

Victor S. L'vov

Wave Turbulence Under Parametric Excitation

Applications to Magnets

With 69 Figures

References	317
Subject Index	327

Springer-Verlag

Berlin Heidelberg New York

London Paris Tokyo

Hong Kong Barcelona

Budapest

References

Chapter 1

- 1.1 V.S. L'vov: *Nonlinear Spin Waves* (Nauka, Moscow 1987) [in Russian]
- 1.2 L.D. Landau and E.M. Lifshitz: *Course of Theoretical Physics. Vol. 1: Mechanics* (Pergamon, Oxford 1966)
- 1.3 V.E. Zakharov: *Izv. Vuzov, Radiofizika* 17, No 4, 431–453 (1974)
- 1.4 V.E. Zakharov and E.A. Kuznetsov: Hamiltonian Formalism for System of Hydrodynamic Type, in *Soviet Scientific Reviews. – Section C. – Mathematical Physics Reviews*, ed. by S.P. Novikov (OPA, Amsterdam 1984)
- 1.5 V.S. L'vov: *Lectures on Nonlinear Physical Phenomena* (University of Novosibirsk Press, Novosibirsk 1977)
- 1.6 V.P. Krasitsky: *Zh. Eksp. Teor. Fiz.* 97 in press (1991)
- 1.7 G. Lamb: *Hydrodynamics* (Dover, N.-Y 1930)
- 1.8 V.E. Zakharov and N.N. Filonenko: *Dokl. Akad. Nauk SSSR* 170, 1292 (1966)
- 1.9 H.W. Wyld: *Ann of Phys.* 14, 143, (1961)
- 1.10 N. Bloembergen: *Nonlinear Optics*, (W.A. Benjamin, Inc., New York, 1965)
- 1.11 V.E. Zakharov: “The Inverse Scattering Method” in *Solitons*, ed. by R.K. Bullough and Caudrey, *Topics in Current Physics Vol. 17* (Springer, Berlin, Heidelberg 1980) pp.243–285
- 1.12 S.P. Novikov, S.V. Manakov, L.P. Pitaevskii and V.E. Zakharov: *Theory of Solitons*, (Plenum, New York 1984)
- 1.13 V.E. Zakharov and S.V. Manakov: *Zh. Eksp. Teor. Fiz.* 69, 1654 (1975)
- 1.14 V.E. Zakharov: *Prikl. Meck. Techn. Fiz.* 2, 86 (1968)
- 1.15 L.D. Landau and E.M. Lifshitz: *Course of Theoretical Physics, Vol.5, Fluid Mechanics* (Pergamon, Oxford 1986)
- 1.16 V.E. Zakharov and A.B. Shabat: *Zh. Eksp. Teor. Fiz.* 61, 118 (1971)
- 1.17 V.I. Vlasov, V.I. Talanov, V.A. Petrishev: *Izv. Vuzov, Radiofizika* 14, 1353 (1971)
- 1.18 S.A. Ahmanov, A.P. Suhorukov and F.V. Hohlov: *Usp. Fiz. Nauk* 93, 19–70 (1967)
- 1.19 V.E. Zakharov and V.S. Synakh: *Zh. Eksp. Teor. Fiz.* 68, 940–948 (1975)

Chapter 2

- 2.1 J.H. Van Vleck: *The Theory of Electromagnetic Susceptibilities*, (Oxford University Press, Oxford 1932)
- 2.2 A.A. Abragam: *The Principles of Nuclear Magnetism*, (Oxford University Press, Oxford 1961)
- 2.3 M. Sparks: *Ferromagnetic Relaxation Theory*, (Mc-Graw-Hill, New York 1964)
- 2.4 C.D. Mattis: *The Theory of Magnetism*, (Mc-Graw-Hill, New York 1965)
- 2.5 J.S. Smart: *Effective Field Theories of Magnetism* (Saunders, Philadelphia 1966)
- 2.6 B. Lax and K.J. Button: *Microwave Ferrites and Ferrimagnetics*, (Mc-Graw-Hill, New York, London 1962)

- 2.7 S.V. Tyablicov: *Methods for Quantum Theory of Magnetism*, (Nauka, Moscow 1965), [in Russian]
- 2.8 A.I. Akhiezer, V.G. Bar'yakhtar and S. V. Peletmisky: *Spin Waves*, (Nauka, Moscow 1967), [in Russian], [English transl.: North-Holland, Amsterdam; Wiley, New York, 1968]
- 2.9 S. V. Vonsorsky: *Magnetism*. (Nauka, Moscow 1971), [in Russian]
- 2.10 *Handbuch der Physik*. Bd XVIII/I: *Magnetism* (Springer Verlag, Berlin, Heidelberg 1968)
- 2.11 *Magnetism. A Treatise on Modern Theory and Materials*, ed. by G.T. Rado and H. Suhl (Acad. Press, New York 1963-1966), Vols. I-IV
- 2.12 *Physics of Magnetic Dielectrics*, ed. by G.A. Smolensky (Nauka, Moscow 1974), [in Russian]
- 2.13 V.G. Bar'yakhtar, K.N. Krivorychko and D.A. Yablonsky: *Green Functions in the Theory of Magnetism*, (Naukova Dumka, Kiev 1984), [in Russian]
- 2.14 K. Binger and A.P. Young: *Spin Glasses: Experimental Facts, Theoretical Concepts and Open Questions*, Rev. Mod. Phys. **58**, No 4, 801-976 (1986)
- 2.15 L.D. Landau and E.M. Lifshitz: Phys. Z6. Sowjet **8**, 153 (1935), see also: L.D. Landau: *Collected Works*, Vol. 1, (Nauka, Moscow 1969) pp.127-143
- 2.16 I.E. Dzyaloshinsky: Zh. Eksp. Teor. Fiz. **32**, No 6, 1547-1563 (1957)
- 2.17 P.W. Anderson: *Solid State Physics*, vol. 14 (Acad. Press, New York 1963)
- 2.18 G.M. Nedlin: Fiz. Tverd. Tela **66**, 1822 (1974).
- 2.19 J.C. Slater: *Quantum Theory of Molecules and Solids*, (McGraw-Hill, N.Y. 1963)
- 2.20 E.A. Turov: *Physical Properties of Magnets*, (Nauka, Moscow 1963)
- 2.21 I.V. Kolokolov, V.S. L'vov, V.B. Cherepanov: Sov. Phys.- JETP **57**, 605 (1983)
- 2.22 I.V. Kolokolov, V.S. L'vov, V.B. Cherepanov: Sov. Phys.- JETP **59**, 1131 (1984)

