UNIVERSITY OF MARYLAND
Department of Physics and Astronomy
College Park, Maryland 20742-4111

CURRICULUM VITAE

Oscar Wallace Greenberg

Professor of Physics

I.   Education:

B.S.	Rutgers University	1952
M.A.	Princeton University	1954
Ph.D.	Princeton University	1957

II.   Experience in Higher Education:

1956-57	Brandeis University	Instructor
1959-61	Massachusetts Institute of Technology	NSF Postdoctoral Fellow
1961-63	University of Maryland	Assistant Professor
1963-67	University of Maryland	Associate Professor
1967-	University of Maryland	Professor

During leaves of absence:

Fall semester 1964-65,	Member,	Institute for Advanced Study
Academic year 1965-66,	Visiting Associate Professor,	Rockefeller University
Academic year 1968-69,	Visiting Professor,	Weizmann Institute of Science and Tel-Aviv University
Fall semester 1977-78,	Visiting Professor,	The Johns Hopkins University
Spring semester 1977-78,	Visiting Scientist,	NASA/Goddard Space Flight Center
August 1984-July 1985,	Visiting Scientist,	Fermi National Accelerator Laboratory, and
	Visiting Scholar,	Enrico Fermi Institute, University of Chicago

III. Experience Other than Higher Education:

1957-59 Air Force Cambridge Research Center, 1st Lieutenant, U.S.A.F.

IV. Publications:

See attached list

V. Professional Activities:

American Physical Society
International Association for Mathematical Physics
Association of Members of the Institute for Advanced Study
Divisional Associate Editor of Physical Review Letters 1976-1978.

VI. Honors and Awards:

Phi Beta Kappa (Junior year)
Sigma Xi
NSF Postdoctoral Fellow, Massachusetts Institute of Technology, 1959-1961
Alfred P. Sloan Research Fellow, 1964-66
John Simon Guggenheim Memorial Fellow, 1968-69
Fellow, American Physical Society
Washington Academy of Sciences Award in Physical Sciences for 1971
Fellow, Washington Academy of Sciences
Listed in American Men and Women of Science, starting 11th edition
Listed in Who's Who in America, starting 37th edition
Listed in Who's Who in the World, starting 4th edition
Listed in Who's Who in Technology Today, starting 3rd edition
University of Maryland Faculty Research Grant, Spring 1982
University of Maryland Faculty Research Grant, Fall 1987
University of Maryland Faculty Research Grant, Fall 1992
University of Maryland Faculty Research Grant, Fall 1996

VII. Publications

A. Papers published (or accepted for publication) in refereed journals.

1. Physics research

CLOTHED PARTICLE OPERATORS IN SIMPLE MODELS OF QUANTUM FIELD THEORY, with S.S. Schweber, Nuovo Cimento 8, 378-406 (1958).

HAAG'S THEOREM AND CLOTHED OPERATORS, Phys. Rev. 115, 706-710 (1959).

HYDRODYNAMIC MODEL OF DIFFUSION EFFECTS ON SHOCK WAVE STRUCTURE IN A PLASMA, with H. K. Sen and Y. M. Treve, Phys. Fluids 3. 379-386 (1960).

SHOCK WAVE AND SOLITARY WAVE STRUCTURE IN A PLASMA, with Y. M. Treve, Phys. Fluids 3, 769-785 (1960).

GENERALIZED FREE FIELDS AND MODELS OF LOCAL FIELD THEORY, Ann. Phys. 16, 158-176 (1961).

LIMIT ON HIGH-ENERGY CROSS SECTION FROM ANALYTICITY IN LEHMANN ELLIPSES, with F.E. Low, Phys. Rev. 124, 2047-2048 (1961).

TWO FOLK LEMMAS ON THE EXPANSION OF THE S-MATRIX OR THE OUT FIELD IN NORMAL ORDERED IN FIELDS, J. Math. Phys. 3, 31-34 (1962).

HEISENBERG FIELDS WHICH VANISH ON DOMAINS OF MOMENTUM SPACE, J. Math. Phys. 3, 859-866 (1962).

COMPLETENESS IDENTITY IN FIELD THEORY, with H.J. Schnitzer and E.C.G. Sudarshan, Nuovo Cimento 25, 461-464 (1962).

QUANTUM FIELD THEORY WHOSE TRUNCATED VACUUM EXPECTATION VALUES VANISH BEYOND SOME ORDER, with A.L. Licht, J. Math. Phys. 4, 613-614 (1963).

COUPLING OF INTERNAL AND SPACE-TIME SYMMETRIES, Phys. Rev. 135, B1447-B1450 (1964).

SYMMETRIZATION POSTULATE AND ITS EXPERIMENTAL FOUNDATION, with A.M.L. Messiah, Phys. Rev. 136, B248-B267 (1964).

SPIN AND UNITARY-SPIN INDEPENDENCE IN A PARAQUARK MODEL OF BARYONS AND MESONS, Phys. Rev. Lett. 13, 598-602 (1964).

SELECTION RULES FOR PARAFIELDS AND THE ABSENCE OF PARA PARTICLES IN NATURE, with A. M. L. Messiah, Phys. Rev. 138, B1155-B1167 (1965).

HIGH-ORDER LIMIT OF PARA-BOSE AND PARA-FERMI FIELDS, with A.M.L. Messiah, J. Math. Phys. 6, 500-504 (1965).

INTRODUCTION TO THE N-QUANTUM APPROXIMATION IN QUANTUM FIELD THEORY, Phys. Rev. 139, B1038-B1049 (1965); erratum, Phys. Rev. 156, 1742 (1967).

EQUIVALENCE OF LOCALITY AND PARALOCALITY IN FREE PARAFIELD THEORY, with H. Araki and J. S. Toll, Phys. Rev. 142, 1017-1018 (1966).

MAGNETIC MOMENTS OF SPIN-ONE-HALF PARTICLES IN EXTERNAL FIELDS, Phys. Lett. 19, 423-424 (1965).

NON-RELATIVISTIC MOTION OF PARTICLES IN STRONGLY BOUND S-STATES, Phys. Rev. 147, 1077-1080 (1966).

