References

Chapter 1

a) General

Alfvén, H. (1981): *Cosmic Plasma* (D. Reidel, Dordrecht).
Alfvén, H., Fälthammar, C.-G. (1963): Cosmical *Electrodynamics* (Oxford, London)
Alfvén, H., Arrhenius, G. (1976): *Evolution of the Solar System* (NASA Publication SP-345, NASA, Washington D.C.)
Bekefi, G. (1966): *Radiation Processes in Plasmas* (Wiley, New York)
Jursa, A.S. (1985): *Handbook of Geophysics and the Space Environment* (National Technical Information Service, U.S. Department of Commerce, Springfield, VA)
Krall, N.A., Trivelpiece, A.W. (1973): *Principles of Plasma Physics* (McGraw-Hill, New York)
Lang, K. (1974): *Astrophysical Formulae* (Springer, New York, Heidelberg, Berlin)
Lui, A.T.Y. (ed.) (1987): *Magnetotail Physics* (The Johns Hopkins University Press, Baltimore)
Lyons, L. R., Williams, D. J. (1984): *Quantitative Aspects of Magnetospheric Physics* (D. Reidel, Dordrecht)
Miller, R. B. (1982): Intense *Charged Particle Beams* (Plenum, NewYork)
Nishida, A. (1988): *Magnetospheric Plasma Physics* (D. Reidel, Dordrecht, Holland)
Priest, E. R. (1985): *Solar System Magnetic Fields* (D. Reidel, Dordrecht, Holland)
Rose, D. J., Clark, M. (1961): *Plasmas and Controlled Fusion* (MIT Press, Cambridge, MA)

b) Special

Alfvén, H. (1950): *Cosmical Electrodynamics* (Oxford University Press, New York)
Alfvén, H., Wernholm, O. (1952): "A new type of accelerator," Ark. För Fys. **15** 175
Akasofu, S.-I. (1981): "Energy coupling between the solar wind and the magnetosphere", Space Sci. Rev. **28** 121
Bennett, W.H. (1934): "Magnetically self-focussing streams", Phys. Rev. **45** 890
Berlin, A.B., Bulaenko, E.N., Vitkivskii, V.V., Pariiskii, Yu.N., Petrov, Z.E. (1983): "Search for small scale anisotropy of the 3K emission of the universe", in Abell and Chincarini (eds) *Early Evolution of the Universe and its Present Structure* (IAU Symposium 104, Kolymbari, Greece), pp.121-124
Block, L.P., Fälthammar, C.-G. (1969): "Field-aligned currents and auroral precipitation", in *Atmospheric Emissions*, ed. by B.M. McCormac (Van Nostrand Reinhold Company), p. 285
Book, D. L. (1987): *Plasma Formulary*, NRL Publication 0084-4040 (Naval Research Laboratory, Washington DC)
Borucki, W. J. (1989): "Planetary lightning: a short review of extraterrestrial lightning characteristics," in *Laboratory and Space Plasmas*, ed. by H. Kikuchi (Springer, Berlin, Heidelberg)
Bostick. W.H. (1986): "What laboratory-produced plasma structures can contribute to the understanding of cosmic structures both large and small", IEEE Trans. Plasma Sci. **1** 703
Brecker (1984):"The quadrapole anisotropy", Phys. Today **37**

Bridle, A.H. (1967): "The spectrum of the radio background between 13 and 404 MHz", Mon. Not. R. Astro. Soc. **136** 219

Brown, W. C., Ness, W. N., Van Allen, J. A. (1963): "Collected papers on the artificial radiation belt from the July 9, 1962, nuclear detonation", J. Geophys. Res. **68** 605

Buneman, O., Levy, R.H., Linson, L.M. (1966): "Stability of crossed-field electron beams," J. Appl. Phys. **37** 3203

Chandrasekhar, S. (1961): *Hydrodynamic and Hydromagnetic Stability* (Clarendon Press, Oxford)

Collins, G.B. (1948): Microwave *Magnetrons* (McGraw-Hill, New York)

Dennis, B., Canfield, R. (1988): *Max '91* (NASA Goddard Space Flight Center, Greenbelt, Maryland)

Destler, W.W., Hoeberling, R.F., Kim, H., Bostick, W.H. (1979): "Collective acceleration of carbon ions to 170 MeV," Appl. Phys. Lett. **35** 296

Eastman, T. (1990): "Transistion regions in solar system and astrophysical plasmas," IEEE Trans. Plasma Sci. **18** 18

Faehl, R. J., Godfrey, B. B. (1978): "Collective ion acceleration through temporal modulation of relativistic-electron beam energy," Phys. Rev. Lett. **40** 1137

Fälthammar, C.-G. (1990): "Electrodynamics of Cosmical Plasmas—Some basic aspects of cosmological importance", IEEE Trans. Plasma Sci. **18** 11

Felch, K.L. (1985): "Introduction to the special issue on high-power microwave generation", IEEE Trans. on Plasma Sci. **13** 361

Godfrey, B.B., Thode, L. E. (1975): "Collective ion acceleration via the two-stream instability", New York Acad. Sci. **251** 582

Kaiser, M.L., Desch, M.D. (1984): "Radio emissions from the planets Earth, Jupiter, and Saturn," Rev. Geophys. and Space Phys. **22** 373

Katsouleas, T. (1987): "Introduction to the special issue on plasma-based high-energy accelerators," IEEE Trans. Plasma Sci. **15** 85

Luce, J.S. (1975): "Neutrons and radioisotopes produced by collective effect acceleration", Ann. New York Acad. Sci. **251** 217

Moran, P. (1984): "Masers in the nuclei of galaxies", Nature **310** 270

Nahin, P.J. (1988): *Oliver Heaviside: Sage in Solitude* (IEEE Press, New York)

Ness, W.N. (1963): "Collected papers on the artificial radiation belt from the July 9, 1962, nuclear detonation", J. Geophys. Res. **68** 605

Peratt, A.L. (1985): "A high-power reflex triode microwave source", IEEE Trans. on Plasma Sci. **13** 498

Periiskii, Y.N., Korolkov, D.V. (1986): "Experiment Cold: the first deep sky survey with the Ratan–600 radio telescope", Sov. Sci. Rev. E. Astrophys. Space Phys. **5** 39

Reber, G. (1986): "Intergalactic plasma", IEEE Trans. Plasma Sci. **14** 678

Shannahan, W. R., Faehl, R. J. (1981): "Collective ion acceleration," Los Alamos National Laboratory Report LA-8961-PR

Suess, S. T., Dessler, A. J. (1985): "Probing the local interstellar medium," Nature **317** 702

Willett, J.C., Bailey, J.C., Leteinturier, C., Krider, E.P. (1990): "Lightning electromagnetic radiation field spectra in the interval from 0.2 to 20 MHz, J. Geophys. Res. **95** 20,367

Yusef-Zadeh, F., Morris, M., Chance, D. (1984): "Large, highly organized radio structures near the galactic centre", Nature **310** 557

c) Critical Ionization Velocity

Alfvén, H. (1942): "On the cosmogony of the solar system", Stockholms Observatoriums Annaler I. **14** No. 2

Brenning, N., Axnäs, I. (1988): "Critical ionization velocity interactions: Some unsolved problems", Astrophys. Space Sci. **144** 15