Chapter 3

- 3.1 A.I. Akhiezer, V.G. Bar'yakhtar and S.V. Peletmisky: *Spin-Waves* (North-Holland, Amsterdam, 1968)
- 3.2 L.D. Landau and E.M. Lifshitz: *Course of Theoretical Physics, Vol. V, Part 1 Statistical Physics, 3rd edition* (Pergamon, Oxford 1980)
- 3.3 P.G. De Gennes, P.A. Pincus, F. Hartmann- Bountron and J.M. Winter: Phys. Rev. **129**, 1105-1115 (1963)
- 3.4 V.A. Tulin: *Nuclear Spin Waves in Magnets*, Fis. Niskikh Temp. **5**, 965-993 (1979)
- 3.5 E. Schlömann, J.H. Saunder, M.H. Sirvetz: Trans. IRE, MTT-8 No 1, 96 (1960)
- 3.6 V.G. Bar'yakhtar and D.A. Yablonsky: Teor. Mat Fiz. **25**, 250 (1975)
- 3.7 I.V. Kolokolov, V.S. L'vov, V.B. Cherepanov: Sov. Phys.-JETP **57**, 605 (1983)
- 3.8 V.S. Lutovinov and V.L. Safonov: Fiz. Tverd. Tela **22**. 2640-2650 (1980)

Chapter 4

- 4.1 V.E. Zakharov, V.S. L'vov and S.S. Starobinets: *Instability of the Monochromatic Spin Waves*, Fiz. Tverd. Tela **11**, No 10, 2924-2930 (1969)
- 4.2 A.G. Gurevitch: Fiz. Tverd. Tela **6**, No 8, 2388 (1964)
- 4.3 E. Schlömann, R.J. Joseph: J. Appl. Phys. **30** Suppl. 177-178 (1959)
- 4.4 S.K. Turitsin and G.E. Falkovitch: Zh. Eksp. Teor. Fiz. **87**, No 7, 1061-1065 (1985)
- 4.5 V.I. Ozhogin and A.Yu. Yakubovsky: Zh. Eksp. Teor. Fiz. **67**, No 1 (7), 287-308 (1974)
- 4.6 C.S. Gardner, I.M. Green, M.D. Kruskal and R.M. Miura: Phys. Rev. Lett. **19**, 1095 (1967)

- 4.7 S.P. Novikov, S.V. Manakov, L.P. Pitaevskii and V.E. Zakharov: *Theory of Solitons*, (Plenum Publ., New York 1984)
- 4.8 V.E. Zakharov: "The Inverse Scattering Method" in *Solitons*, ed. by R.K. Bullough and Caudrey, Topics in Current Physics, Vol. 17 (Springer, Berlin, Heidelberg 1980)
- 4.9 B.B. Kadomsev and V.I. Petviashvili: Dokl. Akad. Nauk SSSR **192**, 753 (1970)
- 4.10 V.E. Zakharov: Sov. Phys.- JETP **35**, 908 (1972)
- 4.11 H. Suhl: Phys. Chem. Sol **1**, 209-227 (1957)
- 4.12 F.R. Morgenthaler: J. Appl. Phys. **31S**, 95S-97S (1960)
- 4.13 E. Schlömann, J.H. Saunder, M.H. Sirvetz: Trans. IRE, MTT-8 No 1, 96 (1960)
- 4.14 V.I. Ozhogin: Zh. Eksp. Teor. Fiz. **58**, No 6, 2079-2089 (1970)

Chapter 5

- 5.1 H. Suhl: *Note on the Ferromagnets*, J. Appl. Phys. **30**, No 12, 1961-1964 (1959)
- 5.2 E. Schlömann, J.H. Saunder, and M.H. Sirvetz: *L-Band Ferromagnetic Resonance at High Peak Power Level*, Trans. IRE, MTT **8**, No 8, 96-100 (1960)
- 5.3 V.E. Zakharov, V.S. L'vov and S.S. Starobinets: Preprint No 227 (Institute for Nuclear Physics, Novosibirsk 1968)
- 5.4 V.E. Zakharov, V.S. L'vov, S.S. Starobinets: Fiz. Tverd. Tela **11**, 2047 (1969)
- 5.5 V.E. Zakharov, V.S. L'vov and S.S. Starobinets: *Instability of the Monochromatic Spin Waves*, Fiz. Tverd. Tela **11**, No 10, 2924-2930 (1969)
- 5.6 V.E. Zakharov, V.S. L'vov and S.S. Starobinets: *Stationary Nonlinear Theory of Parametric Excitation of Waves*, Sov. Phys.-JETP **32**, 656 (1971)
- 5.7 V.V. Zautkin, V.S. L'vov, S.L. Musher, S.S. Starobinets: *Proof of Stage-by-Stage Excitation of Parametric Spin Waves*, Sov. Phys.-JETP, Lett. **14**, 206 (1971)
- 5.8 V.V. Zautkin, V.S. L'vov and S.S. Starobinets: *Resonance Phenomena in Parametric Spin Wave System*, Sov. Phys.-JETP **36**, No 1, 96-99 (1973)
- 5.9 V.V. Zautkin, V.E. Zakharov, V.S. L'vov, S.L. Musher and S.S. Starobinets: Sov. Phys.-JETP **35**, 926 (1972)
- 5.10 V.V. Zautkin and S.S. Starobinets: Fiz. Tverd. Tela **16**, No 3, 678-686 (1974)
- 5.11 V.E. Zakharov and V.S. L'vov: Sov. Phys.-JETP **33**, 1113-1119 (1971)
- 5.12 V.E. Zakharov, V.S. L'vov and S.L. Musher: Sov. Phys.-Solid State **14**, 710 (1973)
- 5.13 V.E. Zakharov and V.S. L'vov: Sov. Phys.- Solid State **14**, 2513 (1973)
- 5.14 V.S. L'vov: Sov. Phys.-Solid State **13**, 2949 (1971)
- 5.15 V.S. L'vov and S.S. Starobinets: Sov. Phys.- Solid State **13**, 418-425 (1971)
- 5.16 V.S. L'vov: Preprint No 68-72 (Institute for Nuclear Physics, Novosibirsk 1972)
- 5.17 V.S. L'vov and A.M. Rubenchik: Preprint No 1-72 (Institute for Nuclear Physics, Novosibirsk 1972)
- 5.18 V.S. L'vov, S.L. Musher and S.S. Starobinets: Sov. Phys.- JETP **37**, 546 (1973)
- 5.19 V.S. L'vov, A.M. Rubenchik, V.S. Sobolev and V.S. Synakh: Fiz. Tverd. Tela **15**, No 3, 793-800 (1973)
- 5.20 V.S. L'vov and A.M. Rubenchik: *Nonlinear Theory of the Parametric Instability of Waves in a Plasma*, Sov. Phys.-JETP **37**, No 2, 263-268 (1973)
- 5.21 V.S. L'vov and M.I. Shirokov: *Nonlinear Theory of Parametric Excitation of Spin Waves in Antiferromagnets*, Sov. Phys.- JETP **40**, 960 (1975)
- 5.22 T.S. Harvick, E.R. Peressini and M.T. Weiss: *Subsidiary Resonance in YIG*. J. Appl. Phys. **32**, No 3, 223-224 (1961)
- 5.23 V.E. Zakharov, V.S. L'vov and S.S. Starobinets: *Spin-Wave Turbulence Beyond the Parametric Excitation Threshold*, Sov. Phys.-USP **17**, 896 (1975)
- 5.24 V.V. Zautkin, V.S. L'vov, B.I. Orel and S.S. Starobinets: Sov. Phys.-JETP **72**, 272-284 (1977)
- 5.25 V.S. L'vov and A.M. Rubenchik: Sov. Phys.-JETP **45**, 67-74 (1977)