INTRODUCTION TO THE N-QUANTUM APPROXIMATION FOR BOUND STATES: THE DEUTERON IN PSEUDOSCALAR MESON THEORY, with R. J. Genolio, Phys. Rev. 150, 1070-1076 (1966).

N-QUANTUM SOLUTION OF THE DERIVATIVE COUPLING MODEL, Phys. Rev. 150, 1076-1078 (1966).

SATURATION IN TRIPLET MODELS OF HADRONS, with D. Zwanziger, Phys. Rev. 150, 1177-1180 (1966).

THE SYMMETRIC QUARK MODEL OF BARYON RESONANCES, with M. Resnikoff, Phys. Rev. 163, 1844-1851 (1967).

$SU(3)''$-EXCITATION IN BARYON RESONANCES, with C. A. Nelson, Phys. Rev. Lett. 20, 604-607 (1968).

ABSENCE OF INTERACTION IN LIE FIELD THEORIES, Comm. Math. Phys. 9, 13-17 (1968).

RE-ANALYSIS OF THE LOWEST-MASS NEGATIVE PARITY BARYON RESONANCES USING THE SYMMETRIC QUARK MODEL, with D.R. Divgi, Phys. Rev. 175, 2024-2026 (1968); erratum, Phys. Rev. 178, 2487 (1969).

CONSEQUENCES OF $SU(3)''$-EXCITATION IN BARYON RESONANCES, with C.A. Nelson, Phys. Rev. 179, 1354-1363 (1969).

GENERALIZED BOSE OPERATORS IN THE FOCK SPACE OF A SINGLE BOSE OPERATOR, with R. A. Brandt, J. Math. Phys. 10, 1168-1176 (1969).

THREE TRIPLET MODEL, DUALITY AND THE POMERONCHON, Phys. Lett. 29B, 493-496 (1969).

PARTON MODEL WITH VARIABLE INTERMEDIATE STATE PARTON MASS, with D. Bhaumik, Phys. Rev. D 4, 2048-2055 (1971).

FINITE ENERGY SUM RULES ON HYPERBOLAS, I, with J. C. Sandusky, Nuovo Cimento 6A, 617-626 (1971).

MELLIN-TRANSFORM ANALYSIS OF LIGHT-CONE STRUCTURE AND SCALING IN INELASTIC ELECTRON SCATTERING, with D. Bhaumik and R. N. Mohapatra, Phys. Rev. D 6, 2989-2997 (1972).

DIAGONAL STRUCTURE OF THE S-MATRIX IN THE LEE MODEL, with H. Yabuki, Ann. Phys. 79, 146-170 (1973).

COMMENT ON AN EXACTLY SOLUBLE MODEL OF RELATIVISTIC FIELD THEORY, with I. Bialynicki-Birula and J. C. Sandusky, Phys. Rev. D 7, 1928-1929 (1973).

LIGHT-CONE VS NON-LIGHT-CONE CONTRIBUTIONS TO STRUCTURE FUNC-
TIONS, with D. Bhaumik, Phys. Rev. D 7, 3136-3141 (1973).

DIFFRACTIVE LEPTON SCATTERING AND CONSTANT $\sigma(e^+e^- \rightarrow$ HADRONS): A
NEW REGIME IN LEPTON PHYSICS, with G. B. Yodh, Phys. Rev. Lett. 32,
1473-1477 (1974).

COMPOSITE MODELS OF LEPTONS, with C. A. Nelson, Phys. Rev. D 10, 2567-2573
(1974).

ds/dX FOR $e^+e^- \rightarrow hX$ FROM DIRECT QUARK-LEPTON INTERACTIONS, with A.
Raychaudhuri, Phys. Rev. D 12, 2903-2906 (1975).

NEW NARROW RESONANCES AND SEPARATE LOCALIZATION OF ORDINARY
AND COLOR SU(3), Phys. Rev. Lett. 35, 1120-1123 (1975).

QUARK MODEL RELATION FOR KAON CHARGE RADII, with S. Nussinov and J.
Sucher, Phys. Lett. 70B, 465-468 (1977).

INFRARED REGULARIZATION OF THE MASSLESS SCALAR FREE FIELD IN TWO-
DIMENSIONAL SPACE-TIME VIA LORENTZ EXPANSION, with J. S. Kang and
C. H. Woo, Phys. Lett. 71B, 363-366 (1977).

STRUCTURE OF ASYMPTOTIC FIELDS ASSOCIATED WITH PERMANENTLY-CONFINED
DEGREES OF FREEDOM IN QUANTUM FIELD THEORY, Phys. Rev. D 17, 2576-
2582 (1978).

PERMANENT QUARK CONFINEMENT WITHOUT VAN DER WAALS FORCES, with
J. Hietarinta, Phys. Lett. 86B, 309-312 (1979).

LINK OPERATOR FORMULATION OF QUARK CONFINEMENT WITHOUT VAN
DER WAALS FORCES, with J. Hietarinta, Phys. Rev. D 22, 993-998 (1980).

QUANTUM STRUCTUREDYNAMIC MODEL OF QUARKS, LEPTONS, WEAK VEC-
TOR BOSONS, AND HIGGS MESONS, with J. Sucher, Phys. Lett. 99B, 339-343
(1981).

THE POTENTIAL MODEL OF COLORED QUARKS: SUCESS FOR SINGLE HADRON
STATES; FAILURE FOR HADRON-HADRON INTERACTIONS, with H. J. Lipkin,
Nucl. Phys., A 370, 349-364 (1981).

LOCALLY GAUGE-INVARIANT FORMULATION OF PARASTATISTICS, with K. I.
Macrae, Nucl. Phys. B 2l9, 358-366 (l983).

WEAK INTERACTION SYMMETRY AND GENERATION STRUCTURE IN THE QUA-
SI-NAMBU-GOLDSTONE FERMION PICTURE OF QUARKS AND LEPTONS,
with R.N. Mohapatra and M. Yasue, Phys. Lett. 128B, 65-68 (l983).

STRING-BREAKING DESCRIPTION OF THE BARYON-MESON INTERACTION, with
R. J. Perry and R. D. Smith, Phys. Lett. 131B, 209-212 (l983).