Cloutier, P.A., Daniell, R.E., Dessler, A.J., Hill, T.J. (1978): "A cometary ionosphere model for Io", Astrophys. Space Sci. **55** 93

Fahleson, U. (1961): "Experiments with plasma moving through neutral gas", Phys. Fluids **4** 123

Fälthammar, C.-G. (1988): "Laboratory and near-earth space plasma as a key to the plasma universe", Laser and Particle Beams **6** 437

Galeev, A.A. *et al* (1986): "Critical ionization velocity effects in the inner coma of Comet Halley: measurements by Vega-2", Geophys. Res. Lett. **13** 845

Gold, T., Soter, S. (1976): "Cometary impact and the magnetization of the moon", Planet. Space Sci. **24** 45

Haerendel, G. (1982): "Alfvén's critical velocity effect tested in space" Zeitschrift für Naturforschung **37a** 728

Haerendel, G. (1986): "Plasma flow and critical velocity ionization in cometary comae", Geophys. Res. Lett. **13** 255

Lai, S.T., Murad, E., McNeil, W.J. (1989): "An overview of atomic and molecular processes in critical velocity ionization", IEEE Trans. Plasma Sci. **17** 124

Lindeman, R.A. *et al* (1974): "The interaction between an impact-produced neutral gas cloud and the solar wind at the lunar surface", J. Geophys. Res. **79** 2287

Luhmann, J. (1988): "An assessment of the conditions for critical velocity ionization at the weakly ionized planets", the XXVIIth COSPAR Meet. Helsinki, Finland, paper XIII.1.6

Petelski, E.F., Fahr, H.J., Ripken, H.W., Brenning, N., Axnäs, I. (1980): "Enhanced interaction of the solar wind and the interstellar neutral gas by virtue of a critical velocity effect", Astron. Astrophys. **87** 20

Petelski, E.F. (1981): "Viability of the critical ionization velocity concept in selected space situations" in *Relation Between Laboratory and Space Plasmas*, H. Kikuchi, Ed. (D. Reidel, Dordrecht, Holland)

Singh, N. (1989): "Magnetic field-aligned plasma expansion in critical ionization velocity space experiments", IEEE Trans. Plasma Sci. **17** 124

Torbert, R. (1988): "Review of ionospheric CIV experiments", XXVIIth COSPAR Meet. Helsinki, Finland, paper XIII.2.1

Chapter 2

a) Birkeland Currents

Alfvén, H. (1939): "Magnetic storms and the aurorae", Proc. Royal Swedish-Academy of Sciences (Kungliga Svenska Vetenskapakademiens Handlingar **18** 139)

Alfvén, H. (1977): "Electric currents in cosmic plasma," Rev. Geophys.& Space Phys.**15** 271

Bhavsar, S.P., Ling, E.N. (1988): "Are the filaments real?", Astrophys. J. **331** L63

Browne, P.F. (1986): "Magnetic vortex tubes in astrophysics", IEEE Trans. Plasma Sci. **14** 718
Cummings, W., Dessler, A.J. (1967): "Field-aligned currents in the magnetosphere", J. Geophys. Res. **72** 1007
Dessler, A. (1984): "Evolution of arguments regarding existence of field aligned currents," in *Magnetospheric Currents*, T.A. Potemra (ed.), Geophysical Monograph No. 28, American Geophysical Union, Washington, D.C.
Egeland, A., Holtet, J. (1968): *The Birkeland Symposium on Aurora and Magnetic Storms* (Centre National de la Recherche Scientifique, Paris)
Fälthammar, C.-G. (1986): "Magnetosphere-ionosphere interactions: near-earth manifestations of the plasma universe", IEEE Trans. Plasma Sci. **14** 616
Hill, T.W. (1984): "Rotationally-induced Birkeland current systems," in *Magnetospheric Currents*, T.A. Potemra (ed.), Geophysical Monograph No. 28, American Geophysical Union, Washington, D.C.,p.340
Iijima, T., Potemra, T.A. (1976): "Field-aligned currents in the dayside cusp observed by Triad", J. Geophys. Res. **81** 5971
Kim, K.-T., Kronberg, P.P., Giovannini, G., Venturi, T. (1989): "Discovery of intergalactic radio emission in the Coma-A1367 supercluster", Nature **341** 720
Lerner, E.J. (1986): "Magnetic vortex filaments, universal scale invariants, and the fundamental constants", IEEE Trans. Plasma Sci. **14** 690
Peratt, A.L., Green, J.C. (1983): "On the evolution of interacting magnetized galactic plasmas", Astrophys. Space Sci. **91** 19
Peratt, A.L. (1986): "Evolution of the plasma universe 1. Double radio galaxies, quasars, and extragalactic jets", IEEE Trans. Plasma Sci. **14** 639
Potemra, T.A. (1984): *Magnetospheric Currents* (Geophysical Monograph No. 28, Amer, Geophys. Union, Washington DC)
Salingaros, N. (1988): "An amended magnetohydrodynamics equation which predicts field-aligned current sheets", Astrophys. Space Sci. **137** 385
Zmuda, A.J., Martin, J.H., Huering, F.T. (1966): J. Geophys. Res. **71** 5033
Zmuda, A.J., Huering, F.T., Martin, J.H. (1967): J. Geophys. Res. **72** 1115

b) Bennett Pinches

Bennett, W.H. (1934): Phys. Rev. **45** 890
Carlqvist, P. (1988): "Cosmic electric currents and the generalized Bennett Relation," Astrophys. Space Sci. **144** 73
Meierovich, B.E. (1984): "Electromagnetic collapse, problems of stability, emission of radiation and evolution of a dense pinch", Phys. Reports **104** 259
Murty, G.S. (1961): "Instability of a conducting cylinder in the presence of an axial current, a longitudinal magnetic field and a coaxial conducting cylinder", Arkiv för Fysik **19** 483
Nielsen, D., Green, J., Buneman, O. (1979): "Dynamic evolution of a z-pinch", Phys. Rev. Lett. **42** 1274
Peratt, A.L., Green, J., Nielsen, D. (1980): "Evolution of colliding plasmas," Phys. Rev. Lett. **44** 1767
Pereira, N.R., Davis, J., Rostocker, N. (eds) (1989): Dense Z-Pinches (American Institute of Physics, New York)