- 5.26 V.S. L'vov, V.B. Cherepanov: *Highly Anisotropic Distributions of Parametrically Excited Waves in Near-Isotropic Media* Sov. Phys.-JETP **49**, 1145 (1979)
- 5.27 V.S. L'vov and G.E. Falkovich: *On the Interaction of Parametrically Excited Spin Waves with Thermal Spin Waves*, Sov. Phys.- JETP **55**, No 5, 904-912 (1982)
- 5.28 V.V. Zautkin, V.S. L'vov, E.V. Podivilov: Sov. Phys. - JETP **96**, 177 (1989)
- 5.29 V.G. Morozov and A.I. Muhay: Teor. Mat. Fiz. **51**, 234 (1982)
- 5.30 A.S. Michailov: Zh. Eksp. Teor. Fiz. **69**, No 2(8), 523-524 (1975)
- 5.31 V.M. Tsukernic and P.M. Yankelevich: **68**, No 6, 2116-2124 (1975)
- 5.32 I.A. Vinikovetsky, A.M. Frishman and V.M. Tsukernic: Zh. Eksp. Teor. Fiz. **76**, 2110-2125 (1979)
- 5.33 A.S. Bakay: Zh. Eksp. Teor. Fiz. **74**, No 3, 933-1004 (1978)
- 5.34 A.S. Michailov: Fiz. Tverd. Tela **18**, No 2, 494-502 (1976)
- 5.35 B.Ya. Kotuyzhansky and L.A. Prozorova: Zh. Eksp. Teor. Fiz., Lett. **30**, No 8, 430-432 (1971)
- 5.36 B.Ya. Kotuyzhansky, L.A. Prozorova: Zh. Eksp. Teor. Fiz. **62**, No 6, 1199 (1972)
- 5.37 B.Ya. Kotuyzhansky and L.A. Prozorova: Zh. Eksp. Teor. Fiz. **65**, No(6) 12, 2470-2478 (1973)
- 5.38 B.Ya. Kotuyzhansky, L.A. Prozorova: Zh. Eksp. Teor. Fiz. Lett. **32**, 254 (1980)
- 5.39 B.Ya. Kotuyzhansky and L.A. Prozorova: Zh. Eksp. Teor. Fiz. **81**, No 5, 1931 (1981)
- 5.40 B.Ya. Kotuyzhansky, L.A. Prozorova and L.E. Svistov: Zh. Eksp. Teor. Fiz., Lett. **37**, No 12, 585-588 (1983)
- 5.41 B.Ya. Kotuyzhansky and L.A. Prozorova: Zh. Eksp. Teor. Fiz. **84**, 658-664 (1984)
- 5.42 B.Ya. Kotuyzhansky, L.A. Prozorova and L.E. Svistov: Zh. Eksp. Teor. Fiz. **86**, 1101-1116 (1984)
- 5.43 I.V. Krutsenko, V.S. L'vov, G.A. Melkov: Sov. Phys.- JETP **48**, 561 (1978)
- 5.44 I.V. Krutsenko and G.A. Melkov: Fiz. Tverd. Tela **21**, No 1, 271-274 (1979)
- 5.45 N.G. Kutuzoy and G.A. Melkov: Fiz. Tverd. Tela **17**, No 3, 958-960 (1975)
- 5.46 A.V. Lavrinenko, V.S. L'vov, G.A. Melkov and V.B. Cherepanov: "Kinetic Instability" of a Strongly Nonequilibrium System of Spin Waves and Tunable Radiation of a Ferrite. Sov. Phys.- JETP **54**, No 3, 542-549 (1981)
- 5.47 G.A. Melkov: Sov. Phys.- JETP **34**, 198 (1972)
- 5.48 G.A. Melkov: Fiz. Tverd. Tela **17**, No 6, 1728-1732 (1975)
- 5.49 V.L. Grankin, G.A. Melkov and V.A. Ruban: Fiz. Tverd. Tela **15**, 632-634 (1973)
- 5.50 G.A. Melkov and V.L. Grankin: Sov. Phys.- JETP **42**, 721 (1975)
- 5.51 G.A. Melkov: Zh. Eksp. Teor. Fiz. **70**, 1324-1329 (1976)
- 5.52 G.A. Melkov and I.V. Krutsenko: Sov. Phys.- JETP **45**, 295 (1977)
- 5.53 V.I. Ozhogin: Zh. Eksp. Teor. Fiz. **58**, No 6, 2079-2089 (1970)
- 5.54 V.I. Ozhogin and A.Yu. Yakubovsky: Zh. Eksp. Teor. Fiz. **63**, 2205 (1972)
- 5.55 V.I. Ozhogin and A.Yu. Yakubovsky: Zh. Eksp. Teor. Fiz. **67**, No 1 (7), 287-308 (1974)
- 5.56 V.I. Ozhogin, S.M. Suleymanov and A.Yu. Yakubovsky: Zh. Eksp. Teor. Fiz., Lett **32**, 308-311 (1980)
- 5.57 V.I. Ozhogin, S.M. Suleymanov and A.Yu. Yakubovsky: Zh. Eksp. Teor. Fiz., Lett **34**, No 11, 606-608 (1981)
- 5.58 B.I. Orel and S.S. Starobinets: Sov. Phys.- JETP **41**, 154 (1975)
- 5.59 S.V. Petrov and A.I. Smirnov: Zh. Eksp. Teor. Fiz. **80**, No 4, 1628-1638 (1981)
- 5.60 L.A. Prozorova, A.S. Borovik-Romanov: Zh. Eksp. Teor. Fiz., Lett. **10**, 316 (1969)
- 5.61 L.A. Prozorova and A.I. Smirnov: Zh. Eksp. Teor. Fiz. **69**, No 2(8), 758-763 (1975)
- 5.62 L.A. Prozorova and A.I. Smirnov: Zh. Eksp. Teor. Fiz. **74**, 1554-1561 (1978)
- 5.63 L.E. Svistov and A.I. Smirnov: Zh. Eksp. Teor. Fiz. **74**, 1554-1561 (1978)
- 5.64 A.I. Smirnov: Zh. Eksp. Teor. Fiz. **73**, 2255-2263 (1977)
- 5.65 A.I. Smirnov: Zh. Eksp. Teor. Fiz., Lett. **27**, 177-181 (1977)