THE INTERPLAY BETWEEN THE 'T HOOFT ANOMALY CONSTRAINTS AND THE NAMBU-GOLDSTONE MECHANISM IN SUPERSYMMETRIC COMPOSITE MODELS, with R. N. Mohapatra and M. Yasue, Nucl. Phys. B 237, 189-204 (1984).

DETERMINATION OF THE NUMBER OF GENERATIONS OF QUARKS AND LEPTONS FROM FLAVOR-COLOR SYMMETRY, with R. N. Mohapatra and M. Yasue, Phys. Rev. Lett. 51, 1737-1740 (l983).

COMMENTS ON THE SPECTRUM OF NAMBU-GOLDSTONE PARTICLES IN SUPERSYMMETRIC THEORIES, with J. Sonnenschein, Phys. Lett. 144B, 69-72 (1984).

CONSTRAINTS ON COMPOSITE MODELS DUE TO RARE PROCESSES, with R.N. Mohapatra and S. Nussinov, Phys. Lett. l48B, 465-469 (1984).

REPHASING-INVARIANT FORMULATION OF CP VIOLATION IN THE KOBAYASHI-MASKAWA FRAMEWORK, Phys. Rev. D 32, 1841-1843 (1985).

A PRIORI DEFINITION OF MAXIMAL CP VIOLATION, with I. Dunietz and Dan-di Wu, Phys. Rev. Lett. 55, 2935-2937 (1985).

N-QUANTUM APPROACH TO SYMMETRY BREAKING, Prog. Theor. Phys. Supp. No. 86, 60-64 (1986).

N-QUANTUM CALCULATION OF DYNAMICAL SYMMETRY BREAKING IN THE NAMBU–JONA-LASINIO MODEL, with P. K. Mohapatra, Phys. Rev. D 34, 1136-1140 (1986).

N-QUANTUM CALCULATION OF THE NAMBU–JONA-LASINIO MODEL WITH ISOSPIN, with L.H. Orr, Phys. Rev. D 36, 1240-1246 (1987).

LOCAL QUANTUM FIELD THEORY OF POSSIBLE VIOLATION OF THE PAULI PRINCIPLE, with R. N. Mohapatra, Phys. Rev. Lett. 59, 2507-2510 (1987). Erratum, Phys. Rev. Lett. 61, 1432 (1988).

DIFFICULTIES WITH A LOCAL QUANTUM FIELD THEORY OF POSSIBLE VIOLATION OF THE PAULI PRINCIPLE, with R. N. Mohapatra, Phys. Rev. Lett. 62, 712-714 (1989).

PHENOMENOLOGY OF SMALL VIOLATIONS OF FERMI AND BOSE STATISTICS, with R.N. Mohapatra, Phys. Rev. D 39, 2032-2038 (1989).

ON THE SURPRISING RIGIDITY OF THE PAULI EXCLUSION PRINCIPLE, Nucl. Phys. B (Proc. Suppl.) 6, 83-89 (1989).

EXAMPLE OF INFINITE STATISTICS, Phys. Rev. Lett. 64, 705-708 (1990).

PARTICLES WITH SMALL VIOLATIONS OF FERMI OR BOSE STATISTICS, Phys. Rev. D 43, 4111-4120 (1991).

INTERACTIONS OF PARTICLES HAVING SMALL VIOLATIONS OF STATISTICS, Physica A 180, 419-427 (1992).

SCALING LIMIT OF A NONRELATIVISTIC MODEL OF CONFINED "QUARKS," hep-ph/9210245, Phys. Rev. D 47, 331-335 (1993).

N-QUANTUM APPROACH TO THE BCS THEORY OF SUPERCONDUCTIVITY, Can. J. Phys. 74, 574-577 (1994).

CANONICAL COMMUTATION RELATIONS IN THE SCHWINGER MODEL, with G. Gat, hep-th/9402055, Phys. Lett. B 328, 119-122 (1994).

COVARIANT SINGLE-TIME BOUND-STATE EQUATION, with R. Ray and F. Schlumpf, hep-ph/9504396, Phys. Lett. B 353, 284-288 (1995).

CONSERVATION OF STATISTICS AND GENERALIZED GRASSMANN NUMBERS, hep-ph/9507349, Phys. Lett. A 209, 137-142 (1995).

BOUND STATES IN GALILEAN-INVARIANT QUANTUM FIELD THEORY, with S. Corley, hep-ph/9412211, J. Math. Phys. 38, 571-581 (1997).

SPIN-STATISTICS, SPIN-LOCALITY, AND TCP: THREE DISTINCT THEOREMS, hep-th/9707220, Phys. Lett. B 416, 144-149 (1998).

VARIATIONAL PRINCIPLE IN THE ALGEBRA OF ASYMPTOTIC FIELDS, hep-th/9803190, Phys. Rev. D 58, 065004, 1-7 (1998).

THE RELATION OF CONSTRAINTS ON PARTICLE STATISTICS FOR DIFFERENT SPECIES OF PARTICLES, with R.C. Hilborn, hep-th/9808106, Foundations of Physics 29, 397-407 (1999), (special issue in honor of D.M. Greenberger).

QUON STATISTICS FOR COMPOSITE SYSTEMS AND A LIMIT ON THE VIOLATION OF THE PAULI PRINCIPLE FOR NUCLEONS, with R.C. Hilborn, hep-th/9903020, Phys. Rev. Lett. 83, 4460-4463 (1999).

STUDY OF A MODEL OF QUANTUM ELECTRODYNAMICS, hep-th/0002201, Foundations of Physics 30, 383-391 (2000), (special issue in honor of K. Haller).

QUONS IN RELATIVISTIC THEORIES MUST BE BOSONS OR FERMIONS, with Chi-Keung Chow, hep-th/0011150, Phys. Lett. A 283, 20-24 (2001).

CONSTRUCTION OF BOSONS AND FERMIONS OUT OF QUONS, hep-th/0107058, with J.D. Delgado, Phys. Lett. A 288, 139-144 (2001).

CPT VIOLATION IMPLIES VIOLATION OF LORENTZ INVARIANCE, hep-ph/0201258, Phys. Rev . Lett. 89, 231602-1 to 231602-4 (2002).

HYBRID DIRAC FIELDS, hep-ph/0305276, Phys. Lett. B 567, 179-183 (2003).