Witalis, E. (1986): "Hall magnetohydrodynamics and its applications to laboratory and cosmic plasma", IEEE Trans. on Plasma Sci. **14** 842
Witalis, E. (1981): Phys.Rev.A **24** 2758

c) Diocotron, Beam, and Plasma Instabilities

Alfvén, H. (1951): *Cosmical Electrodynamics* (Oxford, London), p. 206
Bostick, W.H. (1956): "Experimental study of ionized matter projected across a magnetic field", Phys. Rev. **104** 292
Bostick, W.H. (1957): "Simulation of astrophysical processes in the laboratory", Nature **179** 214
Bostick, W.H., Prior, W., Grunberger, L., Emmert, G. (1966): Phys. Fluids **9** 2078
Buneman, O. (1949): "A toroidal magnetron," Proc. Phys. Soc. London **1363** 278
Buneman, O. (1957): "Ribbon beams," J. Electronics and Control **3** 507
Buneman, O., Levy, R. H.,, Linson, L. M. (1966): "Stability of crossed-field electron beams," J. Appl. Phys. **37** 3203
Carmel, Y., Nation, J. A. (1973): "Instability of an unneutralized relativistic electron beam," Phys. Rev. Lett. **31** 286
Cutler, C. C. (1956): "Instabilitity in hollow and strip electron beams," J. Appl. Phys. **27** 1028
Davis, T. N., Hallinan, T. J. (1976): "Aurora spirals 1. Observations," J. Geophys. Res. **81** 3953
Ekdahl, C.A., Freeman, J.R., Leifeste, G.T., Miller, R.B., Stygar, W.A., Godfrey, B.B. (1985): "Axisymmetric hollowing instability of an intense relativistic electron beam propagating in air", Phys. Rev. Lett. **55** 935
Friedman, M., Hammar, D. A. (1972): "Castastrophic disruption of the flow a magnetically confined intense relativistic electron beam," Appl. Phys. Lett. **21** 174
Fälthammar, C.-G. (1986): "Magnetosphere-ionosphere interactions—near-earth manisfestations of the plasma universe," IEEE Trans. Plasma Sci. **14** 616
Hallinan, T. J. (1970): "Small scale arc distortions," Planet. Space Sci. **18** 1735
Hallinan, T. J. (1976): "Aurora spirals 1. Theory," J. Geophys. Res. **81** 3959
Hammer, D.A., Rostocker, N. (1970): Phys. Fluids **13** 1831
Ivanov, V. S., Krementsov, S. I., Raizer, M. D., Rukhadze, A. A.,, Fedotov, A. V. (1981): Sov. J. Plasma Phys. **7** 430
Jones, M. E., Mostrom, M. A. (1981): "The diocotron instability in annular relativistic electron beams," J. Appl. Phys. **52** 3794
Kapetanakos, C. A. (1974): "Filamentation of intense electron beams propagating in dense plasmas," Appl. Phys. Lett. **25** 484
Kapetanakos, C. A., Hammer, D. A., Striffler, C. D.,, Davidson, R. C. (1973): "Destructive instabilities in hollow intense relativistic electron beams," Phys. Rev. Lett. **30** 1303
Knauer, W. (1966): "Diocotron instability in plasmas and gas discharges," J. Appl. Phys. **37** 602
Knauer, W., Poeschel, J. L. (1966): "The diocotron effect in plasmas and gas discharges," in *Phenomena. in Ionized Gases*, Perovic, B. and Tosic, D. (eds) (Gradeviska Knjiga Publ., Beograd) p.719
Küppers, G., Salat, A., Wimmel, H.K. (1973): "Macroscopic equilibria of relativistic electron beams in plasmas", Plasma Phys. **15** 441
Kyhl, R. L., Webster, H. F. (1956): "Breakup of hollow cylindrical electron beams," IRE Trans. Prof. Group on Electron Devices **ED-3** 183

Lehnert, B. (1952): "Experiments on non-laminar flow of mercury in presence of a magnetic field," Tellus 4 63
Lehnert, B. (1955): "An instability of laminar flow of mercury caused by an external magnetic field," Proc. Roy. Soc. A **233** 299
Levy, R. H. (1965): "Diocotron instability in a cyclindrical geometry," Phys. Fluids **8** 1288
Levy, R. H., Hockney, M. A. (1968): "Computer experiments on low-density crossed-field electron beams," Phys. Fluids **11** 766
Mostrom, M. A., Jones, M. E. (1983): "Shear-driven instabilities of annular relativistic electron beams in vacuum," Phys. Fluids **26** 1649
Nardi, V., Bostick. W. H., Feugeas, J., Prior, W. (1980): "Internal structure of electron-beam filaments," Phys. Rev. A **22** 2211
Peratt, A. L., Snell, C.M. (1985): "Microwave generation from filamentation and vortex formation within magnetically confined electron beams," Phys. Rev. Lett. **54** 1167
Pierce, J.R. (1956): "Instability of hollow beams", IRE Trans. on Electron Devices **ED–3** 183
Shrafranov, V.D. (1957): "On the stability of a cylindrical gaseous conductor in a magnetic field", J. Nucl. Energy **5** 86
Wagner, J. S., Sydora, R. D., Tajima, T., Hallinan, T., Lee, L. C., S. -I. Akasofu (1983): J. Geophys. Res. **88** 8013
Webster, H. F. (1955): "Breakup of hollow beams," J. Appl. Phys. **26** 1386
Webster, H. F. (1957): "Structure in magnetically confined electron beams," J. Appl. Phys. **28** 1388
Webster, H. F., Hallinan, T. J. (1973): "Instabilities in charge sheets and current sheets and their possible occurance in the aurora," Radio Sci. **8** 475
Wollman, E.R. (1988): "A grain plasma model of galaxies", Laser and Particle Beams **6** 545
Yu, S. P., Kooyers, G. P., Buneman, O. (1965): "Time-dependent computer analysis of electron wave interaction in crossed fields," J. Appl. Phys. **36** 2550

Chapter 3

a) General

Elliot, R.S. (1966): *Electromagnetics* (McGraw-Hill, New York)
Panofsky, W. K. H., Phillips, M. (1962): *Classical Electricity and Magnetism* (Addison-Wesley, Reading)
Plonsey, R., Collin, R. E. (1961): *Principles and Applications of Electromagnetic Fields* (McGraw-Hill, New York)
Smythe, W. R. (1950): *Static and Dynamic Electricity* (McGraw-Hill, New York)
Stratton, J. A. (1941): Electromagnetic Theory (McGraw-Hill, New York)
Tandberg-Hanssen, E., Emslre, A. G. (1988): *The Physics of Solar Flares* (Cambridge University Press, New York)

b) Magnetic Fields in Laboratory and Space Plasmas

Acuña, M. H., Ness, N. F. (1975): "The Pioneer XI high field fluxgate magnetometer," Space Sci. Instr. **1** 177

Bostick (1986): "What laboratory-produced plasma structures can contribute to the understanding of cosmic structures both large and small", IEEE Trans. on Plasma Sci. **14** 703

Chandrasekhar, S., Kendall, P.C. (1957): "On force-free magnetic fields", Astrophys. J. **126** 457

Gold, T. (1964): in AAS-NASA Symposium *on Physics of Solar Flares* (Hess, W.N., ed), p.389, NASA SP-50

Felber, F.S., Peratt, A.L. (1980): "Self-similar oscillations of a Z pinch", Bull. Am. Phys. Soc. **25**

Ferraro, V.C.A., Plumpton, C. (1966): *An Introduction of Magneto-Fluid Mechanisms* (Clarendon Press, Oxford)

Nakagawa, J., Raadu, M.A. (1972): Solar Phys. **25** 127

Peratt, A. L. (1986): "Evolution of the plasma universe I. Double radio galaxies, quasars, and extragalactic jets," IEEE Trans. Plasma Sci. **14** 639

Peratt, A. L. (1986): "Evolution of the plasma universe II. The formation of systems of galaxies," IEEE Trans. Plasma Sci. **14** 763