- 5.67 A.I. Smirnov: Zh. Eksp. Teor. Fiz. **88**, 1369-1381 (1985)
- 5.68 A.I. Smirnov: Zh. Eksp. Teor. Fiz. **90**, 385-397 (1986); **94**, No 5, 185-193 (1988)
- 5.69 V.S. L'vov: "Solitons and Nonlinear Phenomena in Parametrically Excited Spin Waves", in *Solitons*, ed. by S.E. Trullinger, V.E. Zakharov and V.L. Pokrovsky, (Elsevier, Amsterdam 1986) Ch.5 pp 241-300
- 5.70 V.S. L'vov and L.A. Prozorova: "Spin Waves Above the Threshold of Paramagnetic Excitation", in *Spin Waves and Magnetic Excitation 1*, ed. by A.S. Borovik-Romanov and S.K. Sinha, (Elsevier, Amsterdam 1988) Ch.4 pp. 233-285
- 5.71 V.I. Belinicher and V.S. L'vov: *Spin-diagram technique for non-equilibrium processes in the theory of magnetism*, Sov. Phys.-JETP **59** 564-571 (1984)
- 5.72 E. Schlömann: J.Appl.Phys. **33**, No 2, 527-534 (1962)
- 5.73 P. Gottlieb and H. Suhl: J.Appl.Phys. **33**, No 4, 1508 (1962)
- 5.74 I.M. Halatnicov: *Theory of Superfluidity*, (Nauka, Moscow 1971) [in Russian]
- 5.75 V.S. L'vov: *Lectures on Nonlinear Physics Phenomena* (University of Novosibirsk Press., Novosibirsk 1977)
- 5.76 V.V. Zautkin, V.S. L'vov and E.V. Podivilov, Sov. Phys.-JETP **69**, No 1, 177-185 (1989)
- 5.77 L.D. Landau and E.M. Lifshitz: *Course of Theoretical Physics, Vol.5, Statistical Physics, Part 1 3rd Ed.* (Pergamon, Oxford 1980)

Chapter 6

- 6.1 V.E. Zakharov, V.S. L'vov and S.S. Starobinets: *Spin-Wave Turbulence beyond the Parametric Excitation Threshold*, Sov. Phys.-USP **17**, 896 (1975)
- 6.2 V.V. Zautkin, V.S. L'vov, E.V. Podivilov: Sov. Phys.- JETP **96**, 177 (1989)
- 6.3 V.S. L'vov and G.E. Falkovich: *On the Interaction of Parametrically Excited Spin Waves with Thermal Spin Waves*, Sov. Phys.- JETP **55**, No 5, 904-912 (1982);
- 6.4 H.Le Gall, B. Lemair and D. Sere: Solid State Com. **5**, No 12, 919 (1967)
- 6.5 V.S. L'vov: *On the Interaction of Parametrically Excited Spin Waves with Thermal Spin Waves*, Preprint No 69-72 (Inst. for Nuclear Physics, Novosibirsk 1972)
- 6.6 V.S. L'vov, G.E. Falkovich: *Parametric-Wave Distribution Under Nonlinear Damping*, Prep. No 220 (Inst. of Automation and Electrometry, Novosibirsk 1986)
- 6.7 V.S. L'vov and S.S. Starobinets: Fiz. Tverd. Tela **13**, 523-533 (1971)
- 6.8 H. Suhl: Phys. Chem. Sol. **1**, 209-227 (1957)
- 6.9 E. Schlömann: Phys. Rev. **16**, No 4, 828-837 (1959)
- 6.10 E. Schlömann, J. Green and V. Milano: *Recent Developments in Ferromagnetic Resonance At High Power Levels*, J. Appl. Phys. **31**, Supple., 386S-395S (1960)
- 6.11 R.W. Damon: in *Magnetism* ed. by G.T.Rado and H. Suhl Vol.1, Ch.11 (1963)
- 6.12 A.G. Gurevich and S.S. Starobinets: Fiz. Tverd. Tela **3**, No 7, 1 995-1988 (1961)
- 6.13 B. Lax and K.J. Button: *Microwave Ferrites and Ferrimagnets*, (Mc-Graw-Hill, New York 1962)
- 6.14 V.E. Zakharov and V.S. L'vov: Sov. Phys.-JETP **33**, 1113-1119 (1971)
- 6.15 A.D. Piliya: *Proc. 10th Int. Conf. on Ionised Gases*, (Oxford 1971) p. 320
- 6.16 A.A. Galeev and R.Z. Sagdeev: Nuclear Synthesis, **13**, 603 (1973)
- 6.17 V. Aikhsman and G.F. Shaydurov: Dokl. Akad. Nauk SSSR **180**, 1315 (1968)
- 6.18 L.M. Gorbunov: Zh. Eksp. Teor. Fiz. **67**, 1386 (1974)
- 6.19 V.S. L'vov: "Nonlinear Theory of Parametrically Excited Waves"; D. Sc. Thesis, Institute for Nuclear Physics Ac.Sci. SSSR, Novosibirsk (1973), Ch.9
- 6.20 V.S. L'vov and A.M. Rubenchik: *Nonlinear Theory of the Parametric Instability of Waves in a Plasma* Sov. Phys.- JETP **37**, No 2, 263-268 (1973)
- 6.21 V.B. Cherepanov: Fiz. Tverd. Tela **21**, No 3, 641-647 (1979)

- 6.22 V.V. Zautkin, B.I. Orel, V.B. Cherepanov: Zh. Eksp. Teor. Fiz. **85**, 708 (1983)
 6.23 I.B. Levinson: Zh. Eksp. Teor. Fiz. **65**, No 1, 331-342 (1973)

Chapter 7

- 7.1 B.Ya. Kotuyzhansky, L.A. Prozorova: Zh. Eksp. Teor. Fiz. **62**, No 6, 1199 (1972)
 7.2 L.A. Prozorova and A.I. Smirnov: Zh. Eksp. Teor. Fiz. **69**, No 2(8), 758-763 (1975)
 7.3 V.S. L'vov and A.M. Rubenchik: Sov. Phys.-JETP **45**, 67-74 (1977)
 7.3 V.V. Zautkin, V.S. L'vov and S.S. Starobinets: *Resonance Phenomena in Parametric Spin Wave System*, Sov. Phys.-JETP **36**, No 1, 96-99 (1973)
 7.5 B.I. Orel and S.S. Starobinets: Sov. Phys. - JETP **41**, 154 (1975)
 7.6 V.S. Lutovinov: Fiz. Tverd. Tela **20**, 1807-1815 (1978)
 7.6 V.B. Cherepanov: Zh. Eksp. Teor. Fiz. **90**, 153-157 (1985)
 7.7 A.I. Smirnov: Zh. Eksp. Teor. Fiz. **84**, 2290-2305 (1983)
 7.8 H. Suhl: Phys. Rev. Lett. **6**, 174-176 (1961)
 7.9 T.S. Hartwick, E.R. Peressini and M.T. Weiss: Phys. Rev. Lett. **6**, 176-177 (1961)
 7.10 V.V. Zautkin, V.S. L'vov, B.I. Orel and S.S. Starobinets: Sov. Phys. - JETP **45**, 143-149 (1977)
 7.11 V.V. Zautkin and B.I. Orel: Fiz. Tverd. Tela **20**, No 2, 593-595 (1978)
 7.12 A.M. Frishman: Fiz. Nizkikh Temp. **8**, No 5, 554-556 (1982)
 7.13 V.I. Ozhogin, S.M. Syleymanov and A.Yu. Yakubovsky: Zh. Eksp. Teor. Fiz., Lett. **34**, No 11, 606-608 (1981)
 7.14 V.V. Zautkin and B.I. Orel: Zh. Eksp. Teor. Fiz. **79**, No 1(7), 281-287 (1980)
 7.15 V.E. Zakharov, V.S. L'vov, S.L. Musher: Sov. Phys.-Solid State **14**, 710 (1972)
 7.16 V.S. Zhitnyuk and G.A. Melkov: Zh. Eksp. Teor. Fiz., Lett. **32**, 149-152 (1980)
 7.17 H.Le Gall and J.P. Jamet: "Spin Wave Investigation by Means of Faraday Rotation" in *Proc. of Int. Conf. on Magnetism, Moscow 1973*, Vol.1 (Nauka, Moscow 1974) pp. 20-35
 7.18 V.N. Venitsky, V.V. Eremenko and E.V. Matyushkin: Zh. Eksp. Teor. Fiz., Lett. **27**, No 4, 239-241 (1978)
 7.19 E.V. Podivilov and V.B. Cherepanov: Zh. Eksp. Teor. Fiz. **90**, 767-780 (1986)
 7.20 E. Janke, F. Emde and F. Losch: *Tafeln Höherer Funktionen*, (Teubner, Stuttgart 1960)
 7.21 V.V. Zautkin, V.S. L'vov, B.I. Orel, E.V. Podivilov and V.B. Cherepanov: Sov. Phys.-JETP **66** 717-724 (1987)