2. Instrumentation or techniques – none

3. Review papers

COLOR MODELS OF HADRONS, with C. A. Nelson, Physics Reports 32C, 69-121 (1977).

QUARKS, Ann. Rev. Nucl. Part. Sci. 28, 327-386 (1978).

RESOURCE LETTER $Q - 1$: QUARKS, Am. J. Phys. 50, 1074-1089 (l982).

A NEW LEVEL OF STRUCTURE? COMPOSITENESS OF PARTICLES IN THE STAN-
DARD MODEL, Physics Today 38, No. 9, 22-30 (1985); reprinted in Japanese trans-
lation in Parity 1, No. 3, 18-29 (1986); and to be reprinted in Russian translation in
Fizika za Rubezhom '87, A Series.

QUARKS (theory) in 7th edition of the McGraw-Hill Encyclopedia of Science and Technol-
ogy, 623-626.

ELECTROWEAK INTERACTION to appear in 7th edition of the McGraw-Hill Encyclo-
pedia of Science and Technology

STANDARD MODEL to appear in 7th edition of the McGraw-Hill Encyclopedia of Science
and Technology

revision of QUARKS (theory) to appear in 8th edition of the McGraw-Hill Encyclopedia of
Science and Technology.

FROM WIGNER'S SUPERMULTIPLET THEORY TO QUANTUM CHROMODYNAM-
ICS. MDDP-PP-03-028, Dec 2002. 16pp., hep-ph/0212174. To appear in the proceed-
ings of Wigner Centennial Conference in Commemoration of the 100th year of Wigner's
Birth, Hungary, Pecs, Hungary, 7-12 Jul 2002.

4. Teaching and miscellaneous

GROUP THEORETICAL METHODS IN ELEMENTARY PARTICLE PHYSICS (with E.
P. Wigner), Physics Today 16, 62-64 (1963).

THE QUEST FOR THE ELEMENTARY PARTICLES OF MATTER, American Scientist
76, 361-363 (1988).

A TESTING TIME FOR BOSONS, Physics World 9, No. 7, 27 (1996).

Book reviews

TECHNIQUES AND APPLICATIONS OF PATH INTEGRATION, by Lawrence S. Schul-
man, in J. of Stat. Phys. 27, 827 (1982).

POINTLIKE STRUCTURES INSIDE AND OUTSIDE HADRONS, ed. A. Zichichi, in
Amer. Sci. 70, 638 (l982).

LEPTONS, HADRONS AND NUCLEI, by Florian Scheck, Foundations of Physics, 16,
1227-1228 (1986).

THE QUANTUM UNIVERSE, by T. Hey and P. Walters, Science 238, 558 (1987).

GROUP THEORY IN PHYSICS, AN INTRODUCTION TO SYMMETRY PRINCIPLES, GROUP REPRESENTATIONS, AND SPECIAL FUNCTIONS IN CLASSICAL AND QUANTUM PHYSICS, by W.-K. Tung, Foundations of Physics 18, 489-490 (1988).

QUANTUM FIELD THEORY AND PARASTATISTICS, by Y. Ohnuki and S. Kamefuchi, Foundations of Physics 19, 229-230 (1989).

INWARD BOUND by A. Pais, Foundations of Physics Letters 1, 97-100 (1988).

SYMMETRIES IN PHYSICS, by W. Ludwig and C. Falter, in American Scientist, July 1989.

ASPECTS OF SYMMETRY, by S. Coleman, Foundations of Physics 19, 787-788 (1989).

AN OLD MAN'S TOY, by A. Zee and TURBULENT MIRROR, by J. Briggs and F.D. Peat, Washington Post Book World, **XIX,** No. 30, p6; Sunday, July 23, 1989. (Reprinted in the International Herald Tribune, August 1989.)

PRINCIPLES OF STRING THEORY, by Lars Brink and Marc Henneaux; INTRODUCTION TO SUPERSTRINGS, by Michio Kaku; GAUGE FIELDS AND STRINGS, by A.M. Polyakov; INTRODUCTION TO STRING FIELD THEORY, By Warren Siegel. (to appear in Foundations of Physics)

QUANTUM FIELD THEORY by Lowell S. Brown and QUANTUM FIELD THEORY *A MODERN INTRODUCTION* by Michio Kaku, Physics Today **47**, No. 2, 104-106 (1994).

THE QUANTUM THEORY OF FIELDS, VOLUME I FOUNDATIONS by Steven Weinberg, Physics Today **48**, No. 11, 78 (1995).

THE QUANTUM THEORY OF FIELDS, VOLUME II MODERN APPLICATIONS by Steven Weinberg, Physics Today **50**, No. 1, 67-68 (1997).

THE QUANTUM THEORY OF FIELDS, VOLUME III SUPERSYMMETRY by Steven Weinberg, Foundations of Physics **30**, 1131-1133 (2000).

A TALE OF TWO CONTINENTS by Abraham Pais, pp1-2, to appear in Foundations of Physics.

SPIN IN PARTICLE PHYSICS by Elliot Leader, Physics Today **55**, No. 9, 63-64 (2002).

QUANTUM FIELD THEORY IN A NUTSHELL by Anthony Zee, to appear in Foundations of Physics.

B. Papers presented at scientific meetings

1. Invited papers

TOPICS IN HIGH ENERGY SCATTERING THEORY, 1962 Istanbul NATO Advanced Study Institute. (See article in C)

PARASTATISTICS: AXIOMATIC FORMULATION, CONNECTION WITH SPIN AND TCP THEOREM FOR A GENERAL FIELD THEORY, with G. F. Dell'Antonio and E.C.G. Sudarshan, 1962 Istanbul NATO Advanced Study Institute. (See article in C)

PARAFIELD THEORY, Conference on Mathematical Theory of Elementary Particles, at Endicott House, MIT, 1965. (See article in C)

SATURATION IN TRIPLET MODELS OF HADRONS, Colloques Internationaux du Centre National de la Recherche Scientifique, Gif-sur-Yvette, 1966. (See article in A.1)

QUARK MODELS OF BARYON RESONANCES, American Physical Society meeting in Washington, D.C., April, 1967. (See article in E)

SU(3)" EXCITATION IN BARYON RESONANCES, with C. A. Nelson, Fifth Coral Gables Conference, January, 1968. (See article in C)