Stenzel, R.L., Gekelman, W. (1981): "Magnetic field reconnection experiments 1. Field topologies", J. Geophys. Res. **86** 649

Thompson, J.E., Luessen. L.H. (Eds) (1986): *Fast Electrical and Optical Measurements. Vol. 1— Current and Voltage Measurements* (Martinus Nijhoff Publ., Dordrecht)

Voigt G.-H. (1988): "Quasi static MHD processes in earth's magnetosphere," Laser and Particle Beams **6** 525

Woltjer, L. (1958): "A theorem on force-free magnetic fields", Proc. Nat. Acad Sci. **44** 489

c) Magnetic Fields in Galaxies

Beck, R. (1986): "Interstellar magnetic fields", IEEE Trans. Plasma Sci. **14** 740

Beck, R. (1990): "Magnetic fields in spiral galaxies", IEEE Trans. Plasma Sci. **18** 33

Bosma, A., van de Hulst, J.M, Sullivan III, W.T. (1977): "A neutral hydrogen study of the spiral galaxy NGC 4736", Astron. Astrophys. **57** 373

Bosma, A. (1981): "21-cm line studies of spiral galaxies. I. Observatons of the galaxies NGC 5033, 3198, 5055, 2841, and 7331" Astron. Astrophys. **86** 1791

Bosma, A. (1981): "21-cm line studies of spiral galaxies. II. The distribution and kinematics of neutral hydrogen in spiral galaxies of varous morphological type" Astron. Astrophys. **86** 1825

Bosma, A., Ekers, R.D., Lequeux, J., (1977): "A 21-cm study of the Seyfert galaxy NGC 4151",Astron. Astrophys. **57** 97

Crutcher, R. M., Kazés, I.. (1983): Astron. Astrophys. **125** L23

Davis, L., Greenstein, J.L. (1951): Astrophys. J. **114** 206

Fiebig, D., Güsten, R. (1988): "Strong magnetic fields in interstellar H_2O maser clumps", Astron. Astrophys.

Fujimoto, M. (1987): "Bisymmetric spiral magnetic fields in spiral galaxies", in *Interstellar Magnetic Fields*, R. Beck and R. Gräve (eds) (Springer Verlag, Berlin)

Harnet, J.I. (1984): Mon. Notic. Roy. Astron. Soc. **210** 12

Heiles, C. (1976): Ann. Rev. Astron. Astrophys. **14** 1

Heiles, C., Chu, Y.H., Troland, T.H. (1981): Astrophys. J. **247** L77

Hummel, E., Bosma, A. (1982): "Radio continuum observations of the spiral galaxies NGC 2841, NGC 5055, and NGC 7331", Astron. J. **87** 242

Kaplan, S.A., Pikelner, B. (1970): *The Interstellar Medium* (Harvard University Press, Cambridge, MA)

Kim, K.-T., Kronberg, P.P., Giovannini, G., Venturi, T. (1989): "Discovery of intergalactic radio emission in the Coma-A1367 supercluster", Nature **341** 720

Krause, M., Hummel, E., Beck, R. (1989): "The magnetic field structure in two nearby galaxies. I. The axisymmetric spiral magnetic field in IC 342", Astron. Astrophys. **217** 4

Krause, M., Beck, R., Hummel, E. (1989): "The magnetic field structure in two nearby galaxies. I. The bisymmetric spiral magnetic field in M81", Astron. Astrophys. **217** 17

Peratt, A.L., Green, J.C. (1983): "On the evolution of interacting magnetized galactic plasmas", Astrophys. Space Sci. **91** 19

Peratt, A.L. (1984): "Simulating spiral galaxies", Sky Telesc. **68** 118

Peratt, A.L. (1986): "Evolution of the plasma universe: II. The formation of systems of galaxies", IEEE Trans. Plasma Sci. **14** 763

Peratt, A.L. (1990): "3-dimensional particle-in-cell simulations of spiral galaxies", in IAU Symp. 140, R. Beck (ed)

Phillips, S. Kearsey, S., Osborne, J.L., Haslam, C.G.T., Stoffel, H. (1981): Astron. Astrophys. **98** 286

Reich, W. (1988): "Observations of linear polarization at 32 GHz of the galactic center arc" in *The Galactic Center*, M. Morris (ed) (D. Reidel, Dordrecht)

Rogstad, D.H., Lockart, I.A., Wright, M.C.H. (1974): "Aperture synthesis observations of the HI in the galaxy M85" Astrophys. J. **193** 309

Seiradakis, J.H., Lasenby, A.N., Yusef-Zadeh, F., Wielebinski, R., Klein, U. (1985): "A new symmetrical polarization structure near the galactic center", Nature **317** 697

Sofue, Y. Fujimoto, M., Wielebinski, R. (1986): "Global structure of magnetic fields in spiral galaxies", Ann. Rev. Astron. Astrophys. **24** 459

Sofue, Y., Fujimoto, M. (1983): "A bisymmetric spiral magnetic field and the spiral arms in our galaxy", Astrophys. J. **265** 722

Spoelstra, T.A.T. (1977): Sov. Phys.—Usp. **20** 336

Vallée, J.P. (1988): "Can the large-scale magnetic field lines cross the spiral arms in our Milky Way galaxy?", Astron. J. **95** 750

Van Woerden, H. Van Driel, W., Schwarz, U. J. (1983): "Distribution and motions of atomic hydrogen in lenticular galaxies", in *Internal Kinematics and Dynamics of Galaxies*, E. Athanassoula (ed) (American Astron. Union, Washington D.C.), 99

Verschurr, G.L. (1979): Fund. Cosmic Phys. **5** 113

Verschurr, G.L. (1987): "The strength of the interstellar magnetic field and its possible role in HI cloud dynamics", in *Interstellar Magnetic Fields*, (eds) R. Beck, R. Gräve (Springer-Verlag, Berlin) 154

Wielebinski, R. (1989): "Magnetic fields in the galaxy", Max-Planck-Institut für Radioastronomie preprint series no. 347

Yusef-Zadeh, F., Morris, M., Chance, D. (1984): "Large, highly organized radio structures near the galactic centre", Nature **310** 557

Chapter 4

a) General

Alfvén, H. (1960): *On the Origin of the Solar System* (Oxford University Press, New York). See also Rev. Mod. Phys. **32** 710

Alfvén, H., Fälthammer, C.-G. (1963): *Cosmic Electrodynamics* (Oxford University Press, New York)

Alfvén, H. (1981): *Cosmic Plasma* (D. Reidel Publ. Co., Dordrecht, Holland) Chap. IV

Fälthammar, C.-G. (1977): "Problems related to macroscopic electric fields in the magnetosphere," Rev. Geophys. Space Phys. **15** 457

Helliwell, R. A. (1967): *Whistlers and Related Ionspheric Phenomena* (Stanford Univ. Press, Stanford)

Lyons, L. R., Williams, D. J. (1984): *Quantitative Aspects of Magnetospheric Physics* (D. Reidel, Dordrecht, Holland). Chap. 4

Miller, R.B. (1982): *Intense Charged Particle Beams* (Plenum, New York) Chap.1

b) Special

Acuna, M.H., Neubauer, F. M., Ness, N.F.(1981): J. Geophys. Res. **86** 8513

Alfvén, H. (1958): in Proceedings of the 2nd Int. Conf. on Peaceful Uses of Atomic Energy (United Nations, Geneva) **31** 3

Block, L. P., Fälthammar, C.-G., Lindqvist, P.-A., Markalund, G., Mozer, F. S., Pedersen, A., Potemra, T. A., Zanetti, L. J. (1987): "Electric field measurements on Viking: first results," Geophys. Res. Lett. **14** 435

Colgate, S. (1990): "E-parallel acceleration of cosmic rays, twisted magnetic fields, and collimated radio sources", Los Alamos Astrophysics Seminar, December 5, 1990.