Chapter 8

- 8.1 Ya.A. Monosov: *Non-Linear Ferromagnetic Resonance*, (Nauka Publ., Moscow 1971), [in Russian]
 8.2 W.E. Courtney, T. Claricoats: *Electron and Control* **16**, No 1, 1 (1964)
 8.3 V.L. Grankin, V.S. L'vov, V.I. Motorin and S.L. Musher: Zh. Eksp. Teor. Fiz. **81**, No 2(8) 757 (1981)
 8.4 S. Wang, S. Thomas and Ta-Lin Hsu: *J. Appl. Phys.* **39**, 2719 (1968)
 8.5 S. Wang and Ta-Lin Hsu: *Appl. Phys. Lett.* **16**, 537 (1970)
 8.6 J.J. Green and E. Schlömann: *Appl. Phys. Lett.*, **33**, 1358 (1968)
 8.7 V.S. L'vov, S.L. Musher and S.S. Starobinets: Sov. Phys. - JETP **37**, 546 (1973)
 8.8 V.V. Zautkin and S.S. Starobinets: Fiz. Tverd. Tela **16**, No 3, 678-686 (1974)
 8.9 A.J. Lichtenberg and M.A. Lieberman: *Regular and Stochastic Motion*, (Springer-Verlag, New York 1983)
 8.10 L.D. Landau and E.M. Lifshitz: *Course of Theoretical Physics, Vol.5, Fluid Mechanics Sect. 30-32* (Pergamon, Oxford 1986)

- 8.11 H. Yamazaki: *Oscillations and Period-Doubling of Magnon Amplitude Under Parallel Pumping in Antiferromagnetic CuCl₂*, *J. Phys. Soc. Japan*, **53**, 1155 (1984)
 8.12 G. Gibson and C. Jeffries: *Observation of Period-Doubling and Chaos in Spin-Wave Instabilities in Yttrium Iron Garnet*, *Phys. Rev. A*, **29**, No 2, 811-818 (1984)
 8.13 F. Waldner, D.R. Barberis and H. Yamazaki: *Route to Chaos by Irregular Period: Simulation of Parallel Pumping in Ferromagnets*, *Phys. Rev. A*, **31**, No 1, 420 (1985)
 8.14 S.M. Rezende, O.F. de Alcantara Bonfim and F.M. de Aguiar: *Model for Chaotic Dynamics of the Perpendicular Pumping Spin-Wave Instability*, *Phys. Rev. B*, **33**, No 7, 5153-5157 (1986)
 8.15 H. Yamazaki, M. Mino, H. Nagashima and M. Warden: *Strange Attractor of Chaotic Magnons Observed in Ferromagnetic (CH₃NH₃)CuCl₄*, *J. Phys. Soc. Japan* **56**, No 2, 742-750 (1987)
 8.16 A.I. Smirnov: *Study of Chaotic Regime of Parametric-Magnon Density*, Zh. Eksp. Teor. Fiz. **90**, 385-397 (1986); A.I. Smirnov: *Study of Geometry of Spin-Wave Turbulence Attractors in Antiferromagnetic CsMnF₃*, Zh. Eksp. Teor. Fiz. **94**, No 5, 185-193 (1988)
 8.17 P. Bryant, C. Jeffries and K. Nakamura: "Spin-wave turbulence" in *International Conference on the Physics of Chaos and Systems far from Equilibrium* ed. by M. Duong-Van (North Holland, Amsterdam 1987)
 8.18 X. Zhang and H. Suhl: *Phys. Rev. B* **38**, No 7, 4893 (1987); H. Suhl and X.Y. Zhang: *J. Appl. Phys.* **63**, No 8, 4147 (1988)
 8.19 S.M. Resende, F.M. de Aguiar, *Spin-wave instabilities, auto-oscillations and chaos in yttrium-iron-garnet*, *Proc. of the IEEE*, **78** No. 6 893-908 (1990); S.M. Resende, F.M. de Aguiar and O.F. de Alcantara Bonfim: *J. Mag. Materials*, 54-57 1127 (1986); S.M. Resende, *Phys. Rev. Lett.* **56** 1070 (1986)
 8.20 E.N. Lorenz: *Deterministic Nonperiodic Flow*, *J. Atmos. Sci.* **20**, 130 (1963)
 8.21 M.J. Feigenbaum: *J. Stat. Phys.* **19**, 25 (1978); **21**, 669 (1979)
 8.22 M.J. Feigenbaum: - *Los Alamos Science*, **1**, 4 (1980)
 8.23 E.N. Lorenz: "Nonlinear Dynamics", *Ann. N.Y. Acad. Sci.*, Vol. 357 (N.Y. Ac. Sci., N.Y. 1980) p. 282
 8.24 P. Collet and J.-P. Echman: "Iterated Maps on the Interval as Dynamical Systems", in *Progress in Physics, Vol. 1* (Birkhäuser Verlag, Basel 1983)
 8.25 R.H.G. Helleman: in *Nonequilibrium Problems in Statistical Mechanics, Vol. 2*, ed. by W. Horton, L. Reichl and V. Szebehely (Wiley, N.Y. 1981)
 8.26 S. Grossmann and S. Thomae: *Z. Naturforsch.*, **32A**, No 1 353 (1977)
 8.27 P. Manville and Y. Pomeau: *Intermittency and the Lorenz Model*, *Phys. Lett.* **75A**, No 1, 1-2 (1979)
 8.28 A.I. Smirnov: *Spin-Wave Instabilities in Excited Spin System of Antiferromagnets*, D. Sc. Thesis, (Inst. for Physical Problems, Moscow 1987)
 8.29 A. Wolf, J. Swift: *Phys. Lett. A* **83**, 184 (1981)
 8.30 V.I. Arnold: *Additional Chapters to the Theory of Ordinary Differential Equations* (Nauka, Moscow 1978)
 8.31 N. Packard, J. Gruitchfield, J. Farmer and R. Show: *Phys. Rev. Lett.* **45**, No 9, 712-715 (1980).
 8.32 F. Takens: in *Lecture Notes in Mathematics*, Vol. 898, ed. by D. Rard and L. Young (Springer, Berlin 1981)
 8.33 S.N. Lukaschuk, A.A. Predtshensky, G.E. Falkovich and A.I. Chernykh: *Determination of Attractor Dimensionality Using Experimental Data*. Preprint No 280 (Institute of Automation and Electrometry, Novosibirsk 1985)