RESONANCE MODELS, Rapporteur's review, Lund International Conference on Elementary Particles, 1969. (See article in C)

e^+e^- REACTIONS-THEORY, Division of Particles and Fields Meeting, College of William and Mary, September 1974. (See article in C)

DIFFRACTIVE LEPTON SCATTERING AND CONSTANT $\sigma(e^+e^- \to$ HADRONS), Seminar on Quark-Parton Model, Soviet Academy of Sciences, Moscow, 1974. (See article in A.1)

ELECTRON-POSITRON ANNIHILATION TO HADRONS AND COLOR SYMMETRIES OF ELEMENTARY PARTICLES, OR THE OUTLOOK FOR COLOR: GRAY OR ROSY?, Second Orbis Scientiae at the University of Miami, Coral Gables, Florida, 1975. (See article in C)

UNBOUND COLOR, PREFACED BY REMARKS ON BARYON SPECTROSCOPY, XIIth Rencontre de Moriond, 1977. (See article in C)

COLOR VAN DER WAALS FORCES?, Orbis Scientiae 1980 at the University of Miami, Coral Gables, Florida, 1980. (See article in C)

QUARK CONFINEMENT AND HADRON SEPARATION, with J. Hietarinta, XVII Winter School of Theoretical Physics in Karpacz, University of Wroclaw, 1980. (See article in C)

THE COLOR DEGREE OF FREEDOM IN ELEMENTARY PARTICLE PHYSICS, XVII Winter School of Theoretical Physics in Karpacz, University of Wroclaw, 1980.

A QUANTUM STRUCTUREDYNAMIC MODEL OF QUARKS, LEPTONS, WEAK VECTOR BOSONS, AND HIGGS MESONS, XX International Conference on High Energy Physics, University of Wisconsin at Madison, 1980. (See article in C)

COMPOSITE MODELS OF QUARKS AND LEPTONS WITH WEAK AND STRONG INTERACTIONS ON A PARALLEL FOOTING, with J. Sucher, Conference on Weak

Interactions as Probes of Unification, Virginia Polytechnique Institute and University, 1980. (See article in C)

THE NEXT LAYER ON THE ONION?: COMPOSITE MODELS OF QUARKS AND LEPTONS, Symposium on Grand Unified Theories and Cosmology at meeting of the AAAS, Washington, D.C., January, 1982.

THE NEXT LAYER OF THE ONION?: COMPOSITE MODELS OF QUARKS AND LEPTONS, at Session on Composite Models of Quarks and Leptons, Orbis Scientiae 1982, University of Miami, January, 1982. (See article in C)

THE N-QUANTUM APPROXIMATION, CONCRETE COMPOSITE MODELS OF QUARKS AND LEPTONS, AND PROBLEMS WITH THE NORMALIZATION OF ZERO-MASS BOUND STATES, at Session on Composite Models of Quarks and 1982, University of Miami, January, 1982. (See article in C)

COMPOSITE MODELS OF QUARKS AND LEPTONS, 21st Eastern Theoretical Physics Conference, University of Delaware, October, l982.

LOCALLY GAUGE-INVARIANT FORMULATION OF PARASTATISTICS, with K. Macrae, Workshop on Non-Perturbative Quantum Chromodynamics, Oklahoma State University, March, l983. (See article in C)

NAMBU-GOLDSTONE FERMIONS AND COMPOSITE MODELS OF QUARKS AND LEPTONS, Workshop on Composite Models of Quarks and Leptons, Virginia Polytechnic Institute and State University, Blacksburg, Virginia, September, l983.

PATTERNS OF NAMBU-GOLDSTONE FERMIONS, Workshop on Composite Models of Quarks and Leptons, Virginia Polytechnic Institute and State University, Blacksburg, Virginia, September, l983.

NAMBU-GOLDSTONE FERMIONS AND COMPOSITE MODELS OF QUARKS AND LEPTONS, WORKSHOP ON COMPOSITE MODELS OF QUARKS AND LEPTONS, Erice, April, 1984.

A NEW LEVEL OF STRUCTURE. COMPOSITENESS OF PARTICLES IN THE STANDARD MODEL, Workshop on Composite Models of Quarks and Leptons, University of California at Irvine, November, 1984.

N-QUANTUM APPROACH TO DYNAMICAL SYMMETRY BREAKING AND COMMENTS ABOUT THE ORIGIN OF FAMILIES, Nambu Symposium, University of Chicago, January, 1986. (See article in 1.)

ON THE SURPRISING RIGIDITY OF THE PAULI EXCLUSION PRINCIPLE, International Symposium on Spacetime Symmetries, University of Maryland, May, 1988. (See article in 1.)

Q-MUTATORS AND VIOLATIONS OF STATISTICS, Spring Workshop on Quantum Groups, Argonne National Laboratory, May 1990. (See article in C.)

QUONS, A NEW INTERPOLATION BETWEEN BOSONS AND FERMIONS, Nordita Workshop on Anyons, University of Stockholm, May 1991.

SMALL VIOLATIONS OF PARTICLE STATISTICS, First International Andrei D. Sakharov Conference on Physics, Lebedev Institute, Moscow, May 1991. (See article in C.)

COLOR: FROM BARYON SPECTROSCOPY TO QCD, Baryons '92, International Conference on the Structure of Baryons and Related Mesons, Yale University, New Haven, June 1992. (See article in C.)

QUONS, AN INTERPOLATION BETWEEN BOSE AND FERMI OSCILLATORS, Workshop on Harmonic Oscillators, University of Maryland, March, 1992. (See article in C)

(PARA)BOSONS, (PARA)FERMIONS, ANYONS, QUONS AND OTHER BEASTS IN THE MENA-
GERIE OF PARTICLE STATISTICS, Symposium on Fundamental Aspects of Quantum Theory in Honor of Yakir Aharonov, University of South Carolina, December 1992, (See article in C).

QUON ALGEBRA, Symposium on The Beauty of Physics in Honor of Ralph Amado, University of Pennsylvania, January, 1993.

VIRTUES OF THE HAAG EXPANSION IN QUANTUM FIELD THEORY, Fourth Meeting on Light Cone Quantization and Non-Perturbative Dynamics, Workshop on Light Front Physics, University of Washington, June 17, 1994.