Cook, A.F., Shoemaker, E.M., Smith, B.A., Danielson, G.E., Johnson, T.V., Synnott, S. P. (1981): Science **211** 1419

Fälthammar, C.-G. (1978): "Generation mechanisms for magnetic-field-aligned electric fields in the magnetosphere," J. Geomag. Geoelectr. **30** 419

Fälthammar, C.-G. (1979): "Non-resistive electric potential drops in cosmical plasmas," in *Particle Acceleration Mechanisms in Astrophysics*, ed. by J. Arons, C. McKee, C. Max (Amer. Inst. Phys., New York)

Fälthammar, C.-G. (1983): "Magnetic-field-aligned electric fields," ESA Journal **7** 385.

Fälthammar, C.-G. (1988): "Laboratory and near-earth space plasmas as a key to the plasma universe," Laser and Particle Beams **6** 437

Fälthammar, C.-G., Block, L. P., Lindqvist, P.-A., Marklund, G., Pedersen, A., Mozer, F. S. (1987): "Preliminary results from the d.c. electric field experiment of Viking," Annales Geophys. **5A** 171

Garscadden, A. (1986): "Rydberg states: Properties and applications to electrical discharge measurements," in *Radiative Processes in Discharge Plasmas*, ed. by J.M. Proud and L.H. Leussen (Plenum Publ. Co.)

Geller, R., Hopfgarten, N., Jacquot, B., Jacquot, C. (1974): "Electric fields parallel to the magnetic field in laboratory plasma in a magnetic mirror field", J. Plasma Phys. **12** 467

Gold, T. (1979): Science **206** 1071

Knight, S. (1973): "Parallel electric fields", Planet. Space Sci. **21** 741

Lemaire, J., Scherer, M. (1974): "Ionosphere plasma-sheet field-aligned currents and parallel electric fields", Planet. Space Sci. **22** 1485

Lemaire, J., Scherer, M. (1983): Annales Geophysicue **1** 91

Lundin, R., Sandahl, J. (1978): ESA Special Publication **SP-135** 125

Marklund, G.T. (1979): "Plasma convection in force-free magnetic fields as a mechanism for chemical separation in cosmical plasmas", Nature **277** 370

Marklund, G.T., Blomberg, L.G., Hardy, D.A., Rich, F.J. (1987): "Instantaneous picutres of the high-latitude electrodynamics using Viking and DMSP/F7 observations",, in Proc. 8th ESA Symp. (Sunne, Sweden) ESA SP-270, 45

Marklund, G., Block, L., Lindqvist, P.-A. (1981): "Rocket measurements of electric fields, electron density and temperature during different phases of auroral substorms," Planet. Space Sci. **29** 249

Mauk, B. H., Zanetti, L. J. (1987): "Magnetospheric electric fields and currents," Rev. of Geophys. **25** 541

Melzner, F., Metzner, G., Antrack, D. (1978): "The Geos electron beam experiment S 329," Space Sci. Instr. **4** 45

Mirabel, I.F., Morras, R. (1984): "Evidence for high velocity inflow of neutral hydrogen toward the galaxy", Astrophys. J. **279** 86

Morabite, L.A., Synnott, S.P., Kupferman, P.N., Collins, S.A. (1979): Science **204** 972

Mozer, F.S. et al (1980): "Satellite measurements and theories of low altitude auroral particle acceleration", Space Sci. Rev. **27** 155

Pedersen, A., Cattell, C. A., Fälthammar, C.-G., Formisano, V., Lindqvist, P.-A., Mozer, F., Torbert, R. (1984): "Quasistatic electric field measurements with spherical double probes on the Geos and ISEE satellites," Space Sci. Reviews **37** 269

Peratt, A.L., Dessler, A.J. (1988): "Filamentation of volcanic plumes on the Jovian satellite Io", Astrophys. Space Sci. **144** 451

Richmond, A. D. (1986): "Upper-atmosphere electric-field sources," in *The Earth's Electrical Environment* (National Academy Press, Washington DC), p.195

Smith, B.A. *et.al.* (1979): Science **204** 945.

Smith, B.A., Shoemaker, E.M., Kieffer, S.W., Cook, A.F. (1979): Nature **280** 738

Southwood, D. J., Kivelson, M.G., Walker, R.J., Slavin, J.A. (1980): J. Geophys. Res. **85** 5959

Strom, R.G., Terrile, R.J., Masursky, H., Hansen, C. (1979): Nature **280** 733

Strom, R.G., Schneider, N.M. (1982): in D. Morrison (ed.) *Satellites of Jupiter* (Univ. Arizona Press, Tucson, Arizona) 598

Yariv, A. (1985): *Optical Electronics* (Holt, Rinehart, and Winston, New York)

Zanetti, Jr., L. J., Arnoldy, R. J., Cahill, Jr., L. J., Behm, D. A., Greenwald, R. A. (1980): "Comparative rocket observations of ionospheric electric fields in the auroral oval," Space Sci. Instr. **5** 183

c) Dense Plasma Focus

Alfvén, H., Wilcox, J.M. (1962): Astrophys. J. **136** 1016

Borowiecki, M. *et al* (1981): "Investigation of the breakdown and run-down phases of the dense plasma focus discharge". S. Kaliski Institute of Plasma Physics and Laser Microfusion, Report No. 14/81 (74), Warsaw, Poland.

Borowiecki, M. *et al* (1983): "The dynamics and plasma sheath structure in the plasma focus device". S. Kaliski Institute of Plasma Physics and Laser Microfusion, Report No. 3/83 (94), Warsaw, Poland.