- 8.34 S.N. Lukaschuk, V.S. L'vov, A.A. Predtechenskiy and A.I. Chernykh: "First Bifurcation in Circular Cuvette Flow: Laboratory and Numerical Experiments", in *Laminar-Turbulent Transition IUTAM Symposium Novosibirsk 1984*, ed by V.V. Kozlov (Springer, Berlin, Heidelberg 1985) pp. 653-658
- 8.35 V.S. L'vov: *Sov. Phys.-Solid State* **13**, 2949 (1972)
- 8.36 V.S. L'vov and A.M. Rubenchik: Preprint No 1-72 (Institute for Nuclear Physics, Novosibirsk 1972)
- 8.37 S.A. Akhmanov, A.P. Sukhorukov, R.V. Khokhlov: *Usp. Fiz. Nauk* **93**, 19 (1967)
- 8.38 B.B. Kadomtsev and V.I. Karpman: *Usp. Fiz. Nauk* **103**, 193 (1970)
- 8.39 V.I. Talanov: *Izv. Vuzov, Radiofizika* **7**, 564 (1964)
- 8.40 V.E. Zakharov: *Zh. Eksp. Teor. Fiz.* **53**, 1710 (1967)
- 8.41 V.E. Zakharov, V.V. Sobolev, V.S. Sunakh: *Sov. Phys.-JETP, Lett.* **14**, 390 (1971)
- 8.42 V.N. Vlasov, V.A. Petrishchev and V.I. Talanov: *Izv. Vuzov, Radiofizika* **14**, 1353-1364 (1971)
- 8.43 V.S. L'vov, A.M. Rubenchik, V.V. Sobolev and V.S. Synakh: *Sov. Phys.-Solid State* **15**, 550 (1973)
- 8.44 V.E. Zakharov, V.V. Sobolev and V.S. Sunakh: *Zh. Eksp. Teor. Fiz.* **60**, 136 (1971)

Chapter 9

- 9.1 F.R. Morgenthaler: *J. Appl. Phys.* **31S**, 95S-97S (1960)
- 9.2 E. Schlömann, J.H. Saunderson, and M.H. Sirvetz: *L-Band Ferromagnetic Resonance at High Peak Power Level*, *Trans. IRE, MTT* **8**, No 8, 96-100 (1960)
- 9.3 E. Schlömann, J. Green and V. Milano: *Recent Developments in Ferromagnetic Resonance at High Power Levels*, *J. Appl. Phys.* **31**, Suppl., 386S-395S (1960)
- 9.4 B.Ya. Kotyuzhansky and L.A. Prozorova: *Zh. Eksp. Teor. Fiz.* **62**, 2199 (1972)
- 9.5 W.J. Jantz, B. Anglaer and J. Schneider: *Solid State Commun.* **10**, 937 (1972)
- 9.6 B.Ya. Kotyuzhansky, L.A. Prozorova: *Zh. Eksp. Teor. Fiz. Lett.* **32**, 254 (1980)
- 9.7 E.M. Turner: *Phys. Rev. Lett.* **5**, 100 (1960)
- 9.8 M.H. Seavey: *Phys. Rev. Lett.* **23**, 132 (1969)
- 9.9 V.V. Kveder, B.Ya. Kotyuzhansky and L.A. Prozorova: *Zh. Eksp. Teor. Fiz.* **63**, 2205 (1972)
- 9.10 B.Ya. Kotyuzhansky, L.A. Prozorova: *Zh. Eksp. Teor. Fiz.* **62**, No 6, 1199 (1972)
- 9.11 B.Ya. Kotyuzhansky and L.A. Prozorova: *Zh. Eksp. Teor. Fiz.* **65**, No (6) 12, 2470-2478 (1973)
- 9.12 A.N. Anisimov and A.G. Gurevitch: *Zh. Eksp. Teor. Fiz.* **68**, 677 (1975)
- 9.13 A.N. Anisimov and A.G. Gurevitch: *Fiz. Tverd. Tela* **18**, 38 (1976)
- 9.14 I.V. Kolokolov, V.S. L'vov, V.B. Cherepanov: *Sov. Phys.-JETP* **57**, 605 (1983)
- 9.15 I.V. Kolokolov, V.S. L'vov, V.B. Cherepanov: *Sov. Phys.-JETP* **59**, 1131 (1984)
- 9.16 T. Kasuya and R. Le Craw: *Phys. Rev. Lett.* **6**, 223 (1961)
- 9.17 V.L. Grankin, G.A. Melkov and S.M. Ruabchenko: *Fiz. Tverd. Tela* **17**, 358 (1975)
- 9.18 B.Ya. Kotyuzhansky and L.A. Prozorova: *Zh. Eksp. Teor. Fiz.* **81**, No 5, 1931 (1981)
- 9.19 V.S. Lutovinov: *Fiz. Tverd. Tela* **20**, 1807 (1978)
- 9.20 R.B. Woolsey and P.M. White: *Phys. Rev.* **188**, 813 (1969)
- 9.21 A.V. Andrienko and L.A. Prozorova: *Zh. Eksp. Teor. Fiz.* **88**, 213 (1985)
- 9.22 V.V. Zautkin, V.E. Zakharov, V.S. L'vov, S.L. Musher and S.S. Starobinets: *Sov. Phys.-JETP* **35**, 926 (1972)
- 9.23 B. Lax and K.J. Button: *Microwave Ferrites and Ferrimagnets*, (Mc-Graw-Hill, New York, London 1962)
- 9.24 G.A. Melkov and I.V. Krutsenko: *Sov. Phys.-JETP* **45**, 295 (1977)
- 9.25 T.S. Hartwick, E.R. Peressini and M.T. Weiss: *Phys. Rev. Lett.* **6**, 176-177 (1961)
- 9.26 E. E. Schlömann: *Longitudinal Susceptibility of Ferromagnets in Strong RF Field*, *J. Appl. Phys.*, **33**, No 2, 527-534 (1962)