VIRTUES OF THE HAAG EXPANSION IN QUANTUM FIELD THEORY, University of Maryland Preprint 95-99, pp1-28, First Arctic Workshop on Future Physics and Accelerators, Saariselka, Finland, August, 1994, (See article in C).

RELATIVISTIC BOUND STATES, Fourth Meeting on Light Cone Quantization and Non-Perturbative Dynamics, Workshop on Light Front Physics, Telluride, August 22, 1995. (See article in C).

A NEW VARIATIONAL PRINCIPLE FOR QUANTUM FIELD THEORY, Eighth International Workshop on Light Cone QCD and Non-Perturbative Hadronic Physics, Lutsen, August 22, 1997. (See article in C).

THE RELATION OF SPIN, STATISTICS, LOCALITY AND TCP, Orbis Scientiae 1997 II:Physics of Mass, Miami, December, 1997. (See article in C).

SMALL VIOLATIONS OF STATISTICS, Orbis Scientiae, 1998, Ft. Lauderdale, December 20, 1998, quant-ph/9903069. (See article in C).

THEORIES OF VIOLATION OF STATISTICS, International Conference on the Spin-Statistics Connection and Commutation Relations: Experimental Tests and Theoretical Implications, Capri, Italy, May 31, 2000. (See article in C).

FROM WIGNER'S SUPERMULTIPLET THEORY TO QUANTUM CHROMODYNAM-
ICS, Wigner Centennial Conference, Pecs, Hungary, July 9, 2002. (See article in C).

CPT, LORENTZ INVARIANCE, LOCALITY AND RELATED ISSUES, 8th International
Wigner Symposium, New York, May 29, 2003. (Article in preparation.)

2. Contributed papers

RE-EXAMINATION OF NEUTRINO THEORY OF LIGHT, with A. S. Wightman, Ab-
stract, Phys. Rev. 99, 675 A (1955).

THE ASYMPTOTIC CONDITION IN QUANTUM FIELD THEORY, Abstract, Bull. Am.
Phys. Soc. 2, 190 (1957). (See thesis in E)

CLOTHED PARTICLE OPERATORS IN SIMPLE MODELS OF QUANTUM FIELD
THEORY, with S.S. Schweber, Abstract, Bull. Am. Phys. Soc. 3, 10 (1958). (See
article in A.1)

DIFFUSION EFFECTS ON SHOCK STRUCTURE IN A PLASMA, with H.K. Sen and
Y.M. Treve, Third Annual Shock Tube Symposium, Fort Monroe, Va., (1959). (See
article in C)

PROOF OF HAAG'S THEOREM, Abstract, Bull. Am. Phys. Soc. 4, 280 (1959). (See
article in A.1)

CHARGE SEPARATION EFFECTS ON SHOCK STRUCTURE IN PLASMA, with H.K.
Sen and Y.M. Treve, Fourth International Conference on Ionization Phenomena in
Gases, Uppsala, (1959). (See article in C)

GENERALIZED FREE FIELDS AND MODELS OF LOCAL FIELD THEORY, Abstract,
Bull. Am. Phys. Soc. 6, 306 (1961). (See article in A.1)

N-QUANTUM APPROXIMATION IN THE A^4 THEORY, Abstract, with D. G. Currie,
Bull. Am. Phys. Soc. 9, 449 (1964).

INTRODUCTION TO THE N-QUANTUM APPROXIMATION IN QUANTUM FIELD
THEORY, Abstract, Bull. Am. Phys. Soc. 9, 448 (1964). (See article in A.1)

N-QUANTUM DESCRIPTION OF BOUND STATES IN QUANTUM FIELD THEORY,
Abstract, Bull. Am. Phys. Soc. 10, 484 (1965). (See article in A.1)

STRING-BREAKING DESCRIPTION OF THE BARYON-MESON INTERACTION, Ab-
stract, with R.J. Perry and R. D. Smith. Bull. Am. Phys. Soc. Amherst Meeting Oct.
14-16 (1982).

Q-MUTATORS ALLOW SMALL VIOLATION OF THE EXCLUSION PRINCIPLE, Ab-
stract, Bull. Am. Phys. Soc. 35, 981 (1990).

C. Books or contributions to edited books

HAAG'S THEOREM AND CLOTHED OPERATORS, (See article in A.1),

DIFFUSION EFFECTS ON SHOCK STRUCTURE IN A PLASMA, with H. K. Sen and Y.M. Treve, Proc. Fourth AFBMD/STL Symposium: Advances in Ballistic Missle Technology, Vol. 2, pp. 358-373, ed. C. T. Morrow, D. P. LeGalley, and L.D. Ely (Pergamon Press, Oxford, 1961).

CHARGE SEPARATION EFFECTS ON SHOCK STRUCTURE IN A PLASMA, with H.K. Sen and Y.M. Treve, Proc. Fourth International Conference on Ionization Phenomena in Gases, IV D, pp. 1098-1104 (North Holland Publishing Co., Amsterdam, 1960).

SPIN AND UNITARY-SPIN INDEPENDENCE IN A PARAQUARK MODEL OF BARY-ONS AND MESONS, (See article in A.1), reprinted in The Quark Model, pp. 122-126, ed. J. J. J. Kokkedee (Benjamin, New York, 1969); in Selected Papers in Physics, Vol. 25; Elementary Particle Models, pp. 154-158, ed, S. Tanaka and S. Ishida (Physical Society of Japan, Tokyo, 1975); in Developments in the Quark Theory of Hadrons, pp. 102-106, ed. D.B. Lichtenberg and S.P. Rosen (Hadronic Press, Nonantum, 1980); in Selected Papers on Gauge Theories of Fundamental Interactions, pp.311-315, ed. R.N. Mohapatra and C.H. Lai (World Scientific, Singapore, l981). and in Quarks, Selected Reprints, pp. 1-156, ed O. W. Greenberg (American Association of Physics Teachers, McGregor and Warner, Washington, D.C., 1986).

TOPICS IN HIGH ENERGY SCATTERING THEORY, in Group Theoretical Concepts and Methods in Elementary Particle Physics, pp. 107-134, ed. F. Gürsey (Gordon and Breach, New York, 1964).

PARASTATISTICS: AXIOMATIC FORMULATION, CONNECTION WITH SPIN AND STATISTICS AND TCP THEOREM FOR A GENERAL FIELD THEORY (with G.F. Dell'Antonio and E.C.G. Sudarshan), in Group Theoretical Concepts and Methods in Elementary Particle Physics, pp. 403-408, ed. F. Gürsey, (Gordon and Breach, New York, 1964).

COUPLING OF INTERNAL AND SPACE-TIME SYMMETRIES, (See article in A.1), reprinted in Symmetry Groups in Nuclear and Particle Physics, pp. 246-249, ed. F. J. Dyson (W. A. Benjamin, Inc., New York, 1966).

PARAFIELD THEORY, in Mathematical Theory of Elementary Particles, pp. 26-44, ed. R. Goodman and I. Segal (Massachusetts Institute of Technology Press, Cambridge, 1966).

SATURATION IN TRIPLET MODELS OF HADRONS, with D. Zwanziger, (See article in A.1), reprinted in L'Extension du Groupe de Poincaré aux Symétries Internes des Particules Elementaires ,pp. 61-70, ed. L. Michel and J.-P. Vigier, (CNRS, Paris, 1968); and in The Quark Model, pp. 143-146, ed. J. J. J. Kokkedee (W. A. Benjamin, Inc., New York, 1969).

THE SYMMETRIC QUARK MODEL OF BARYON RESONANCES, with M. Resnikoff, Phys. Rev. 163, 1844-1851 (1967), reprinted in Quarks, Selected Reprints, pp. 1-

156, ed O. W. Greenberg (American Association of Physics Teachers, McGregor and Warner, Washington, D.C., 1986).

SU(3)"-EXCITATION IN BARYON RESONANCES, with C. A. Nelson, (see article in A.1), in Symmetry Principles at High Energy, pp. 225-234, ed. A. Perlmutter, C. A. Hurst, and B. Kursunoglu (W. A. Benjamin, Inc., New York, 1968).

RESONANCE MODELS, Rapporteur's Review, in Proceedings of the Lund International Conference on Elementary Particles, pp. 387-409, ed. G. von Dardel (Berlingska Boktryckeriet, Lund, 1969).

e^+e^--REACTIONS-THEORY, in Particles and Fields - 1974, AIP Conference Proc., No. 23, pp. 409-436, ed. C.E. Carlson (American Institute of Physics, New York, 1975).

ELECTRON-POSITRON ANNIHILATION TO HADRONS AND COLOR SYMMETRIES OF ELEMENTARY PARTICLES OR THE OUTLOOK FOR COLOR: GRAY OR ROSY, in Theories and Experiments in High-Energy Physics, Studies in the Natural Sciences, Volume 9, pp. 71-114, ed. A. Perlmutter and S. M. Widmayer (Plenum Press, New York, 1975).

BOSE-EINSTEIN STATISTICS, in Encyclopedia of Physics, ed. R. G. Lerner and G.L. Trigg (Addison-Wesley, Reading, 1981), pp. 87-88; revised version, 1988, to be published by VCH Publishers, Inc., in press.

UNBOUND COLOR, PREFACED BY REMARKS ON BARYON SPECTROSCOPY, in Color Symmetry and Quark Confinement, Proc. Twelfth Rencontre de Moriond, Vol. III, pp 51-73, ed. J. Tran Thanh Van (Institute National de Physique Nucleaire et de Physique des Particules and Commissariat a l'Energie Atomique, Orsay, 1977).

QUARKS, (See article in A.3)

MERCER STREET (poem), in "Mercer Street and Other Memories," gathered by John Archibald Wheeler, in Albert Einstein 1879-1979, ed. P. C. Aichelburg and R. U. Sexl (Vieweg-Verlag, Vienna, 1979); and in Albert Einstein's Theory of General Relativity, ed. G. E. Tauber (Crown, New York, 1979), p. 186.

COLOR VAN DER WAALS FORCES?, in Recent Developments in High Energy Physics, ed. A. Perlmutter and L. F. Scott (Plenum, New York, 1980), pp. 67-86.

QUANTUM STRUCTUREDYNAMIC MODEL OF QUARKS, LEPTONS, WEAK VECTOR BOSONS, AND HIGGS MESONS, with J. Sucher, Phys. Lett. 99B, 339-343 (1981), reprinted in Quarks, Selected Reprints, pp. 1-156, ed O. W. Greenberg (American Association of Physics Teachers, McGregor and Warner, Washington, D.C., 1986).

A QUANTUM STRUCTUREDYNAMIC MODEL OF QUARKS, LEPTONS, WEAK VECTOR BOSONS, AND HIGGS MESONS, with J. Sucher, in High-Energy Physics-1980, Part I (American Institute of Physics, New York, 1981), ed. L. Durand and L.G. Pondrum, pp. 531-535.

COMPOSITE MODELS OF QUARKS AND LEPTONS WITH WEAK AND STRONG INTERACTIONS ON A PARALLEL FOOTING, with J. Sucher, in Weak Interactions as Probes of Unification, ed. G. B. Collins, L. N. Chang, and J. R. Ficenec, (American Institute of Physics, New York, 1981), pp. 564-573.

COMMENTS AND SPECULATIONS (Contribution to Audience Discussion), in Weak Interactions as Probes of Unification, ed. G. B. Collins, L. N. Chang and J. R. Ficenec, (American Institute of Physics, New York, 1981), p. 681.

QUARK CONFINEMENT AND HADRON SEPARATION, with J. Hietarinta, in Developments in the Theory of Fundamental Interactions, ed. L. Turko and A. Pekalski, (Harwood Academic Publishers, Chur, Switzerland, l98l), pp. 411-450.

RESOURCE LETTER $Q-1$: QUARKS, Am. J. Phys. 50, 1074-1089 (l982), reprinted in Quarks, Selected Reprints, pp. 1-156, ed O. W. Greenberg (American Association of Physics Teachers, McGregor and Warner, Washington, D.C., 1986).

THE NEXT LAYER OF THE ONION? COMPOSITE MODELS OF QUARKS AND LEPTONS, in Field Theory in Elementary Particles, ed. A. Perlmutter, (Plenum, New York, 1983), pp. 333-347.

THE N-QUANTUM APPROXIMATION, CONCRETE COMPOSITE MODELS OF QUARKS AND LEPTONS, AND PROBLEMS WITH THE NORMALIZATION OF ZERO-MASS BOUND STATES, in Field Theory in Elementary Particles, ed. A. Perlmutter, (Plenum, New York, l983), pp. 379-391.

LOCALLY GAUGE-INVARIANT FORMULATION OF PARASTATISTICS, with K. I. Macrae, in Workshop on Non-Perturbative Quantum Chromodynamics, ed. K.A. Milton and M.A. Samuel, (Birkhauser, Boston, l983), pp. 181-190.

QUARKS (theory), for 6th edition of McGraw-Hill Encyclopedia of Science and Technology

QUARKS, SELECTED REPRINTS, pp. 1-156, ed O. W. Greenberg (American Association of Physics Teachers, McGregor and Warner, Washington, D.C., 1986).

ON THE SURPRISING RIGIDITY OF THE PAULI EXCLUSION PRINCIPLE, in Spacetime Symmetries, Proc. International Symposium on Spacetime Symmetries, ed. Y.S. Kim and W.W. Zachary, (North-Holland, Amsterdam, 1989), pp. 83-89. (See article in 1.)

Q-MUTATORS AND VIOLATIONS OF STATISTICS, in Proc. Argonne Workshop on Quantum Groups, Argonne, ed. T. Curtright, D. Fairlie and C. Zachos, (World Scientific, Singapore, 1991), pp 166-180.

SMALL VIOLATIONS OF PARTICLE STATISTICS, in Proc. First International Andrei D. Sakharov Conference on Physics, ed. Man'ko, (Nova Science Publisher, 1991), pp 29-38.

COLOR: FROM BARYON SPECTROSCOPY TO QCD, hep-ph/9301207, in Baryons '92, International Conference on the Structure of Baryons and Related Mesons, ed. M. Gai, (World Scientific, Singapore, 1993), pp 130-139.

QUONS, AN INTERPOLATION BETWEEN BOSE AND FERMI OSCILLATORS, cond-mat/9301002, in Workshop on Harmonic Oscillators, NASA Conference Publication 3197, ed. D. Han, Y.S. Kim and W.W. Zachary (National Aeronautics and Space Administration, Greenbelt, 1993), pp 5-18.

(PARA)BOSONS, (PARA)FERMIONS, QUONS AND OTHER BEASTS IN THE MENAGERIE OF PARTICLE STATISTICS, with D.M. Greenberger and T.V. Greenbergest, hep-ph/9306225, in Quantum Coherence and Reality, eds. J.S. Anandan and J.L. Safko, (World Scientific, Singapore, 1994), pp 301-312.

VIRTUES OF THE HAAG EXPANSION IN QUANTUM FIELD THEORY, hep-ph/9502253 in Proc. of the First Arctic Workshop on Future Physics and Accelerators, eds. M. Chaichian, K. Huitu and R. Orava, (World Scientific, Singapore, 1995), pp 498-520.

THE RELATION OF SPIN, STATISTICS, LOCALITY AND TCP, Orbis Scientiae, II, 1997, in *Physics of Mass*, ed. B. N. Kursunoglu, S. Mintz, and A. Perlmutter (Plenum Press, New York, 1999).

SMALL VIOLATIONS OF STATISTICS, Orbis Scientiae, 1998, in *Confluence of Cosmology, Massive Neutrinos, Elementary Particles, and Gravitation*, ed. B. Kursunoglu, S. Mintz and A. Perlmutter (Plenum Press, New York, 1999), pp 173-194, quant-ph/9903069.

THEORIES OF VIOLATION OF STATISTICS, in *Spin-Statistics Connection and Commutation Relations*, ed. R.C. Hilborn and G.M. Tino (American Institute of Physics, Melville, New York, 2000), pp 113-127, hep/th.0007054.

FROM WIGNER'S SUPERMULTIPLET THEORY TO QUANTUM CHROMODYNAMICS, MDDP-PP-03-028, Dec 2002. 16pp., hep-ph/0212174. Proceedings of Wigner Centennial Conference in Commemoration of the 100th year of Wigner's Birth in Hungary, Pecs, Hungary, 7-12 Jul 2002; to appear in Acta Physica Hungarica - Heavy Ion Physics series.

D. Articles in preparation or submitted for publication

THE N-QUANTUM APPROACH TO THE HYDROGEN ATOM, (pedogogical paper), draft of 9 pages exists.

VARIATIONAL CALCULATION OF THE FIELD ATTACHED TO A CHARGE, draft of 13 pages exists.

WHY IS CPT FUNDAMENTAL?, draft of 7 pages exits.

E. Technical Reports (not published elsewhere)

Thesis: THE ASYMPTOTIC CONDITION IN QUANTUM FIELD THEORY, Princeton (1956), pp. 1-198, supervising professor, A.S. Wightman (unpublished).

INTRODUCTORY LECTURES IN SCATTERING THEORY, pp. 1-75, U. of Md.,Phys. Dept., Tech. Report 243 (1962).

INTRODUCTORY LECTURES ON RELATIVISTIC WAVE EQUATIONS, pp. 1-38, U. of Md., Phys. Dept. (1963).

QUARK MODELS OF BARYON RESONANCES, U. of Md. Tech. Report No. 680, pp. 1-23 (1967).

A SCHEMATIC MODEL OF LEPTONS AND ITS POSSIBLE RELATION TO HADRONS, pp. 1-9, with C.A. Nelson, Univ. of Md. Tech. Report No. 74-006 (1973).

SINGLE-PARTICLE INCLUSIVE DISTRIBUTIONS IN ELECTRON-POSITRON ANNIHILATION NOT DUE TO THE ONE-PHOTON GRAPH, pp. 1-17, with G. B. Yodh, Univ. of Md. Tech. Report No. 74-109 (1974).

ABSENCE OF COLOR VAN DER WAALS FORCES, NON-ASSOCIATIVITY, AND THE LARGE-N LIMIT OF SU(N) THEORIES, University of Maryland Technical Report No. 80-027 (1979), pp. 1-10.