Bostick, W.H., Nardi, V., Prior, W. (1975): Annals New York Academy of Sciences **251** 2

Dattner, A., Eninger, J. (1964): Phys. of Fluids Suppl. **7** S41

Filippov, N.V., Filippova, T.I., Vinogradov, V. P. (1962): Nucl. Fusion Suppl., Pt. 2

Gratton, F.T., Nardi, V., De Chiara, P., Gnavi, G. (1990): "On the possibility of chaotic motion and acceleration of ions in oscillating plasma structures", Contributed Papers, IV Latin American Workshop on Plasma Physics, Buenos Aires, July 1990

Lerner, E.J. (1986): "Magnetic self-compression in laboratory plasmas, quasars and radio galaxies", Laser and Particle Beams **4** part 2, 193

Lindberg, L., Witalis, E., Jocobsen, C.T. (1960): Nature **185** 452

Lindberg, L., Jacobsen, C. T. (1961): Astrophys. J. **133** 1043

Lindberg, L., Jacobsen, C.T. (1964): Phys. of Fluids Suppl. **7** S44

Mather, J. W. (1971): in Lovberg, R.H., Griem, H.R., *Plasma Physics* (Academic Press, New York) Chap.15

Chapter 5

Akasofu, S.–I. (1988): "An electric-current description of solar flares", Astrophys. Space Sci. **144** 303

Alfvén, H. (1958): Tellus **10** 104

Alfvén, H. (1986): "Double layers and circuits in astrophysics," IEEE Trans. Plasma Sci. **14** 779

Babi´c, M. *et al* (1971): *Tenth International Conference on Phenomena in Ionized Gases*, Oxford

Bernstein, I. B., Greene, J. M., Kruskal, M. D. (1957): "Exact nonlinear plasma oscillations", Phys. Rev. **108** 546

Biskamp, D, Chodura, R. (1971): Phys. Rev. Lett. **23** 1553

Block, L. P. (1978): "A double layer review," Astrophys. Space Sci. **55** 59

Bohm, M., Torven, S. (1987): Inter. Conf. Plasma Phys. (Kiev), TRITA-EPP-86-11, Roy. Inst. Tech., Stockholm, Sweden

Boris, J.P., Dawson, J.M., Orens, J.H., Roberts, K.V. (1970): "Computations on anomalous resistance", Phys. Rev. Lett. **25** 706

Borovosky, J. E. (1984): "A review of plasma double-layer simulations," in *Second Symposium on Plasma Double Layers and Related Topics*, ed. by R. Schrittwieser and G. Eder (Innsbruck,Austria)

Borovosky, J.E., Joyce, G. (1983): "Numerically simulated two-dimensional auroral double layers", J. Geophys. Res. **88** 3116

Borovosky, J.E. (1984): "The production of ion conics by oblique double layers", J. Geophys. Res. **89** 2251

Borovosky, J.E. (1988): "Production of auroral kilometric radiation by gyrophase-bunched double-layer-emitted electrons: Antennae in the magnetospheric current regions", J. Geophys. Res. **93** 5727

Carlqvist, P. (1969): "Current limitation and solar flares," Solar Phys. **7** 377

Carlqvist, P. (1972): "On the formation of double layers in plasmas," Cosmic Electrodynamics **3** 377

Carlqvist, P. (1982): "On the physics of relativistic double layers," Astrophys. Space Sci. **87** 21

Carlqvist, P. (1986): "On the acceleration of energetic cosmic particles by electrostatic double layers," IEEE Trans. Plasma Sci. **14** 794

Carpenter, R.T., Torven, S. (1987): " The current-voltage characteristic and potential oscillations of a double layer in a triple plasma device", Laser and Particle Beams **5** 325

Chupp, E.L. *et al* (1982): "A direct observation of solar neutrons following the 0118 UT flare on 1980 June 21", Astrophys. J. **263** L95

Crawford, F.W., Freeston, I. L. (1963): *VIe Conférence Internationale sur les Phénomenes d'Ionisation dans les Gaz*, Paris, Vol. I.

Goertz, C.K., Joyce, G. (1975): Astrophys. Space Sci. **32** 165

Goldsworthy, M. P., Green, F, Lalousis, P., Stening, R. J., Eliezer, S., Hora, H. (1986): "Hydrodynamic analysis of the high electric fields and double layers in expanding inhomogenous plasmas," IEEE Trans. Plasma Sci. **14** 823

Ichimaru, S. (1973): *Basic Principles of Plasma Physics* (W.A. Benjamin, Reading, MA)

Jones, M.E., Gisler, G. (1986): Bull. Am. Phys. Soc. **31** 1398

Kan, J. R., Akasofu, S.-I. (1989): "Electrodynamics of solar wind-magnetosphere-ionosphere interactions," IEEE Trans. Plasma Sci. **17** 83

Langmuir, I. (1929): "The interaction of electron and positive ion space charges in cathode sheaths", Phys. Rev. **33** 954

Lindberg, L. (1982): in Proc. Symp. Plasma Double Layers, P. Michersen and J. J. Rasmussen (eds) (Risø Nat. Lab., Roskilde, Denmark)

Moreton, G.E., Severny, A.B. (1968): "Magnetic fields and flares in the region CMP, 20 September 1963", Sol. Phys. **3** 282

Peratt, A.L., Jones, M.E. (1986): "Particle-in-cell simulations of heavy ion plasma double layers", IEEE Conf. Rec., IEEE Int. Conf. Plasma Sci., Saskatoon, Canada.

Priest, E.R. (1982): *Solar MHD* (D. Reidel, Dordrecht)

Raadu, M. A. (1989): "The physics of double layers and their role in astrophysics," Phys. Reports **178** 25

Ryan, J.M., Chupp, E.L., Forrest, D.J., Matz, S.M., Rieger, E., Reppin, C., Kanbach, G., Share, G.H. (1983): Astrophys. J. **272** L61

Sato, T., Okuda, H. (1981): J. Geophys. Res. **86** 3357

Schönhuber, M. J. (1958): *Quecksilber-Niederdruck-Gasenladunger* (Lachner, München)

Severny, A.B. (1965): Astron. Zh. **42** 217

Singh, N., Thiemann, H., Schunk, R.W. (1986): "Plasma processes driven by current sheets and their relavance to the auroral plasma", IEEE Trans. on Plasma Sci. **14** 805

Tonks, L. (1958): Trans. Electrochem. **72** 167

Vlasov, V.P., Zhdanov, S.K., Trubnikov, B.A. (1989): "Plasma pinch as a source of cosmic rays", JETP Letters **49** 667
Williams, A. C. (1986): "General Bohm and Langmuir conditions for a strong double layer in space plasmas," IEEE Trans. Plasma Sci. **14** 800
Williams, A. C. (1987): "Double Layers in Astrophysics", Laser and Particle Beams **5**
Yamamoto,T., Kan, J.R. (1985): "The field-aligned scale length of one-dimensional double layers", J. Geophys. Res. **90** 1553

Chapter 6

a) General

Bekefi, G. (1966): *Radiation Processes in Plasmas* (Wiley, New York)
Ginzburg, V. L. (1961): *Propagation of Electromagnetic Waves in Plasma* (Gordon and Breach, New York)
Ginzburg, V.L., Syrovatskii, S.I. (1965): "Cosmic magnetobrehsstrahlung", Ann. Rev. Astron. Astrophys. **3** , 297
Harrington, R. F. (1961): *Time-Harmonic Electromagnetic Fields* (McGraw-Hill, New York)
Jackson, J. D. (1962): *Classical Electrodynamics* (Wiley, New York)
Jones, D.S. (1964): *The Theory of Electromagnetism* (Pergamon Press, New York)
Kellermann, K., Sheets, B. (eds) (1983): *Serendipitous Discoveries in Radio Astronomy* (National Radio Astronomy Observatory, Green Bank, West Virginia)
Kraus, J. D. (1986): *Radio Astronomy* (Cygnus-Quasar Books, Powell, Ohio)
Landau, L.D., Lifshitz, E.M. (1962): *The Classical Theory of Fields* (Pergamon, Oxford, London, Paris, Frankfurt). Chap. 9
Pacholczyk, A.G. (1977): *Radio Galaxies* (Pergamon Press, New York)
Panosfsky, W. K., Phillips, M. (1962): *Classical Electricity and Magnetism* (Addison-Wesley, Reading, MA)
Rohlfs, K. (1986): *Tools of Radio Astronomy* (Springer, Heidelberg, New York)
Rose, D.J., Clark, M. (1961): *Plasmas and controlled fusion* (MIT Press, Cambridge, MA)
Shklovsky, I.S. (1960): *Cosmic Radio Waves* (Harvard University Press, Cambridge), Chap.VI

b) Special

Alfvén, H., Herlofson, N. (1950): Phys. Rev. **78** 616
Baade, W., Minkowksi, R. (1954): "Identification of the radio sources in Cassiopeia, Cygnus A, and Puppis A", Astrophys. J. **119** 206
Benard, A. *et al* (1975): "Experimental studies of the plasma focus and evidence for nonthermal processes", Phys. Fluids **18** 180
Bennett, W.H. (1934): "Magnetically self-focussing streams", Phys. Rev. **45** 890
Burkhalter, P.G., Dozier, C.M., Nagel, D.J. (1977): "X-ray spectra from exploded-wire plasmas", Phys. Rev. A **15** 700
Burkhalter, P.G., Davis, J., Rauch, J., Clark, W., Dahlbacka, G., Schneider, R. (1979): "X-ray line spectra from exploded-wire arrays", J. Appl. Phys. **50** 705

Ekers, R.D. (1974): "Radio observations of the nuclei of galaxies", in *The Formation and Dynamics of Galaxies*, J.R. Shakeshaft, Ed. (IAU Symp. 58), p.257

Epstein, R.I., Feldman, P.A. (1967): "Synchrotron radiation from electrons in helical orbits", Astrophys. J. **150** L109

Gersten, M., Rauch, J.E., (1982): "Source size line broadening in convex curved crystal x-ray spectrographs", J. Appl. Phys. **53** 1297

Ginzburg, V. L., Syrovatskii, S. I. (1965): "Cosmic Magnetobremsstrahlung", Ann. Rev. Astron. Astrophys. **3** 297

Ginzburg, V.L., Sazonov, V.N., Syrovatskii, S.I. (1968): "Synchrotron radiation and its reabsorption", Sov. Phys. Uspekhi **11** 34

Ginzburg, V.L., Ozernoy, L.M. (1977): "On the nature of quasars and active galactic nuclei", Astrophys. Space Sci. **50** 23

Hutchings, J.B. (1987): "What is the difference between radio galaxies and radio quasar galaxies?", Astrophys. J. **320** 122

Johner, J. (1988): "Angular distribution of the total cyclotron radiation of a relativistic particle with parallel velocity", Phys. Rev. A **36** 1498

Kai, K. (1965): "Polarization characteristics of type IV bursts", Publ. Astron. Soc. Japan **17** 294

Kawabuta, K. (1964): "Transfer of the gyro-resonance radiation", Publ. Astron. Soc. Japan **16** 30

Lerner, E.J. (1986): Magnetic self compression in laboratory plasmas, quasars, and radio galaxies, Part I, II Laser and Particle Beams **4** 193

Liang, E.P. (1989): "Gamma ray bursts: confrontation between theory and observational data", in Proc. GRO Science Workshop, W. N. Johnson (ed) (Naval Research Laboratory, Washington D.C.), p.4-397

Mack, J.M., Peratt, A.L., Gisler, G.R. (1987): "Microwave signatures from circulating electron rings", Bull.Am. Phys. Soc. **32** 1721

Meirovich, B.E. (1984): "Electromagnetic collapse, problems of stability, emission of radiation and evolution of a dense pinch", Phys. Reports **104** 259

Miley, G. (1980): "The structure of extended extragalactic radio sources," Ann. Rev. Astron. Astrophys.**18** 165

Moffet, A. T. (1975): "Strong nonthermal radio emission from galaxies", in Galaxies and the Universe, (eds) Sandage, Sandage, and Kristian (University of Chicago Press, Chicago)

Newberger, B.S. *et al* (1984): "Synchrotron radiation from Bennett beams", Bull. Amer. Phys. Soc. **29** 1435

Peratt, A.L., Green, J.C. (1983): "On the evolution of interacting magnetized, galactic plasmas", Astrophys. Space Sci. **91** 19

Peratt, A.L., Koert, P. (1985): "Pulsed electromagnetic acceleration of exploded wire plasmas", J. Appl. Phys. **54** 6292

Peratt, A.L. (1986): "Evolution of the plasma universe: I. Double radio galaxies, quasars, and extragalactic jets", IEEE Trans. Plasma Sci. **14** 639

Peratt, A.L. (1988): "Particle beams and electrical currents in the plasma universe", Laser and Particle Beams **6** pt.3, 471

Perola, G.C. (1981): "Radio galaxies: observations and theories of their extended components," Fundamentals of Cosmic Phys.**7** 59

Reber, G. (1940): "Cosmic static", Proc. IRE **30** 367

Reber, G. (1944): "Cosmic static", Astrophys. J. **100** 279

Scheuer, P.A.G. (1968): "Synchrotron radiation formulae", Astrophys. J. **151** L139
Schwinger, J. (1949): "On the classical radiation of accelerated electrons", Phys. Rev. **75** 1912
Takakura, T. (1960): "Synchrotron radiation from intermediate energy electrons in helical orbits and solar radio bursts at microwave frequencies", Publ. Astron. Soc. Japan **12** 352
Trubnikov, B.A. (1958): Sov. Phys., 'Doklady' **3** 136

Chapter 7

a) General

Abromwitz, M., Stegun, I. (1965): *Handbook of Mathematical Functions* (Dover, New York)
Bekefi, G. (1966): *Radiation Processes in Plasmas* (Wiley, New York)
Reif, F. (1965): *Fundamentals of Statistical and Thermal Physics* (McGraw-Hill, New York)
Sobolev, V.V. (1963): *A Treatise on Radiative Transfer* (D. Van Nostrand, Princeton)
Stix, T. H. (1962):*The Theory of Plasma Waves* (McGraw-Hill, New York)

b) Special

Crusius, A. (1988): "The influence of a thermal plasma on synchrotron radiation", Laser and Particle Beams **6** 421
Crusius, A., Schlickeiser, R. (1986): "Synchrotron radiation in random magnetic fields", Astron. Astrophys. **164** L16
Hirshfield, J.L., Bekefi, G. (1963): "Decameter radiation from Jupiter", Nature **198** 20
Kimura, (1966): in Lyons, L. R., Williams, D. J. (1984): *Quantitative Aspects of Magnetospheric Physics* (D. Reidel, Dordrecht, Holland)
Peratt, A.L., Kuehl, H.H. (1972): "Transmission and reflection of a wave obliquely incident on a nonuniform magnetized plasma", Radio Sci. **7** 309
Peter, W., Peratt A. L. (1988): "Thermalization of synchrotron radiation from field-aligned currents", Laser and Particle Beams **6** 493
Peter, W., Peratt A. L. (1990): "Synchrotron radiation spectrum for galactic-sized plasma filaments", IEEE Trans. Plasma Sci. **18** 49
Storey, L.R.O. (1953): "An investigation of whistling atmospherics", Phil. Trans. Roy. Soc. London Ser. A **246** 113
Trubnikov, B. A. (1958): "Plasma radiation in a magnetic field", Sov. Phys. Doklady **3** 136
Trubnikov, B.A. (1961): "On the angular distribution of cyclotron radiation from a hot plasma", Phys. Fluids **4** 195
Trubnikov, B.A., Yakubov, V.B. (1963): "Cyclotron radiation of electrons having a two-dimensional maxwellian distribution", Plasma Phys. **5** 7

Chapter 8

Birdsall, C.K., Langdon, A.B. (1985): *Plasma Physics via Computer Simulation* (McGraw-Hill, New York)

Birdsall, C.K. (1991): "Particle-in-cell charged particle simulations, plus Monte Carlo collisions with neutral atoms, PIC–MCC", IEEE Trans. Plasma Sci. **19**

Boris, J.P., Dawson, J.M., Orens, J.H., Roberts, K.V. (1970): "Computations on anomalous resistance", Phys. Rev. Lett. **25** 706

Bostick. W.H. (1958): "Possible hydromagnetic simulations of cosmical phenomena in the laboratory", Rev. Mod. Phys. **30** 1090

Buneman, O. (1986): "Multidimensional particle codes: their capabilities and limitations for modeling space and laboratory plasma", IEEE Trans. Plasma Sci. **14** 661

Buneman, O., Barnes, C.W., Green, J.C., Nielsen, D.E. (1980): "Principles and capabilities of 3D, EM particle simulations", J. Comp. Phys. **38** 1

Cashwell, E.D., Everett, C.J. (1959): *Monte Carlo Method for Random Walk Problems* (Pergamon Press, New York)

Hockney, R.W., Eastwood, J.W. (1981): *Computer Simulation Using Particles* (McGraw-Hill, New York)

Karin, S., Smith, N.P. (1987): *The Supercomputer Era* (Hartcourt, Brace, Jovanovich, Boston)

Kwan, T.J.T., Snell, C.M., Mostrom, M.A., Mack, J.M., Hughes, H.G. (1985): "Monte Carlo charged particle and photon transport in particle-in-cell codes" in Eleventh International Conference on Numerical Simulation of Plasmas, Montreal, Canada 25-27 June 1985

Langdon, A.B., Birdsall, C.K. (1970): Phys. Fluids **13** 2115

Lehnert, B. (1959): "Plasma physics on cosmical and laboratory scale", Nuovo Cimento **13** (supplement) 59

Lindman, E.L. (1970): J. Comp. Phys. **5** 13

Nash, S. (1991): *History of Scientific Computation* (in press)

Okuda, H., Birdsall, C.K. (1970): Phys. Fluids **13** 2123

Okuda, H. (1972): Phys. Fluids **15** 1268

Snell, C.M., Kwan, T.J.T., Morel, J.E., Witte, K.H. (1990): "Incorporation of atomic physics into particle simulations" Bull. Am. Phys. Soc. **35** 2001

Störmer, C. (1955): *The Polar Aurora* (Clarendon Press, Oxford)

Appendix A

Allis, W.P., Buchsbaum, S.J., Bers, A. (1963): *Waves in Anisotropic Plasmas* (MIT Press, Cambridge)

Bekefi, G. (1966): *Radiation Processes in Plasmas* (Wiley, New York)

Book, D.L. (1987): *NRL Plasma Formulary* (Naval Research Laboratory, Washington DC)

Stix, T. H. (1962):*The Theory of Plasma Waves* (McGraw-Hill, New York)

Swanson, G.D. (1989): *Plasma Waves* (Academic Press, New York)

Westman, H.P. (ed.) (1960): *Reference Data For Radio Engineers* (International Telephone and Telegraph Corporation, New York). Chap. 20.

Appendix B

Brown, R.G., Sharpe, R.A., Hughes, W.L. (1961): *Lines, Waves, and Antennas* (Ronald Press, New York)

Fink, D.G., Christiansen, D. (eds) (1989): *Electronic Engineer's Handbook* (McGraw-Hill, New York). Chap. 9

Metzer, G., Vabre, J-P. (1969): *Transmission Lines with Pulse Excitation* (Academic Press, New York)

Sato, T. (1978): "A theory of quiet auroral arcs", J. Geophys. Res. **83** 1042

Appendix C

Alfvén, H., Arrhenius, G. (1976): *Evolution of the Solar System* (NASA publication SP-345, Washington, D.C.)

Alfvén, H., Carlqvist, P. (1978): "Interstellar clouds and the formation of stars", Astrophys. Space Sci. **55** 484

Azar, M.J., Thompson, W.B. (1989): "The role of dust particles with large gryoradii in the 2/3 fall-down process",.IEEE Trans. Plasma Sci. **17** 228

Deforest, S.E. (1972): J. Geophys. Res. **77** 651

Gisler, G.R., Wollman, E.R. (1988): Phys Fluids **31** 1101

Hill, J.R., Mendis, D.A. (1979): Moon and the Planets **21** 3

Hill, J.R., Mendis, D.A. (1980): "Charged dust in outer planetary magnetospheres" Moon and the Planets **22**

Horanyi, M., Goertz, C.K. (1990): "Coagulation of dust particles in a plasma", Astrophys. J. **361** 155

Houpis, H.L.F., Whipple, E.C. (1987): "Electrostatic charge on a dust size distribution in a plasma", J. Geophys. Res. **92** 12057

Mendis, D.A. (1979): Astrophys. Space Sci. **65** 5

Mendis, D.A., Houpis, H.L.F., Hill, J.R. (1982): "The gravito-electrodynamics of charged dust in planetary magnetospheres", J. Geophys. Res. **87** 3449

Reasoner, D.L., Lennartsson, W. Chappell, C.R., Rosen, A. (eds) (1976): *Spacecraft Charging by Magnetospheric Plasmas* (Amer. Inst. of Aeronautics and Astronautics, New York). p. 89

Wollman, E.R. (1988): "A grain plasma model of galaxies", Laser and Particle Beams **6** 545

Index

In the past decade, our understanding of plasma physics has expanded greatly and has contributed extensively to current research in astrophysics. The explosive growth in plasma physics has been concentrated mainly in two research areas: work directed toward controlled nuclear fusion, and work in space physics. This book addresses the growing need to apply these complementary discoveries to astrophysics.

Today many scientists recognize plasma as the key element to understanding the generation of magnetic fields in planets, stars, and galaxies; the behavior of stellar atmospheres and the interstellar medium; the acceleration and transport of cosmic rays; and many other phenomena occurring in radio galaxies, galactic nuclei, quasars, and so forth.

These phenomena have only recently been recognized as a unified discipline. The material in *Physics of the Plasma Universe* addresses the known properties of matter in the plasma state and addresses topics in contemporary astrophysics such as magnetism in plasma; electric fields in space plasmas; double layers, synchrotron radiation, and energy transport in plasmas; and particle-in-cell simulation of astrophysical plasmas. Examples of specific problems are included, as well as numerous useful illustrations and appendixes that discuss transmission line concepts in space plasmas, the polarization properties of plasma waves, and dusty and grain plasmas.

ISBN 0-387-**97575**-6
ISBN 3-540-**97575**-6