- 9.27 P. Gottlieb, H. Suhl: *Saturation of Ferrimagnetic Resonance with Parallel Pumping*, *J. Appl. Phys.* **33**, No 4, 1508 (1962)
- 9.28 Ya.A. Monosov: *Non-Linear Ferromagnetic Resonance*, (Nauka Publ., Moscow 1971), [in Russian]
- 9.29 J.J. Green, B.J. Healy: *Apple. Phys.* **34**, No 4, 1285-1286 (1963)
- 9.30 V.S. L'vov and M.I. Shirokov: *Nonlinear Theory of Parametric Excitation of Spin Waves in Antiferromagnets* *Sov. Phys.-JETP* **67**, 960-967 (1974)
- 9.31 L.A. Prozorova and A.I. Smirnov: *Zh. Eksp. Teor. Fiz.* **74**, 1554-1561 (1978)
- 9.32 V.S. L'vov and S.S. Starobinets: *Sov. Phys.-Solid State* **13**, 418-425 (1971)
- 9.33 A.G. Gurevich and S.S. Starobinets: *Fiz. Tverd. Tela* **3**, No 7, 1995-1988 (1961)
- 9.34 H. Suhl: *Phys. Chem. Sol.* **1**, 209-227 (1957)
- 9.35 V.V. Zautkin, B.I. Orel, V.B. Cherepanov: *Zh. Eksp. Teor. Fiz.* **85**, 708 (1983)
- 9.36 L.A. Prozorova and A.I. Smirnov: *Zh. Eksp. Teor. Fiz.* **67**, 1952 (1974)
- 9.37 L.A. Prozorova and A.I. Smirnov: *Zh. Eksp. Teor. Fiz.* **69**, No 2(8), 758-763 (1975)
- 9.38 V.N. Venitsky, V.V. Eremenko and E.V. Matyushkin: *Zh. Eksp. Teor. Fiz., Lett.* **27**, No 4, 239-241 (1978)
- 9.39 V.G. Zhotikov and N.M. Kreines: *Zh. Eksp. Teor. Fiz.* **77**, 2486 (1979)
- 9.40 B.Ya. Kotyuzhansky, L.A. Prozorova and L.E. Svistov: *Zh. Eksp. Teor. Fiz., Lett.* **37**, No 12, 585-588 (1983)
- 9.41 B.Ya. Kotyuzhansky and L.A. Prozorova: *Zh. Eksp. Teor. Fiz.* **84**, 658-664 (1984)
- 9.42 A.S. Mikhailov and A.V. Chubikov: *Zh. Eksp. Teor. Fiz.* **86** 1401 (1984)
- 9.43 V.S. L'vov: *Sov. Phys.-JETP* **42**, 1057 (1976)
- 9.44 I.V. Krutsenko, V.S. L'vov and G.A. Melkov: *Sov. Phys.-JETP* **48**, 561 (1978)
- 9.45 V.V. Zautkin: *D. Sc. thesis*, (Institute for Physics and Techics, Ac. Sci SSSR, Leningrad 1988)
- 9.46 V.V. Zautkin, V.S. L'vov and S.S. Starobinets: *Resonance Phenomena in Parametric Spin Wave System*, *Sov. Phys.-JETP* **36**, No 1, 96-99 (1973)
- 9.47 A.I. Akhiezer, V.G. Bar'yakhtar and S.V. Peletniskiy: *Spin Waves*, (North-Holland, Amsterdam 1968)
- 9.48 B.I. Orel and S.S. Starobinets: *Sov. Phys.-JETP* **41**, 154 (1975)
- 9.49 V.V. Zautkin, V.S. L'vov, S.L. Musher, S.S. Starobinets: *Proof of Stage-by-Stage Excitation of Parametric Spin Waves*, *Sov. Phys.-JETP, Lett.* **14**, 206 (1971)
- 9.50 G.A. Petrakovskiy and V.N. Berzhansky: *Zh. Eksp. Teor. Fiz., Lett.* **12**, 429 (1970)
- 9.51 V.V. Zautkin, V.S. L'vov and E.V. Podivilov: *Sov. Phys.-JETP* **69**, No 1, 177-185 (1989)
- 9.52 V.V. Zautkin and S.S. Starobinets: *Fiz. Tverd. Tela* **16**, No 3, 678-686 (1974)
- 9.53 H. Le Gall, B. Lemair and D. Sere: *Solid State Com.* **5**, No 12, 919 (1967)
- 9.54 V.S. L'vov: *On the Interaction of Parametrically Excited Spin Waves with Thermal Spin Waves* *Prep. No 69-72* (Inst. for Nuclear Physics, Novosibirsk 1972)
- 9.55 V.V. Zautkin and B.I. Orel: *Fiz. Tverd. Tela* **20**, No 2, 593-595 (1978)
- 9.56 V.V. Zautkin, V.S. L'vov, B.I. Orel and S.S. Starobinets: *Sov. Phys.-JETP* **45**, 143-149 (1977)
- 9.57 V.V. Zautkin and B.I. Orel: *Zh. Eksp. Teor. Fiz.* **79**, No 1(7), 281-287 (1980)
- 9.58 V.V. Zautkin, B.I. Orel, V.B. Cherepanov: *Zh. Eksp. Teor. Fiz.* **85**, 708 (1983)

Chapter 10

- 10.1 V.S. L'vov: *Nonlinear Theory of Parametric Excitation of Waves* *Sov. Phys.-JETP* **42**, 1057 (1976)
- 10.2 H.W. Wyld: *Ann. Phys.* **14**, 143, (1961)
- 10.3 L.D. Landau and E.M. Lifshitz: *Course of Theoretical Physics. Vol. 10* E.M. Lifshitz and L.P. Pitaevsky: *Physical Kinetics* (Pergamon, Oxford 1981)
- 10.4 V.S. L'vov: *Nonlinear Spin Waves* (Nauka, Moscow 1987) [in Russian]

- 10.5 V.S. L'vov: "Solitons and Nonlinear Phenomena in Parametrically Excited Spin Waves", in *Solitons*, ed. by S.E. Trullinger, V.E. Zakharov and V.L. Pokrovsky, (Elsevier Science Publishers B.L. 1986) Ch.5 pp. 241-300
- 10.6 V.S. L'vov, L.A. Prozorova: "Spin Waves Above the Threshold of Paramagnetic Excitation", in *Spin Waves and Magnetic Excitation 1*, ed. by A.S. Borovik-Romanov and S.K. Sinha, (Elsevier, Amsterdam 1988) Ch.4 pp. 233-285
- 10.7 V.E. Zakharov and V.S. L'vov: *Izv. Vuzov, Radiofizika* **18** 1470-1487 (1965)
- 10.8 M. Sparks: *Ferromagnetic Relaxation Theory*, (New York 1964)
- 10.9 E. Schlömann: *Phys. Rev.* **182**, 632 (1969)
- 10.10 A.G. Gurevich: *Magnetic Resonance in Ferro- and Antiferromagnets* (Nauka, Moscow 1973) [in Russian]
- 10.11 E. Schlömann: *Phys. Rev.* **16**, No 4, 828-837 (1959)
- 10.12 H. Suhl: *Note on the Ferromagnets*, *J. Appl. Phys.* **30**, No 12, 1961-1964 (1959)
- 10.13 G.A. Melkov and V.L. Grankin: *Sov. Phys.-JETP* **42**, 721 (1975)
- 10.14 S.V. Petrov and A.I. Smirnov: *Zh. Eksp. Teor. Fiz.* **80**, No 4, 1628-1638 (1981)
- 10.15 V.E. Zakharov and V.S. L'vov: *Sov. Phys.-Solid State* **14**, 2513 (1973)
- 10.16 V.S. L'vov and M.I. Shirokov: *Nonlinear Theory of Parametric Excitation of Spin Waves in Antiferromagnets*, *Sov. Phys.-JETP* **40**, 960 (1975)
- 10.17 V.S. L'vov and V.B. Cherepanov: *Sov. Phys.-JETP*, **48** No. 5 822-828 (1978)
- 10.18 I.V. Krutsenko, V.S. L'vov and G.A. Melkov: *Sov. Phys.-JETP* **48**, 561-569 (1978)
- 10.19 V.S. L'vov and V.B. Cherepanov: *Highly Anisotropic Distributions of Parametrically Excited Waves in Near-Isotropic Media* *Sov. Phys.-JETP* **49**, 1145-1151 (1979)

Subject Index

- Amplitude of interaction of two-waves 304
 — — of three-waves 8, 12, 20-27
 — — of three-magnons 60-62, 68
 — — of four-waves 8-15
 — — of pairs of waves (S) 105-106, 110-117, 123-126, 167, 179-181
 — — of four-magnons 15, 60-62, 63-65, 69
 — — of waves with pumping 87-94
 — of waves 4-34
- Anisotropy energy 46
 — of the "easy-axis type" 44
 — of the "easy-plane type" 44
- Antiferromagnets 37, 52, 53
 — with anisotropy of the "easy-axis type" 65
 — — of the "easy-plane type" 66, 68-70, 92-94, 249-250 254, 262
 — with cubic anisotropy 67
- Asymmetrical S -theory 161-172
- Attractors of secondary parametric turbulence in CsMnF_3 226-234
- Auto-oscillations 214-218, 226-234, 281-289
- Basic equations of S -theory 102-107
 — — — under frequency sweeping 204-205
 — — of asymmetrical S -theory 165-167
 — — of noise S -theory 173-175
 — — of spatially-inhomogeneous S -theory 155-157
 — — of temperature S -theory 148-149
 — — of S, g^2 -theory 308-310
 — — of S, T^2 -theory 311
- Canonical variables for spin waves (magnons) 72-73
 — — for waves 5-11
 — motion equation for waves *see* Motion equations for waves
- Chaos in dynamic systems 218-234
 — of parametric spin waves (magnons) 215-217, 226-231
- Collapse 28, 31-34
- Collective oscillations 179-189, 266-276
- Correlation auto-oscillations 171
 — instability of parametric waves 169-171
- Damping decrement of waves 17-20
 — — of spin waves 245-250
- Decay instability 22-24, 78-79
 — — increment 22-24
 — processes 22 -24

- Dimensionality of inclusion 229–230
- Double parametric resonance 193–196, 293–294
- Dynamic equation of motion for waves *see* Motion equations for waves
- Exchange interaction 38–44
- Explosive instability 25–26
 - processes 25–26
- External stability 108, 169
- Feigenbaum scenario 232–234
- Ferromagnets 37, 45–49, 52, 57
- Ferrimagnets 37, 49–52, 245–250, 252–254, 258–260, 263–266
- First-order Suhl processes (instability of the homogeneous precession of magnetization) 87–90, 143–146
- Frequency of collective oscillations *see* Spectrum of collective oscillations
 - of spin waves (magnons) *see* Spectrum of spin waves
 - of waves *see* Spectrum of waves
- Green's functions (normal and abnormal) 148–149, 302–307
- Ground state (of parametric wave system) 108–119, 167–172
- Hamiltonian 3–15, 31
 - of crystallographic anisotropy
 - of non-interacting waves 5–8, 67, 165
 - of interaction 8–17
 - — of two-wave scattering by inhomogeneities 306
 - — of three-waves 8, 20–27
 - — of three-magnons 61–62, 68
 - — of four-waves 8, 10–13, 27–31, 166
 - — of four-magnons 15, 60, 63–65, 69
 - — of waves with pumping 87–94, 99
 - of exchange interaction 14
 - of magnetic dipole–dipole interaction 43, 48–49
 - of basic *S*-theory 107
 - of asymmetrical *S*-theory 165
 - equations of motion for waves *see* Motion equations for waves
 - — of basic *S*-theory 106
- Internal stability 108
- Invariant phase of the pairs 110
- Landau–Hopf scenario 221
- Linear wave damping *see* Damping of wave 17
- Magnetodielectrics 35–53
- Magnons *see* Spin-waves
- Mean-field approximation 103–106
- Modulation instability 28–30
 - — increment 28–30, 81
 - — of spin waves 80–82
- Motion equations for waves 16, 19, 22, 26, 27, 100, 141, 194, 304
- Noise pumping 173, 294–299

- *S*-theory 171–175
- Nonlinear damping of waves 18–19, 101, 132–139
 - ferromagnetic resonance 139–146, 257–258
 - frequency shift 28, 104, 106, 156–157, 167, 255–257
 - susceptibility of collective oscillations 186–187, 272–273
 - — of parametric waves 118–119, 131, 133–134, 144–145, 250–255, 258–260
- Non-simultaneous correlator (of wave amplitudes) 147–151, 152
- Nuclear magnons (spin waves) 69–70, 94
- Numerical simulation of auto-oscillation 215–217
- “Oblique” Pumping of Spin Waves 91
- One-frequency turbulence 313–316
- Parallel pumping 90–91, 92–93
- Parametric excitation of collective oscillations *see* Double parametric resonance
 - — of waves *see* “Oblique” Pumping, Parallel pumping, Noise pumping, Transverse pumping,
- Phase relations 100–101
 - of pairs of waves 260–261
 - mechanism of amplitude limitation 102, 113–114, 176–177
 - — — under sweeping of their frequency 200–211, 291–293
- Resonance excitation of collective oscillations 184–187, 191–192
 - surface 109
 - processes 8–9, 20–21
- Route to chaos in parametric waves turbulence *see* Chaos of parametric waves
- Second group of pairs 114–116, 125–131, 278–281
- Second-order Suhl processes (instability of the homogeneous precession of magnetization) 91–92, 146–147
- Second threshold (threshold of generation of second group of pairs) 114–116, 125–128
- Secondary parametric wave turbulence 213–242
- Self-consistent pumping 104, 106, 110–117, 140, 156, 167
- Self-focusing 32–34,
 - mechanism for amplitude limitation 238–242
 - of magnetoelastic waves 82–86
- Spatially inhomogeneous *S*-theory 155–164
- Spectrum (dispersion law) of collective oscillations 179–184, 189, 269–271
 - of waves of different nature 12–15
 - of magnons in ferromagnetics 56–60
 - — in antiferromagnetics 64–66, 244–245
 - of nuclear magnons 68–69
- Spectrum (energy distribution) of parametric waves 153, 313–316
- Spin-waves 15, 54–77
- Soliton of the envelopes 32–34, 86, 237–238,
 - mechanism of amplitude limitation 241–242
- Stepwise excitation of parametric waves 114–116, 125–132, 276–281
- Strange attractors 222–223, 228–233
- Structure of spinels 50
 - of garnets 51–52
 - of magnets with hexagonal symmetry 52
 - — with rhombohedral symmetry 53
- Susceptibility *see* Nonlinear susceptibility

- Temperature *S*-theory 148–155
- Tensor of demagnetizing factors 48, 57
- Thermal noise 18
- waves (thermally excited waves) 17–18, 151, 308
- Transverse pumping of spin waves 87–90