupes et des algèbres / *C. R. Acad. Sci., Paris Sér. 1*, 1983, v. 297, p. 381–384.
2. Homologie cyclique et  $K$ -théorie algébrique, I, II / *C. R. Acad. Sci., Paris Sér. 1*, 1983, v. 297, p. 447–450; p. 513–516.

Kashiwara M.

1. Systems of microdifferential equations / Boston: Birkhäuser, 1983.
2. Riemann – Hilbert problem for holonomic systems / *Publ. Res. Inst. Math. Sci.*, 1984, v. 20, no. 1, p. 319–365.

Knudsen F., Mumford D.

1. The projectivity of the moduli spaces of stable curves / *Math. Scand.*, 1976, v. 39, no. 1, p. 19–35.

Knutson D.

1. Algebraic spaces / *Lect. Notes Math.*, Berlin – Heidelberg: Springer, 1971, v. 203.

Lazard D.

1. Autour de la platitude / *Bull. Soc. Math. Fr.*, 1969, v. 97, no. 1, p. 81–128.

Leites D.A.

1. Introduction to the theory of supermanifolds / *Usp. Mat. Nauk.*, 1980, v. 35, no. 1, p. 3–57 [Russian].
2. Theory of supermanifolds / Petrozavodsk: Karelia Branch of AN SSSR, 1983 [Russian].

Lemann D.

1. Théorie homotopique des formes différentielles / *Astérisque*, 1977, v. 45.

Leray J.

1. L'anneau d'une représentation / *C. R. Acad. Sci., Paris* 1946, v. 222, p. 1366–1368.

Loday J.L., Quillen D.

1. Cyclic homology and the Lie algebra homology of matrices / *Comment. Math. Helv.*, 1984, v. 59, no. 4, p. 565–591.

Lofwall C.

1. On the subalgebra generated by one-dimensional elements in the Yoneda Ext-algebra / in: [AAT], p. 291–338.

MacLane S.

1. Homology / Berlin – Heidelberg: Springer, 1963.
2. Categories for the working mathematician / New York: Springer, 1971.

Manin Y.I.

1. Some remarks on Koszul algebras and quantum groups / *Ann. Inst. Fourier*, 1987, v. 37, no. 4, p. 191–205.

Massey W.S.

1. Exact couples in algebraic topology / *Ann. Math.*, 1952, v. 56, p. 363–396.
2. Homology and cohomology theory / New York – Basel: Marcel Dekker, 1978.

May J.P.

1. Simplicial objects in algebraic topology / Princeton: Van Nostrand, 1967.

Mazur B.

1. Notes on étale cohomology of number fields / *Ann. Sc. Norm. Super. Pisa, Cl. Sci., IV. Ser.*, 1973, v. 6, p. 521–556.

McCleary J.

1. User's guide to spectral sequences / Publish or Perish: Wilmington, Delaware (USA), 1985, 423 pp.

Meltzer H.

1. Tilting bundles, repetitive algebras and derived categories of coherent sheaves / Humboldt-Universität zu Berlin, *Sek. Math.*, 1988, prepr. 193.



Milne J.S.

1. Etale cohomology / Princeton: Princeton Univ. Press, 1980.

Morgan J.

1. The algebraic topology of smooth algebraic varieties / Publ. Math. IHES, 1978, v. 48, p. 137–204.

Morita K.

1. Duality for modules and its applications to the theory of rings / Sci. Rep. Tokyo, Kyoiku Daigaku, Sec. A, 1958, v. 6, p. 83–142.

Morozov A.Yu.

1. Anomalies in gauge theories / Usp. Mat. Nauk., 1986, v. 150, no. 3, p. 337–416.

Okonek Ch., Schneider M., Spindler H.

1. Vector bundles on complex projective spaces / Basel – Boston – Stuttgart: Birkhäuser, 1980.

Priddy S.B.

1. Koszul resolutions and the Steenrod algebra / Bull. Am. Math. Soc., 1970, v. 76, no. 4, p. 834–839.
2. Koszul resolutions / Trans. Am. Math. Soc., 1970, v. 152, no. 1, p. 39–60.

Quillen D.

1. Homotopical algebra / Lect. Notes Math., Berlin – Heidelberg: Springer, 1967, v. 43.
2. Rational homotopy theory / Ann. Math., 1969, v. 90, p. 205–295.
3. On the (co)homology of commutative rings / Proc. Symp. Pure Math., 1970, v. 17, p. 65–87.
4. Higher algebraic  $K$ -theory, I / Lect. Notes Math., Berlin – Heidelberg: Springer, 1973, v. 341, p. 85–147.
5. Projective modules over polynomial rings / Invent. Math., 1976, v. 36, p. 167–171.

Reiman A.G., Semenov-Tyan-Shansky M.A., Faddeev L.D.

1. Quantum anomalies and cocycles on gauge groupes / Funkts. Anal. Prilozh., 1984, v. 18, no. 4, p. 64–72.

Roos J.-E.

1. Sur les foncteurs dérivés de  $\lim$ . Applications / C. R. Acad. Sci., Paris 1961, v. 252, no. 24, p. 3702–3704.
2. Sur les foncteurs dérivés de produits infinis dans les catégories de Grothendieck. Exemples et contre-exemples / C. R. Acad. Sci., Paris 1966, v. 263, no. 25, p. 895–898.

Sato M., Kashiwara M., Kawai T.

1. Hyperfunctions and pseudodifferential equations / Lect. Notes Math., Berlin – Heidelberg: Springer, 1993, v. 287, p. 265–529.

Schapira P.

1. Théorie des hyperfonctions / Lect. Notes Math., Berlin – Heidelberg: Springer, 1970, v. 126.
2. Microdifferential systems in the complex domain / Berlin – Heidelberg: Springer, 1985.

Schechtman V.V.

1. Algebraic  $K$ -theory and characteristic classes / Usp. Mat. Nauk., 1978, v. 33, no. 6, p. 239–240.

Serre J.-P.

1. Homologie singulière des espaces fibrés. Applications / Ann. Math., 1951, v. 54, p. 425–505.
2. Groupes de homotopie et classes de groupes abéliennes / Ann. Math. 1953, v. 58, p. 258–294.
3. Faisceaux algébriques cohérents / Ann. Math., 1955, v. 61, p. 197–278.
4. Géométrie algébrique et géométrie analytique / Ann. Inst. Fourier, 1956, v. 6, p. 1–42.
5. Sur la dimension homologique des anneaux et de modules noethériens / Proc. Int. Sympos. algebraic number theory Tokyo – Nikko, 1956, p. 175–189.
6. Algèbre locale - multiplicités / Lect. Notes Math., Berlin – Heidelberg: Springer, 1965, v. 11; English edition: Local Algebra / Berlin – Heidelberg: Springer, 2000.
7. Cohomologie Galoisienne / Lect. Notes Math., Berlin – Heidelberg: Springer, 1965, v. 5; English edition: Galois Cohomology / Berlin – Heidelberg: Springer, 2002.
8. Cohomologie des groupes discrets / Ann. Math. Stud., 1971, v. 70, p. 77–169.

Spaltenstein N.

1. Resolutions of unbounded complexes / Comment. Math. Helv., 1988, v. 65, no. 2, p. 121–154.

Spanier E.

1. Algebraic topology / New York: Mc Graw-Hill, 1966.

Steenrod N., Eilenberg S.

1. Foundations of algebraic topology / Princeton: Princeton Univ. Press, 1952.

Sullivan D.

1. Infinitesimal computations in topology / Publ. Math. IHES, 1977, v. 47, p. 269–331.

Suslin A.A.

1. Projective modules over polynomial rings are free / Dokl. Akad. Nauk. SSSR, 1976, v. 229, no. 5, p. 1063–1066.
2. Algebraic  $K$ -theory / Itogi Nauki Tekh. Ser.: Algebra, Topologia, Geom., 1982, v. 20, p. 71–152.

Tanré D.

1. Homotopie rationnelle: modèles de Chen, Quillen, Sullivan / Lect. Notes Math., Berlin – Heidelberg: Springer, 1983, v. 1025.

Tate J.

1. Duality theorems in Galois cohomology over number fields, Proc. Int. Congress Math. 1962, Uppsala: Almqvist, 1963, p. 288–295.

Verdier J.-L.

1. Théorème de dualité pour les cohomologies des espaces localement compacts / Sémin. Heidelberg – Strasbourg 1966–1967, Strasbourg: Publ. Inst. Rech. Math. Avancée, 1969, no. 3, Exp. 4.
2. Théorème de dualité de Poincaré / C. R. Acad. Sci., Paris, 1963, v. 256, p. 2084–2086.
3. Catégories dérivées, état 0 / Lect. Notes Math., Berlin – Heidelberg: Springer, 1977, v. 569, p. 262–311.
4. Extension of a perverse sheaf over a closed subspace / Astérisque, 1985, v. 130, p. 210–217.

Yoneda N.

1. On the homology theory of modules / J. Fac. Sci., Univ. Tokyo, Sec. IA, 1954, v. 7, p. 193–227.
2. On ext and exact sequences / J. Fac. Sci., Univ. Tokyo, Sec. IA, 1960, v. 8, p. 507–526.

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