VITA

OREST GEORGE SYMKO **January 2021**

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EDUCATIONAL BACKGROUND

B.S. 1961 (Physics) University of Ottawa, Canada
M.A. 1962 (Physics) University of Ottawa, Canada
D. Phil. 1967 (Physics) University of Oxford, England (Thesis advisor: N. Kurti, F.R.S.)

ACADEMIC POSTS

- Research Officer, (Post-doctoral Fellow) Clarendon Laboratory, University of Oxford, 1967-68 (with N. Kurti).
- Research Assistant Professor, Dept. of Physics, University of California at San Diego, La Jolla 1968-70, (with J. C. Wheatley).
- Assistant Professor of Physics, University of Utah, 1970-74.
- Associate Professor of Physics, University of Utah, 1974-79.
- Professor of Physics, University of Utah, 1979-Present.
- Chair, University J. Fourier and C.N.R.S. (Municipal Chair), Grenoble, France, 1994-95.
- Director, Center of Acoustic Cooling Technology, Utah Center of Excellence, University of Utah, 2000 –.
- Director of TAPEC (Thermo Acoustic Piezo Energy Conversion). 2005-

HONORS

- Faraday Scholarship (University of Ottawa), 1962, University of Oxford.
- Shell Postgraduate Scholarship, University of Oxford, 1963-66.
- Outstanding Physics Teacher Award, Department of Physics, University of Utah, 1973.
- David P. Gardner Faculty Fellowship, University of Utah, 1976.
- Visiting Scientist, National Academy of Science, Beijing, China 1985.
- Distinguished Teacher Award, University of Utah, 1985.
- Fellow of the American Physical Society, 1990-Present.
- University Professor, University of Utah, 1990-91.
- Hatch Award, University of Utah, 1995.
- Distinguished Research Award, University of Utah, 2002.
- Mortar Board Award, Professor Recognition Award, Fall 2015, for excellent dedication in teaching
- LDSSA at U. of U. recognition of teaching impact during "EXCELLENCE IN TEACHING" week, May 2016.

RESEARCH INTERESTS

- Low Temperature Physics: nuclear cooling, ^{3}He-^{4}He dilution refrigerator, thermometry, Pomeranchuk cooling, liquid and solid ^{3}He, 1K helium cryostat,
- Magnetism: dilute magnetic alloys, nuclear magnetism, spin glasses, magnetic semiconductors.
- Applications of Superconducting Devices (SQUIDS): NMR, EPR, relaxation phenomena, NQR, Photoacoustic Spectroscopy.
- Superconductivity: Thin Films, long Josephson Junctions, electronics, fluxons, fluctuations and instabilities, chaos, macroscopic quantum tunneling, single electron tunneling.
- High T_c superconductivity: microwave properties, SQUIDS, shields, fluxons, optical response, non-equilibrium phenomena.
- Biomagnetism: using SQUID magnetometers.
- Thermo-acoustics: refrigeration, heat engines, and energy converters.
- Quasicrystals: thin films, electronic, mechanical and optical properties, coatings, applications, non-stick and low friction coatings.
- Heat Transfer in microcircuits: thermoacoustic applications, energy conversion, interfacing thermoacoustic engines to microcircuits for heat management, arrays of thermoacoustic engines, application of MEMS technology to miniature thermoacoustic engines.
- Renewable Energy: conversion of waste heat to electricity.
- Metamaterials

PROFESSIONAL ACTIVITIES

Scientific Posts and Visits:

- Consultant at Technical University of Helsinki, Otaniemi, Finland, Summer 1967.
- Visiting Professor at Lancaster University, Lancaster, England, Summer 1972.
- Visiting Professor at University of McGill, Summer 1974.
- Consultant at Los Alamos Scientific Laboratory, April 1975.
- Visiting Professor at University of Minnesota, April 1976.
- Visiting Professor at Catholic University in Rio de Janeiro, Brazil, Fall 1978, Fall 1979, Fall 1981, Fall 1982, Fall 1984, Fall 1985, Fall 1986, Fall 1988, Fall 1990, Fall 1991, Fall 1992, Fall 1996.
- Consultant: acoustics, instrumentation, and education.
- Visiting Professor, University of Minnesota, November 1984.
- Consultant for EG & G, Santa Barbara, 1987, 1988, 1989.
- Consultant for Ceramatec, Salt Lake City, 1987
- Consultant for Technical Research Associates, Salt Lake City 1989.
- National Science Foundation Panel for Undergraduate Education Proposals, 1988.
- Member of Editorial Board for Review of Scientific Instruments, 1988-1990.
- Visiting Professor, L.E.P.E.S. C.N.R.S., Grenoble, France, Summer 1991.
  Visiting Professor, L.E.P.E.S. and C.R.T.B.T, C.N.R.S., Grenoble, France, Fall 1993.
  Visiting Professor, L.E.P.E.S., C.N.R.S., Grenoble, France, Fall 1994.
- National Research Council Associateship Program Panel Review, Washington, D.C. 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005.
- Referee for Physical Review Letters, Physical Review, Review of Scientific Instruments, Journal of Applied Physics, Journal of Physics, Superc. Science Technology, Philosophical magazine, Journal of Low Temperature Physics, Journal of Micromechanical Microengineering, Journal of Power and Energy, Journal of Mechanical Engineering, Proc. of the Royal Society.

INVITED LECTURES

Clarendon Laboratory, Oxford, 1967.
Technical University of Helsinki, Finland, 1967.
Eleventh International Low Temperature Conference, St. Andrews, 1968.
University of California at San Diego, La Jolla, California, 1969.
North American Rockwell Corporation, Science Center, California, 1969.
University of California at Santa Barbara, 1970
University of Utah, 1970.
Fifth Symposium on Temperature, its Measurement and Control in Science and Industry, Washington, 1971.
Brigham Young University, Utah, 1972.
University of Saskatchewan, Regina, Canada, 1972.
University of Minnesota, Mpls., 1973.
McGill University, Montreal, Canada, 1974.
Los Alamos Scientific Lab, New Mexico, 1975.
Utah State University, Logan, Utah, 1975.
International Low Temperature Conference, LT. 14, Helsinki, Finland, 1975.
Bayer Ak. der Wissenschaften, Garching, Germany, 1976.
University of Minnesota, Mpls., 1976.
University of Illinois, Champaign-Urbana, 1976.
University of Ottawa, Canada, 1976.
American Physical Society Meeting, Chicago, 1977.
Pontificia Universidade Catolica, Rio de Janeiro, Brasil, 1978.
Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro, Brasil, 1978.
Univer. Fed. Fluminese, Niteroi, Brasil, 1978
Univ. Fed do Rio de Janeiro, Brasil, 1978.
University of Washington, Seattle, 1979.
Brigham Young University, Utah, 1979.
University of Utah, 1979.
Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro, Brasil, Nov. 1979.
University of Sao Carlos, Brasil, Nov. 1979.
University of Campinas, Brasil, Nov. 1979.
University Fed. do Rio de Janeiro, Brasil, Dec. 1979.
University of Sao Carlos, Brasil, Nov. 1981.
University Fed. do Rio de Janeiro, Brasil, Nov. 1981.
Pontificia Universidade Catolica, Rio de Janeiro, November 1982.
University of Utah, 1984.
Brigham Young University, 1984.
University of Minnesota, 1984.
Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro, Brasil, 1984.
Univ. Fed. do Rio de Janeiro, Fundao, Rio de Janeiro, Brasil, 1984.
University of Ottawa, 1985.
Institute of Physics, Chinese Academy of Sciences, Beijing, 1985.
Northwestern University, Xian, China, 1985.
Nanjing University, Nanjing, China, 1985.
Pontificia Universidade Catolica, Rio de Janeiro, Brasil, 1985.
Air Force Cryoelectronics Symposium, Dayton, Ohio 1986
Pontificia Universidade Catolica, Rio de Janeiro, Brasil, 1986.
Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro, Brasil, 1986.
University of Utah, 1987, Physics Dept.
Institute of Physics, University of Southern California, L.A., 1987.
Brigham Young University, 1987.

EG & G, Santa Barbara, 1987.
Superconductive Electronics Workshop, Cota de Casa, California, 1987.
Brazilian School of Superconductivity, Rio de Janeiro, 1988.
Institute of Superconductivity, University of California at Santa Barbara, 1988.
Utah State University, Logan, 1988.
EG & G, Santa Barbara, 1988.
Pontificia Universidade Catolica, Rio de Janeiro, Brazil, 1988.
Workshop on High Temperature Superconductivity (D.O.D.), Huntsville, AL, 1989
Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro, 1990.
University Federal do Rio de Janeiro, Fundao, Rio de Janeiro, 1990.
University of Utah, University Professor Public Lecture, 1991.
Laboratoire d'Etudes des Propr. Electr. des Solides, C.N.R.S., Grenoble, 1991.
Centre de Tres Basses Temp., C.N.R.S., Grenoble, 1991.
University of Marseille, France 1991.
Technical University of Lausanne, Switzerland, 1991.
Arizona State University, Tempe, 1993.
Centre Nationale de Recherche Scientifique, Grenoble, France, 1993.
Centre Nationale de Recherche Scientifique, Orsay, France, 1993.
University J. Fourier, Grenoble, France, 1993.
University of British Columbia, Vancouver, Canada, 1994.
NATO Workshop on Macroscopic Quantum Tunneling, France, Summer 1994.
Brigham Young University, 1994.
University J. Fourier, Grenoble, France, 1994.
E.T.H. Zurich, Switzerland, 1994.
University of Utah, Dept. of Chemistry, 1995.
National Science Teachers Association, Salt Lake City, 1995.
Science at Breakfast 1995, Salt Lake City, 1995.
University of Nebraska, Lincoln, 1996.
Workshop on Physics of Non-Crystalline Solids, Egypt, 1996.
Brazilian Physical Society 30th Anniversary Meeting, 1996.
Pontificia Universidade Catolica, Rio de Janeiro, Brazil, 1996.
Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro, 1996.
International Conference on f Elements, Paris, 1997
11th International Conference on Surface Modification Technologies, Paris, 1997.
Egyptian Society of Solid State Science and Applications, Luxor, Egypt, 1997.
American Physical Society, March meeting, Los Angeles, 1998.
International conference on Material Science and Properties for I.R., Kiev, Ukraine, 1998.
Rockwell International Science Center, California, 1998.
ONR Workshop on Acoustic Refrigeration, University of Mississippi, 1999.
XXI Conference on Solid State Devices and Silicon Technology, Egypt, 1999.
International Conference on Thermoelectricity, Maryland, 1999.
Arizona State University, Tempe, 1999.
SUTI, Newport Beach, California, 2000.
Egyptian XXII Conference on Solid State Science and Advanced Materials, Red Sea, Egypt, 2001.
University of Illinois, Champaign-Urbana, 2001.
Brigham Young University, Utah, 2002.
Horizons 2002, Salt Lake City.
Eurotherm 75, "Microscale Heat Transfer 2," 2003 Reims, France.
Idaho State University, Pocatello, 2003.
Air Force Research Laboratory Workshop on Energy and Thermal Management, Dayton, Ohio, 2004.
University of Mississippi, Oxford, 2004. "Quasicrystals and their Unusual Properties."
Utah State University, 2005

University of Utah, Kingsbury Hall, World Year of Physics Lecture "An Evening with Einstein", 2005
Colorado State University, Fort Collins, 2007 "Acoustic Engines for Harvesting Energy from Waste Heat".
International Conference on Ultrasonics, Vienna, Austria, April 11, 2007, "Ultrasonic Thermoacoustic Devices".
University of California at San Diego, La Jolla, CA. April 19, 2007, "Acoustic Engines for Harvesting Energy From Waste Heat".
University of Ottawa, Canada, June 1, 2007, Anniversary Lecture for Professor Gilles Lamarche, "Acoustic Engines for Harvesting Energy From Waste Heat".
Realms of Inquiry, April 9, 2009, S.L.C., "Energy and Sustainability"
Idaho University, Pocatello, April 13, 2009, "Thermoacoustic Engines"
Brigham Young University, January 27, 2010, "Beautiful and Practical Patterns"
University of Colorado, Boulder, September 15, 2011, "Thermoacoustic Engines"
17th International Congress on Sound and Vibrations, Cairo, Egypt, July 21, 2010, "Thermoacoustics", "Acoustics in Education: Physics of Audio and Video"
University of Florida, Gainesville, November 8, 2012, "Quasicrystals and Their Properties"
Idaho State University, October 13, 2014, "Beautiful and Practical Patterns".
University at Buffalo, June 29, 2020, "Beautiful and Practical Patterns"

PROFESSIONAL SOCIETIES

- Linacre College, Oxford, Junior Member (1967-1968)
- Acoustical Society of America, Member.
- American Physical Society, Fellow.
- IEEE

COURSES TAUGHT

At University of Utah:

- Introduction to Solid State Physics (PY 557)
- Physics for Scientists and Engineers (PY 173)
- Physics for Scientists and Engineers (PY 271, 272, 273)
- Physics of Music (PY 311-2)
- Modern Physics (PY-374)
- Introduction to Calculus (Honors Program) (203H-1)
- Modern Physics Lab (PY-371)
- Physics of Hi-Fi (LE-133-1), a Liberal Education course.
- Electric and Magnetic Transducers (PY-577)
- Physics (PY-101)
- Science of the Digital Domain (LE 230-1), Bits and Bytes of Physics, a Liberal Education course, Intro. to Digital Audio and Video.
- Physics of Audio and Video (PY-1330-1)
- Digital Audio and Video, International Impact (PHYS 3330)
- General Physics I (PHYS 2010)
- Energy and Sustainability (PHYS 3150)

At Pontificia Universidade Catolica, Rio de Janeiro, Brazil:

- Instrumentation and Transducers, Fall 1979.
- Applied Superconductivity, Fall 1981.
- Physics of Thin Films, Fall 1986.

At University J. Fourier, Grenoble, France, 1994

- From Fundamental Physics to its Applications.

Educational Contributions at University of Utah:

- Developed a Liberal Education course in Physics: Physics of Hi-Fi. This 5-credit hour course has been attracting around 200 students each quarter since 1977; it has a lab associated with it.
- Developed Masters of Instrumentation Program (with G. Cassidy), 1978.
- Chaired Masters of Instrumentation Program from 1978 to 1988.
- Developed Graduate course "Electric and Magnetic Transducers" (PHYS 577)
- Developed a Liberal Education course in Physics: The Science of the Digital Domain, 1991. (Now, Bits and Bytes of Physics). (LE 230)
- Developed General Education course: Physics of Audio and Video plus labs (PHYS 1330).
- Developed General Education course: Digital Audio & Video

Research Projects Supervised: (over 32 Masters and Ph.D. Thesis and 12 Postdoctoral Fellows)

- Photoacoustic Spectroscopy.
- Magnetocardiogram Detection with SQUID Magnetometers.
- Josephson Junction Electronics.
- Weakly Magnetic systems (nuclear magnetism, hemoglobin, dilute magnetic alloys, magnetic semiconductors, low dimensional systems).
- Detection of Nuclear Magnetic Resonance, Electron Spin Resonance, Nuclear Quadrupole Resonance with SQUID Magnetometer.
- Metal-Insulator Transition in Semiconductors.
- Developed Instrumentation Lab for Dept. of Physics, Instrumentation Masters Program.
- Masters of Instrumentation Research Projects
- Fluctuations and Chaos in long Josephson junctions.
- High frequency characteristics of long Josephson junctions.
- Microwave properties of high T_c superconductors.
- Shielding properties of high T_c superconductors.
- Macroscopic Quantum Tunneling.
- Small Tunnel Junctions.
- Thermo-acoustics.
- Thin films of superconductors, quasicrystals.
- Quasicrystals.
- Computational Modeling of High Frequency Thermoacoustic Engines.
- High Frequency Thermoacoustic Devices.
- TAPEC (Thermoacoustic Piezo Energy Conversion): Heat Engines.
- Conversion of Heat to Electricity Using Acoustics.

GRANTS & CONTRACTS

- University of Utah Research Committee 1970-1972.
- Research Corporation, 1971-1973. $7,000
- National Science Foundation, 1972-1974, $52,500.
- National Science Foundation, 1974-1976, $124,700.
- National Science Foundation, 1976-1979.
- National Science Foundation, 1979-1981, $84,500.
- National Science Foundation, 1981-1984, $160,100.
- Department of the Army, 1980-1981, $40,000
- Institutional Funds, U of U., 1980-1981.
- National Science Foundation (International Program USA-Brazil) 1981-1984, $12,800.
- Rockwell International, 1982-1985, $99,904.
- National Science Foundation (International Program USA-Brazil) 1984-1986, $16,505.

- Rockwell International, 1984-1985, $199,904.
- Air Force, 1985-1988, $159,710.
- Rockwell International, 1987-1990, $225,000.
- National Science Foundation (International Program USA-Brazil)- 1988-1991, $16,843.
- University of Utah Funds, 1988.
- Air Force, 1988-1991, $260,733.
- Naval Research Laboratories, 1991-1993, $162,760.
- Office of Naval Research, 1993-1996, $150,000.
- University of Utah Technology Innovation Grant, 1995-97, $45,000.
- Office of Naval Research, Expansion Funds, 1996, $50,000.
- University of Utah Incentive Seed Grant, 1999, $26,000.
- Teaching grant, University of Utah, 1999, $3,000.
- Office of Naval Research, 1999-2001, $375,000.
- DARPA HERETIC Program, 2000-2003, $300,000.
- Utah Center of Excellence (Center of Acoustic Cooling Technology) 2000, $100,000.
- Utah Center of Excellence (Center of Acoustic Cooling Technology) 2001, $100,000.
- Parvus Corporation, 2001, $10,000.
- Utah Center of Excellence (Center of Acoustic Cooling Technology) 2002, $100,000.
- Utah Center of Excellence (Center of Acoustic Cooling Technology) 2003, $50,000.
- Utah Center of Excellence (Center of Acoustic Cooling Technology) 2004, $50,000.
- University of Utah, Seed Grant, 2003 –2004, $34,324.
- Office of Naval Research, 2003-2005, $300,000.
- TAPEC (Thermo-Acoustic-Piezo Energy Conversion), U.S. Army Space & Missile Defense Command, 5-year project for $26.6 millions. First year (2005) awarded $1 million. Second year (2006) awarded $1 million.
- University of Utah (Acoustic Energy Conversion) $100,000.
- Anendo, development funds for Acoustic Energy Conversion (2009), 15,000.

PATENTS

- Radiation Detector Using a Bulk High T_c Superconductor, U.S. Patent 5,268,577 (O.G.Symko, J. Artuso, K. Hull, and L. Franks), 1993.
- Formation and Application of AlCuFe Quasicrystalline Thin Films (O.G. Symko, T. Klein and D. Kieda), U.S. Patent 6294030, 2001.
- Miniature Thermoacoustic Refrigerator (O.G.Symko, E. Abdel-Rahman, D. Zheng and T. Klein), U.S. Patent 6,574,968 B1, 2003.
- Modified Process for Fabricating Quasicrystal Thin Films (O.G. Symko, W. Park and E. Abdel-Rahman), U.S. Patent 6,712,915, 2004.
- Modified Miniature Thermoacoustic Refrigerator (O. G. Symko, and E. Abdel-Rahman), U.S. Patent 6,804,967 B2, 2004.
- High Frequency Thermoacoustic Energy Converter (O.G. Symko, and Y. Kwon)2005, pending.
- High Frequency Thermoacoustic Refrigerator, (with E. Abdel-Rahman,), U.S. Patent 7,240,495, July 2007.
- Compact Thermoacoustic Array Energy Converter, (O.G. Symko and Y.S. Kwon) August 2011, U.S. Patent 8,004,156
- Compact Thermoacoustic Array Energy Converter, (O.G. Symko and Y.S. Kwon) March 2012, U.S. Patent 8,143,767
- Annular Thermoacoustic Energy Converter, (O.G. Symko), 2014, U.S. Patent 8,629,600.

PUBLISHED BOOKS

"Physics of Hi-Fi, from Analog to Digital", Kendall-Hunt, 1995, a textbook.

PUBLICATIONS

"Superconducting Thermal Switches Below 1K" (with R.H. March) Proc. of the Grenoble Conference, Commission I, Intern. Inst. of Refrigeration Bulletin, Annexe 1965 - 2, p. 57.

"Nuclear Cooling with Indium and Nuclear Quadrupole Interaction" Phys. Letters 25A, 385 (1967).

"Nuclear Cooling" Eleventh International Conference on Low Temperature Physics, St. Andrews, I, 66 (1968) (Invited talk).

"Adiabatic Compressional Cooling of ^{3}He" (with R.T. Johnson, R. Rosenbaum, and J.C. Wheatley) Phys. Rev. Letters 22, 449 (1969).

"Nuclear Cooling Using Copper and Indium" J. Low Temp. Phys. 1, 451 (1969).

"Substantial Nuclear Ordering in Solid ^{3}He" (with R. T. Johnson and J.C. Wheatley) Phys. Rev. Letters 23, 1017 (1969).

"Low Temperature Melting Curve of ^{3}He" (with R.T. Johnson, O.V. Lounasmaa, R. Rosenbaum, and J.C. Wheatley) Journ. of Low Temp. Physics 2, 403 (1970).

"Observation of the Static Nuclear Magnetism of Pure Metallic Copper in Low Magnetic Fields" (with E.C. Hirschkoff, L.L. Vant-Hull, and J.C. Wheatley), J. Low Temp. Phys. 2, 653 (1970).

"Continuously Operating ^{4}He Evaporation refrigerator" (with L.E. DeLong and J.C. Wheatley) Rev. Sci, Instr. 42, 147 (1971).

"Magnetization of Dilute Cu-Mn Alloys at Very Low Temperatures" (with E.C. Hirschkoff and J.C. Wheatley) Phys. Letters 33A, 19 (1970).

"Enamel: A Magnetic Thermometer Useful into the Millidegree Region" (with E.C. Hirschkoff and J.C. Wheatley) J. Low Temp. Phys. 4, 111 (1971).

"Magnetic Behavior of Dilute Cu-Mn Alloys at Very Low Temperatures" (with E.C. Hirschkoff and J.C. Wheatley) J. Low Temp. Phys. 5, 155 (1971).

"Magnetization of Dilute Cu(Fe) Alloys at Low Temperatures" (with E.C. Hirschkoff, M.R. Shanabarger and J.C. Wheatley) Phys. Lett. 34A, 341 (1971).

"Magnetic Impurity Pairs in Dilute Cu(Fe) Alloys" (with E.C. Hirschkoff, M.R. Shanabarger, and J.C. Wheatley) Phys. Letters 35A, 449 (1971).

"Magnetic Impurity Pairs in Dilute Cu(Fe) Alloys at Very Low Temperatures" (with E.C. Hirschkoff, M.R. Shanabarger, and J.C. Wheatley) J. Low Temp. Phys. 5, 545 (1971).

"Nuclear Magnetic Thermometry at Very Low Temperatures" 5th Symposium on Temperature, Washington, D.C., 1971, p. 1239.

"Qualitative Changes in the Self-Diffusion Coefficient and T_2 for Solid He^3 at Very Low Temperatures" (with R.T. Johnson and J.C. Wheatley) Phys. Letters 39A, 173 (1972).

"Detection of NMR at Low Temperatures Using a SQUID" (with D. J. Meredith and G.R. Pickett) Phys. Lett. 42A, 13 (1972).

"Application of a SQUID Magnetometer to NMR at Low Temperatures" (with D.J. Meredith and G.R. Pickett) J. Low Temp. Phys. 13, 607 (1973).

"Magnetic Behavior of Mn impurities in Silver" (with J.C. Doran) 19th conference on Magnetism and Magnetic Materials, Boston, 1973, p. 980.

"Detection of NMR Using a SQUID Magnetometer" (with D.J. Meredith and G.R. Pickett) International Magnetism Conference in Moscow 1973.

"Magnetization of Dilute Ag-Mn Alloys: Ordering and Absence of Kondo State" (with J.C. Doran) Solid State Communications 14, 719 (1974).
"Background Signals in SQUID Magnetometer" (with J.C. Doran) IEEE Transitions on Magnetics, Vol. Mag. 10, No. 3, 603 (1974).

"Magnetization Measurements of Polycrystal Zn-Mn Alloys at Very Low Temperatures" (with J.C. Doran, S.F. Kral, and T. Steelhammer) Sol. St. Com. 17, 1099 (1975).

"Magnetization of Dilute Au-Fe Alloys at Very Low Temperatures" (with T. Steelhammer) Proc. of Magn. Conf., Philadelphia, 1975, p. 360.

"Application of SQUID Magnetometer to Nuclear Magnetic Thermometry" (with L.A. Moberly) Proc. of Applied Superconductivity Conference, Stanford, 1976, p. 358.

"Nuclear Spin-Lattice Relaxation Measurements in In, Al and Sn at Very Low Temperatures" (with L.A. Moberly) Proc. of XIXth Congress Ampere, Heidelberg, 1976, p. 273.

"Magnetic Anisotropy of Zn-Cr Alloys at Very Low Temperatures" (with L.A. Moberly) J. of Appl. Physics, 49, 1431 (1978).

"Knight Shift of Mn in Al at Very Low Temperatures" (with J. Babcock, D. Bakalyar, J. Kiely, and W. Weyhmann) J. of Applied Physics, 49, 1450 (1978).

"Magnetization of Dilute Al-Fe Alloys" (with L.A. Moberly, T. Steelhammer, and W. Weyhmann) J. of Low Temp. Physics, 33, 21, 1978.

"Low Temperature Behavior of PdCo" (with L.A. Moberly and G. Williams) Journal de Physique, 39, C6-870, 1978.

"Squid Detection of EPR in Dilute CMN", (with R.V. Chamberlin and L.A. Moberly) Journal de Physique, 39, C6-1217 (1978).

"Fine Strucutre Splitting of Gd IN Au*" (with E. Jaehne) Solid State Communications, 30, 31-31, 1978.

"Magnetic Anisotropy of Zn-Mn and Zn-Cr Alloys below 1 K" (with S.F. Kral, L.A. Moberly, and T. Steelhammer) Solid State Communications, 32, 761, (1979).

"High Sensitivity Magnetic Resonance by SQUID Detection" (with R.V. Chamberlin and L.A. Moberly) J. of Low Temp. Physics 35, 337 (1979).

"On the Recording of Phase and Amplitude Relationships Between Electrical and Magnetic Cardiac Events." (with I. Eghrari, J.P. von der Weid, P. Costa Ribeiro) presented at International Conference on SQUIDS and Biomagnetism, Berlin, (1980).

"The Low-Frequency, Low-Temperature Dielectric Behavior of n-Type Germanium Below the Insulator-Metal Transition" (with T. G. Castner, N. K. Lee, H. S. Tan, and L. Moberly), J. of Low Temp. Phys. 38, 447 (1980).

"The Effect of RKKY Interactions on the Magnetization of Dilute Magnetic Alloys with hcp Hosts" (with P. Gash and R. Roshko) J. of Appl. Phys., 52, 1720 (1981).

"Photoacoustic Spectroscopy at Low Temperatures", (with P. costa Ribeiro, J.P. Von der Weid), Bull. of the Amer. Phys. Soc., 25 (3), 408 (1980).

"Transition from Spin-Glass to Single Impurity Behavior in Cd-Mn-Te", (with M.A. Novak, S. Oseroff)) Physica, 107B, 313 (1981).

"Nuclear Orientation Studies of ^{54}Mn in Zn", (with A.L. Allsop and N.J. Stone), Hyperfine Interactions 10 839, (1981).

"Effect of Crystal Field on the Magnetization of Dilute h.c.p. Alloys", (with L.A. Moberly and R. Roshko), Phys. Rev. B, 25 4695, (1982).

"Spin-Glass Behavior in Dilute Magnetic Alloys with h.c.p. Structure" (with P. Gash and R. Roshko), Phys. Rev. B, 25, 5987, (1982).

"Superconducting Microphone for Photoacoustic Spectroscopy at Low Temperatures" (with P. Costa Ribeiro, Lebrunie, and J.P. Von der Weid), J. of Appl. Phys. 53, 8378 (1982).

"Temperature Dependence of the Order Parameter in a Dilute Ag-Mn Spin-Glass" (with R. Roshko), J. Appl. Phys. 53, 2203 (1982).

"Magnetization of Hemoglobin and Myoglobin Below lK" (with G. Bemski and M.A. Novak), Phys. Lett. 99A, 62 (1983).

"Spin-Glass Behavior of $Cd_{1-x}Mn_xTe$ Below the Nearest-Neighbour Percolation Concentration" (with M.A. Novak, D.J. Zheng, and S. Oseroff), J. Appl. Phys., 57, 3418 (1985).

"Low Temperature Physics", 6th edition of Encyclopedia of Science and Technology, 1984.

"Magnetic Phase Diagram of $Cd_{1-x}Mn_x$ Se Below the Nearest Neighbor Percolation Limit" (with M.A. Novak, D.J. Zheng and S. Oseroff), Physica 126B, 469 (1984).

"Spin Freezing Below the Nearest-Neighbor Percolation Concentration in $Cd_{1-x}Mn_xTe$ and Cd_{1-x} Mn_x Se" (with M.A. Novak, D.J. Zheng, and S. Oseroff) Phys. Rev. B, 33, 6391 (1986).

"Discrete Spatial Filtering with a SQUID Gradiometer in Biomagnetism" (with A.C. Bruno, P. Costa Ribeiro, and J.P. Von der Weid) J. Appl. Phys. 59, 2584, (1986).

"Spin-glass Transition of a Dilute Ag-Mn Alloy in a Magnetic Field" (with M.A. Novak and D.J. Zheng), Phys. Rev. B, 33, 343 (1986).

"Scaling Behavior of a Dilute Spin Glass of Ag-Mn" (with M.A. Novak and d. Zheng), Journal of Magnetism and Magnetic Materials, 54-57 129 (1986).

"NMR and EPR Study of Sn Gd Te at Low Temperatures" (with B.S. Han, F. Hedgcock, and D.J. