

Curriculum Vita: Richard E. Berg



I. Education

B.S., Music, Physics Manchester College (Indiana), 1960
M.S., Physics Michigan State University, 1963
Thesis: Magnetic Coil Design for a Superconducting Air-Cored 40 MeV Cyclotron
Ph.D., Physics Michigan State University, 1966
Thesis: Precise Methods for Pre-Calculation of Cyclotron Control Settings

II. Positions Held

1960-1965 Graduate Research Assistant, Cyclotron Laboratory, Physics Department,
Michigan State University
1965-1966 NSF Graduate Fellow, Michigan State University
1966-1972 Assistant Professor, Physics Department, University of Maryland
1972- Director, Lecture-Demonstration Facility, Physics Department,
University of Maryland

III. M.S. Thesis Supervised

1969 John Bird: Multi-Channel Non-Intercepting Phase Probe for the
University of Maryland Cyclotron.

IV. Work Summary

1960-1966 Theoretical and experimental work on development of the Michigan
State University 45 MeV sector-focused cyclotron; nuclear physics
experimentation
1965-1966 Teaching assistant for undergraduate physics courses, including general
physics, acoustics, and optics
1966-1969 Taught Graduate Laboratory including development of experiments
for nuclear physics and radioactive materials and modernization of
nuclear physics apparatus.
1966- Taught introductory courses in Physics for pre-professional students
(PHYS 121-122), Engineering Physics (PHYS 161, 262, 263), Light
and Color (PHYS 106) and Physics of Music (PHYS 102), as well as
labs for these courses.
1966-1972 Supervising design and construction of the external beam transport
system for the University of Maryland 140 MeV sector-focused

- cyclotron, including scheduling, equipment design and procurement, and supervision of technical staff (\$400,000).
- 1972-1980 Coordinating experimentation for outside users of the University of Maryland Cyclotron Laboratory facilities, development and fabrication of solid state detector laboratory for the cyclotron; supervised design and construction of equipment for use by outside users.
- 1972- Director of the Physics Lecture-Demonstration Facility at the University of Maryland, supervising activities at the Facility, including: delivery of demonstrations and other teaching materials to physics classes; developing new demonstration equipment; design and installation of permanent support facilities, including audiovisual, computer, and other support equipment.
- 1972- Provided **physics demonstration programs** regularly to elementary, middle and high schools.
- 1972- Initiated and taught course **Physics of Music** at the University of Maryland; co-authored textbook **The Physics of Sound**, published by Prentice-Hall in 1982, second edition 1995; produced four-hour set of videotapes **Demonstrations in Acoustics** in 1981, initiated **Physics of Music Laboratory** and authored the manual in 1985.
- 1977- Presented **workshops** and demonstration programs for teacher groups, including several at Maryland Association of Science Teachers and other professional teachers' groups.
- 1982- Initiated and have presented series of public physics demonstration programs **Physics is Phun**, drawing approximately 5000 guests per year to the University. Twelve of these programs have been videotaped and regularly presented on the University of Maryland cable TV "Flagship Channel."
- 1984-1998 **Educational consultant** for the **National Geographic Society** for the books: How Things Work," "Why in the World," and "Fun with Physics," the column "Why in the World" in the monthly National Geographic World magazine, and the "Alexander Graham Bell Science Kit."
- 1986-1988 **Educational consultant** for the **World of Chemistry** videotape series, supported by the Annenberg Foundation and produced at the University of Maryland College Park.
- 1988-1994 Author and editor of **physics demonstration column** for the Physics Instructional Resource Association monthly newsletter.

- 1994- Initiated and have offered yearly honors college course **HONR228Q: Nuclear Physics and Society**, in which concepts of atomic and nuclear physics are studied and applied to contemporary issues such as nuclear power, radon gas, and useful applications of nuclear radiation.
- 1996-2001 Developed and maintained the **demonstration web site** for the Physics Department Lecture-Demonstration Facility. This site, containing over 1500 demonstration descriptions with color pictures along with information on classroom use of these demonstrations and an on-line sign-up system, is the most extensive such web site in the world.
- 1998- Coordinated University of Maryland **Physics Olympics**, hosting over 30 high school physics teams at the University of Maryland Physics Department each spring.
- 1999- Developed and maintained the **Physics Olympics web site** for the University of Maryland College Park.
- 2000- Initiated and maintained web site **Physics Question of the Week**, with an average of over 300 visitors per week since its inception.

V. Professional Honors

- 1981- Highest evaluation for Lecture-Demonstration Facility of all University of Maryland Physics Department functions in the Summary of Program Review Committee Survey Results, April 1, 1981.
- 1986- Award for **Outstanding Contributions as an Associate Staff Member**, Faculty and Associate Staff Convocation, October 1986.
- 1991 **Feature article** on Physics is Phun in **College Park - University of Maryland Alumni Magazine**, Spring 1991
- 1991- **Invited main speaker, Second Inter-American Conference on Teaching of Physics**, Caracas, Venezuela.
- 1991- **Guest demonstrator** on the "Knoff Hoff" Show for German Public Television.
- 1993- **Award of Excellence** for outstanding contributions in bringing science to the general public, from the Prince George's Community College, Science and Technology Resource Center, November 1993.

- 1993- **Presidential Award for Outstanding Service to the Schools**, University of Maryland, College Park Campus, May 1993.
- 1995- **Distinguished Program Award** for the Physics is Phun program series, Maryland Association for Higher Education, October 1995.
- 2000- **Invited main speaker, Conference on Society and Physics**, Caracas, Venezuela, October 2000.
- 2000- Selected competitively as a speaker for the Maryland Humanities Council **Millennium Speakers Bureau**.
- 2001- **The Physics IQ Test**, invited speaker at the **Presidential Awards for Excellence in Mathematics and Science Teaching, Washington, D.C.**, March, 2001.
- 2001- **American Association of Physics Teachers Distinguished Service Citation** for work in the area of physics demonstrations. (Citation reprinted in American Journal of Physics 69 #9, September 2001 (935)).

VI. Contracts and Grants

- 1970 University of Maryland, College Park, General Research Board grant for development of a phase probe for the University of Maryland cyclotron.
- 1976-1981 Grants from the University of Maryland Committee on Improvement of Teaching (approximately \$1000 each):
1. Physics classroom improvement (1976).
 2. Audio graphic control system for the Physics lecture halls (1978).
 3. Videotapes of lectures on religious holidays (1979).
 4. Videotape supplement for Physics of Music course (1980).
 5. Slides and videotapes of physics department research (1981).
- 1989 Grant for purchase of Physics is Phun van from the College of Computer, Mathematical, and Physical Science and the University of Maryland Office of School/University Programs to facilitate presentation of traveling demonstration programs; over 350 off-campus presentations have been offered since 1989 (combined grant of \$15,000).
- 1990 **National Science Foundation** grant "The Video Encyclopedia of Physics Demonstrations," with Jearl Walker and video producer Bennett Glotzer, for videotape and production of a set of 25 videodiscs including 600 demonstrations covering all areas of physics (\$985,000).

Note: the Chairman of the Physics Department before its onset rejected this grant.

- 1991-1992 **Maryland Higher Education Commission** grant for teacher workshop "Acoustics for the Middle School" (\$28,000).
- 1992-1993 **Maryland Higher Education Commission** grant for teacher workshop "Optics for the Middle School" (\$34,000).
- 1992-1995 **National Science Foundation** grant "Physics for the Middle School" for four middle school teacher workshops covering mechanics, sound, light, and electricity & magnetism (\$175,000)

VII. Major Publications

- 1980- Produced, with David G. Stork, set of four hours of videotapes "**Demonstrations in Acoustics.**"
The text for these tapes has been **translated into French** at the University of Montreal.
Tape reviews by Lawrence A. Crum, Journal of the Acoustical Society of America, 71 (5), May, 1982, and by Richard W. Peterson, American Journal of Physics 49 #6 (608), June 1981.
A **paper describing use of videotapes** was presented at the AAPT 1981 Summer Meeting: S. N. Devanathan, "Use of Videotapes of Berg and Stork in the Teaching of Acoustics."
- 1981- Principal author, with David G. Stork, of book "**Physics of Sound**" published by **Prentice-Hall**.
Book reviewed by Brian Holmes, American Journal of Physics 50 #10 (953), October 1982.
- 1992- Article "Sound" published in **Encyclopaedia Britannica**.
- 1995- Second edition of book "**Physics of Sound**" published by Prentice-Hall; now in its sixth printing.

VIII. Articles in Refereed Journals

Measurement of High-Energy Gamma-Rays with GE(Li) Detectors, R. E. Berg and E. Kashy, Nuclear Instruments and Methods 39, 169 (1966).

^{36}K Decay and T=1 Analog in ^{36}Ar , R. E. Berg, J. L. Snelgrove and E. Kashy, Physical Review 153, 1165 (1967).

Theoretical and Experimental Beam Studies for the M.S.U. Cyclotron, with H. G. Blosser and M. M. Gordon, Nuclear Instruments and Methods 58, 327 (1968).

Possibilities of Forming a Compressed Electron Ring in a Static Magnetic Field, with Hogil Kim, M. P. Reiser, and G. R. Zorn, Physical Review Letters 22, 419 (1969).

Local Inertial Frame of Reference, American Journal of Physics 48, 310-312 (1980).

Bridge Crusher for Physics Olympics, The Physics Teacher 28, 400 (1990).

Bright Point Source, The Physics Teacher 27, 494 (1989).

The Feynman Inverse Sprinkler Problem: A Demonstration and Quantitative Analysis, by Richard E. Berg and Michael R. Collier, American Journal of Physics 57, 664-657 (1989).

Angular Momentum Conservation Demonstration, with Robert E. Anders, The Physics Teacher 28, 281-285 (1990).

Rotating Liquid Mirror, American Journal of Physics 58, 280-281 (1990).

Heat Wave focusing by Concave Reflectors, The Physics Teacher 28, 56-57 (1990).

Van de Graaff Generators: Theory, Maintenance, and Belt Fabrication, The Physics Teacher 28, 2181-285 (1990).

Images: A New Physics Olympics Event, The Physics Teacher 28, 400 (1990).

Traction Force on Accelerated Rolling Bodies, The Physics Teacher 28, 600-601 (1990).

The Feynman Inverse Sprinkler Problem: A Detailed Kinematic Study, by Michael R. Collier, R. A. Ferrell, and Richard E. Berg, American Journal of Physics 59, 349-355 (1991).

Wilberforce Pendulum Oscillations and Normal Modes, by Richard E. Berg and Todd S. Marshall, American Journal of Physics 59, 32-38 (1991).

Pendulum Waves: A Demonstration of Wave Motion Using Pendula, American Journal of Physics 59, 186-187 (1991). This article was chosen for inclusion in the "Every Physics Teacher's CD-ROM" Toolkit project.

Dominant Color Reversals and Chromaticity Cusps in Interferometric Color Mixing, by Thomas E. Kiess and Richard E. Berg, *American Journal of Physics* 64, 928-934 (1996).

IX. Papers Published in their Entirety in Conference Proceedings

The focusing Air-Core Magnetic Channel for the MSU 55 MeV Cyclotron, with H. G. Blosser, *IEEE Transactions on Nuclear Science* 12 #3, 392 (1965).

Control of the Michigan State University Cyclotron, with H. G. Blosser and M. M. Gordon, *IEEE Transactions on Nuclear Science* 13 #4, 394 (1966).

The University of Maryland Isochronous Cyclotron, with J. F. Bridges, K. D. Jenkins, H. Kim, M. Reiser, T. Zinneman, P. Delphin, F. Dupont, A. Dupuis, R. Jean, R. Lacazer, H. Leboutet, T. H. Johnson, and W. H. White, *IEEE Transactions on Nuclear Science* 16, 438 (1969).

Design of the Beam Transport System for the University of Maryland Cyclotron, *IEEE Transactions on Nuclear Science* 16, 442-445 (1969).

Magnet and Extraction Studies, with P. Delphin, H. Kim, and M. P. Reiser, *IEEE Transactions on Nuclear Science* 16, 446 (1969).

Theoretical Studies on the Formation and Expansion of a 23 MeV Electron Ring in a Solenoidal Magnetic Field, with H. Kim and M. P. Reiser, *IEEE Transactions on Nuclear Science* 16, 446 (1969).

Beam Transport System Optics for the University of Maryland Cyclotron, *Proceedings of the International Conference on Sector-Focused Cyclotrons and Meson Factories*, Oxford, England, (September 1969).

Multi-Channel Non-Intercepting Phase Probe for the University of Maryland Cyclotron, with J. K. Bird, *Proceedings of the International Conference on Sector-Focused Cyclotrons and Meson Factories*, Oxford, England, (September 1969).

Cross Sections for PI^0 from He^3 on Complex Nuclei, with N. S. Wall, J. N. Craig, D. Ezrow, and H. D. Holmgren, *Proceedings of the 5th International Conference on High-Energy Physics*, Nuclear Structure (1972).

Rotating Wedge Beam Degradar, *Proceedings of the International Conference on Cyclotrons and Their Applications*, Zurich, Switzerland (July 1975).

X. Internal Reports and Technical Reports

Magnetic Coil Design for a Superconducting Air-Cored 40 MeV Cyclotron, Michigan State University Cyclotron Project Internal Report MSUCP-14, August 1963 (M. S. Thesis).

Magnetic Field Measurements for the MSU Cyclotron, with H. G. Blosser and W. P. Johnson, Michigan State University Cyclotron Project Internal Report MSUCP-22, August 1966.

Precise Methods for Pre-Calculation of Cyclotron Control Settings, Michigan State University Cyclotron Project Internal Report MSUCP-24, August 1966 (Ph. D. Thesis).

Theoretical Studies on the Formation of a Compressed 25 MeV Electron Ring in a Static Magnetic Field, with H. G. Kim and M. P. Reiser, University of Maryland Department of Physics and Astronomy Technical Report No. 945, March 1969.

A Computer Program for Determination of Relativistic Electron Motion in Axially Symmetric Magnetic Fields, with M. P. Reiser, University of Maryland Department of Physics and Astronomy Technical Report No. 946, March 1969.

XI. Book and Movie Reviews

- 1978 **Gibbs Free Energy: Enthalpy and Entropy and Free Energy Curves and Binary Phase Diagrams**, Journal of College Science Teaching VIII #1, September 1978.
- 1979 **Generation of phase Diagrams from Free Energy Curves**, Journal of College Science Teaching IX #2, November 1979.
- 1980 **Powers of Ten - 1978**, Journal of College Science Teaching IX #4, March 1980.
- 1981 **Window to the Universe**, Journal of College Science Teaching X #3, January 1981.
- 1982 **The Theory of Relativity - An Introduction**, Journal of College Science Teaching XI #3, January 1982.
- 1998 **Why Toast Lands Jelly-Side Down: Zen and the Art of Physics Demonstrations**, by Robert Erlich, Physics Today, January 1998.

XII. Colloquia and Major Invited Programs

- 1972 **The Physics of Musical Sounds**, colloquium, Department of Music, University of Maryland, College Park, March 1972.
- 1972 **Particle Accelerators**, colloquium, Department of Nuclear Engineering, University of Wisconsin, Milwaukee, May 1972.
- 1974 **The University of Maryland Cyclotron**, colloquium, University of Maryland, Baltimore County, 1974.
- 1976 **The Physics of Music**, colloquium, Montgomery College, Tacoma Park Campus, May 1976.
- 1978 **Analysis of Musical Tone Quality**, colloquium, Department of Physics, University of Maryland, College Park, December 1978.
- 1989 **The Physics IQ Test, NASA Engineering Colloquium**, Goddard Space Flight Center, March 1989.
- 1994 **The Physics IQ Test**, colloquium, **Appalachian State University**, March 1994.
- 1994 **The Physics IQ Test**, special program, **Indiana University of Pennsylvania Alliance for Physics**, May 1994.
- 1994 **The Physics IQ Test**, workshop, **Delaware Teachers of Science**, Rehoboth, DE, November 1994.
- 1995 **The Physics IQ Test**, workshop, **Baltimore City Teachers Professional Day**, January 1995.
- 1995 **The Physics IQ Test**, colloquium, **Salisbury State University**, January 1995.
- 1995 **Physics is Phun, DC Science Writers Association**, October 1995.
- 1995- **The Physics IQ Test**, yearly presentation to the **New Professor Conference** sponsored by the American Association of Physics Teachers, held at the Center for Physics in College Park, MD.
- 1996 **Physics is Phun, Serene Memorial Lecture**, California University of Pennsylvania, April 1996.
- 1996 **The Physics IQ Test**, invited program at the **Ohio State University Physics Day** (for recruiting high school students to OSU) October 1996 (NOTE: The present University of Maryland Physics Department high school recruiting "Physics Day"

was modeled after the Ohio State program upon my suggestion based on this experience.)

- 1997 **The Physics IQ Test**, colloquium, **Old Dominion University**, April 1997.
- 1997 **Physics Lecture-Demonstration Facility on the World Wide Web**, special presentation to the meeting of the President's Commission on School/University Cooperative Programs, University of Maryland College Park, May 1997.
- 1997 **The Physics IQ Test**, colloquium at **Boston University**, October 1997.
- 1998 **The Physics IQ Test**, colloquium at **West Virginia University**, April 1998.
- 1999 **The Physics IQ Test**, colloquium, **Rutgers University** Physics Instructional Seminar, November 1999.
- 2001 **The Physics IQ Test**, colloquium at **State University of New York, Buffalo Campus**, May 2001.

XIII. Workshops

- 1977 **Physics Demonstration Workshop**, Chesapeake Section meeting of the American Association of Physics Teachers, Towson, MD, April 1977.
- 1979 Leader for **Videotaping Workshop**, University of Maryland, College Park, October 1979.
- 1984- Co-leader for **Physics Demonstration Workshop** sponsored by the Physics Instructional Resource Association at the summer meeting of the American Association of Physics Teachers (1984-1994).
- 1984 **Physics Demonstration Workshop**, Baltimore County high school teachers, March 1984.
- 1989 **Physics Demonstration Workshop**, Fairfax county, Virginia, middle schools, January 1989.
- 1989 **Physics Demonstration Workshop**, Prince George's County, MD, Elementary Science Coordinators Meeting, January 1989
- 1989 **Physics Demonstration Workshop**, Maryland Association of Science Teachers K-8 Science Conference, April 1989.
- 1989 **The Physics IQ Test, NASA Educational Workshop** for Mathematics, Science and Technology Teachers, Goddard Space Flight Center, June 1989.

- 1989 **The Physics IQ Test**, workshop, The Quest for Excellence in Science Teaching, Colonial School District, New Castle, DE, June 1989.
- 1989 **Physical Science**, workshop for elementary science and mathematics teachers, Governor's Academy for Science, Mathematics, and Technology, University of Maryland, Baltimore County, June 1989.
- 1989 **Physics is Phun**, workshop for secondary science teachers, Governor's Academy for Science, Mathematics, and Technology, University of Maryland, Baltimore County, June 1989.
- 1990 **Physics Demonstration Workshop, Cecil County (MD)** Professional Inservice Day, March 1990.
- 1990 **The Physics IQ Test, NASA Educational Workshop** for Mathematics, Science and Technology Teachers, Goddard Space Flight Center, June 1990.
- 1991 **The Physics IQ Test**, workshop, Delaware Science Teachers Association, Rehoboth, DE, February 1991.
- 1991 **The Physics IQ Test**, workshop for science teachers, Montgomery County, MD, December 1991.
- 1992 **Physics Demonstration Workshop, Connecticut High School Physics Teachers Institute**, December 1992
- 1993 **Discrepant Events in Physics**, workshop for middle school and high school science teachers, Montgomery County, MD, July 1993.
- 1999 **Physics Teacher Workshop**, Delaware Department of Education, Rehoboth, DE, November 1999.
- 2000- Series of **workshops on topics in physical science** for the teachers of Kenmoor Middle School, Prince George's County, MD, sponsored by the University of Maryland MRSEC Program (2000-2001)

XIV. Programs for Pre-College Students

- 1972- Over **150 presentations** at various University and Departmental functions, including recruiting events (such as Academically Talented Open House, Physics Day, Minority Focus Day) and University open houses (such as University Community Day, Maryland Day, Parents' Day, Maryland State Fair)

- 1972- Over **150 physics demonstration programs** presented at area schools from 1972 through 1989.
- 1972- Over **150 physics demonstration programs** presented to school groups visiting the University of Maryland
- 1989- Over **300 physics demonstration programs** presented at area schools from 1989 to the present using the Physics is Phun van.
- 1989 **The Physics IQ Test, Undergraduate Conference on Physics**, sponsored by the University of Maryland Student Physics Society, College Park, MD, April 1989.
- 1989 **The Physics IQ Test, Soviet/Swiss Exchange**, sponsored by the American Association of Physics Teachers, College Park, MD, July 1989.
- 1990 **The Physics IQ Test**, kickoff program for the **Montgomery County Area Science Fair Association**, April 1990.
- 1990 **The Physics IQ Test, Soviet-American Exchange**, sponsored by the American Association of Physics Teachers, College Park, MD, July 1990.
- 1992 **Physics is Phun**, Science Day videotape for the **University of Maryland**, College Park, **Flagship Channel** (cable TV), April 1992.
- 1993 **The Physics IQ Test**, presentations at **International Physics Olympiad final competition**, College of William and Mary, July 1993.
- 1997 **The Physics IQ Test**, Evening Colloquium for Pre-College Students, Western Maryland College, March 1997.
- 1997 **The Physics IQ Test**, Evening Colloquium Series, **Jefferson Laboratory**, October 1997.

XV. Diversity Programs

- 1980- **Minority Focus** Day recruiting program, University of Maryland College Park (1980-1990)
- 1989 **The Physics IQ Test**, Maryland MESA Pre-College **Career Fair for Black Science and Engineering Students**, Baltimore, February 1989.
- 1990 **Academic Champions of Excellence Saturday Academy** program for minority students in Prince George's County, Maryland; six Saturday series of classes yearly (1989-1991)

- 1992 **The Physics IQ Test, Society of Hispanic Professional Engineers**, Pre-college Day Conference, Washington, DC, November 1992.
- 1993 **The Physics IQ Test, Minorities in Science and Technology**, Career Day, George Washington University, March 1993.
- 1995 **The Physics IQ Test, National Conference of Black Physics Students**, Hosted by the American Physical Society, College Park, MD, February 1995.
- 1996 **Physics is Phun**, University of Maryland Eastern Shore campus, **Upward Bound** summer program, June 1996.
- 1997 **The Physics IQ Test, Maryland MESA Pre-College Career Fair for Black Science and Engineering Students**, Baltimore, February 1997.
- 1985- **Physics is Phun** programs to the **Southern Maryland Intervention Program** for educationally under-represented schools in counties of southern Maryland.
- 1990- Programs presented regularly to special groups to enhance education and diversity at the University of Maryland and elsewhere:
El Ingeniero summer program, UMCP (yearly)
Women in Engineering summer program (two programs yearly), UMCP
Kids for Science, Prince George's County Elementary School Science Fair finals (yearly)
Chillum Youth Project summer program, UMCP (yearly)
University of Maryland Center for Minorities in Science and Engineering,
 Summer Bridge Program, UMCP (yearly)
Johns Hopkins University Institute for Advancement of Youth
 Eleanor Roosevelt High School **Black Male Achievement** Program, UMCP (yearly)
Howard University Upward Bound Math and Science Initiative Program, UMCP (yearly)

Other Yearly programs:

- 1980- **Physics is Phun, University of Maryland, Eastern Shore Campus, annual Physics Day program.**
- 1990- **The Physics IQ Test**, yearly presentation to the **Maryland Junior Science Achievement Program**, final state competition, University of Maryland, College Park.
- 1987- **The Physics IQ Test**, yearly presentation to the **United States high school International Physics Olympiad team**, training at the University of Maryland.

XVI. Physics is Phun Public Program Series

1982- Over **200 public Physics is Phun presentations** made at the University of Maryland. Four programs presented yearly, each given three times on consecutive evenings.

Program titles include:

Energy and Motion	Electricity and Magnetism
Going in Circles with Physics	The Atom
When You're Hot, You're Hot	The Nucleus
Good Vibrations	It's Physics
Making Waves	The Physics IQ Test
The Sounds of Science	Water
Seeing the Light	A Potpourri of Physics
Color	Illusions

Approximately 4000 people attend these programs annually, an average of over 300 per evening.

XVII. Invited Papers at Professional Meetings (Unpublished)

1977 **Musical Synthesizers**, invited paper, Chesapeake Physics Association, Towson State University, June 1977.

1979 **Lecture Demonstrations in Physics, American Association of Physics Teachers**, Chesapeake Section, October 1979.

1981 **Videotapes - Demonstrations in Acoustics**, presented at the demonstration mini-session of the **Acoustical Society of America** meeting at Miami, Florida, December 1981.

1983 **Physics is Phun Demonstrations**, workshop for the Montgomery County MD High School Physics Teachers, September 1983.

1983 **Physics Demonstrations**, invited presentation at the annual conference of the **Association of Independent Maryland Schools**, Baltimore, December 1983.

1984 **Physics is Phun**, main evening demonstration program for **the American Association of Physics Teachers summer meeting** at the University of Maryland College Park, June 1984.

1984 **The Physics IQ Test**, invited presentation at the Maryland Association of Science Teachers convention, Ocean City, October 1984.

1985 **Physics is Phun**, invited paper, Maryland Association of Science Teachers, Fall convention, October 1985.

- 1986 **Physics is Phun Demonstrations**, invited presentation to the Conference of Physics Teacher Resource Agents, sponsored by the American Association of Physics Teachers, July 1986.
- 1987 **The Physics IQ Test**, invited presentation at **the Maryland Association of Science Teachers** Fall Conference, Ocean City, October 1987.
- 1988 **Physics is Phun, Maryland State Department of Education Conference: Mathematics and Science for the Underrepresented and underserved**, March 9 (Annapolis) and March 10 (Frederick), 1988.
- 1988 **The Physics IQ Test, Maryland Association of Science Teachers**, Elementary School Division conference, Annapolis, MD, May 1988.
- 1988 **The Physics IQ Test**, Conference: Quest for Excellence in Science Teaching, **Delaware Elementary Science Teachers Association**, Newark, DE, August 1988.
- 1989 **The Physics IQ Test, Maryland Association of Science Teachers**, Conference: Science and Mathematics: The Year Two Thousand and Beyond, Timonium, MD, March 1989.
- 1990 **Overview of the University of Maryland Physics Lecture-Demonstration Facility**, invited paper at the American Association of Physics Teachers summer meeting, Physics Instructional Resource Association session entitled "Implementing Physics Instructional Resources," August 1990.
- 1990 **The Physics IQ Test**, Northeast Regional meeting of the American Association of Physics Teachers, **Rutgers University**, October 1990.
- 1992 **The Physics IQ Test, Maryland Academy of Family Physicians** annual meeting, Ocean City, MD, March 1992.
- 1992 **The Physics IQ Test, American Association of Physics Teachers** annual summer meeting, Orono, ME, August 1992.
- 1993 **The Physics IQ Test**, (set of two programs), Ohio Section, **American Association of Physics Teachers**, March 1993.
- 1994 **The Physics IQ Test**, invited presentation, **Maryland Association of Science Teachers**, Fall Conference, Westminster, MD, February 1994.
- 1996 **The Physics IQ Test**, invited presentation, **American Association of Physics Teachers**, summer meeting at College Park, MD, August 1996.

- 1996 **Evening Physics Demonstration Program**, invited presentation, **American Association of Physics Teachers**, summer meeting at College Park, MD, August 1996.
- 1997 **Physics Demonstrations, High School Teachers' Day Program**, Joint Meeting of the American Physical Society and the American Association of Physics Teachers, Washington, DC, April 1997.
- 1998 **The Physics IQ Test**, invited presentation, **100th Anniversary Program for the American Physical Society**, Atlanta, GA, October 1997.
- 1999 **The Physics IQ Test**, invited presentation, **Maryland Association for Higher Education**, Washington College, October 1999.
- 1999 **The Physics IQ Test**, Project Kaleidoscope 10th Anniversary **Program (American Physical Society, Plasma Physics Educational Organization)** Washington, DC, November 1999.
- 1999 **Physics is Fun Programs at the University of Maryland**, invited talk at the summer meeting of the **American Association of Physics Teachers**, San Antonio, August 1999.
- 1999 **Nuclear Physics and Society Honors Seminar**, invited talk at the summer meeting of the **American Association of Physics Teachers**, San Antonio, August 1999.
- 2000 **The Physics IQ Test**, invited presentation, **National Science Teachers Association**, Baltimore, November 2000.

XVIII. Contributed Papers at Conferences (Unpublished)

Magnetic Field Measurements on the MSU Variable-Energy Cyclotron, with H. G. Blosser and W. P. Johnson, Bulletin of the American Physical Society Ser. II, 473 (1964).

Measurement of High-Energy Gamma Rays with Ge(Li) Detectors, with E. Kashy, Bulletin of the American Physical Society Ser. II, #10, 1100 (1965).

Energies of ⁴⁰Ca Levels, with E. Kashy, Bulletin of the American Physical Society Ser. II, #11, 477 (1966).

Others unlisted.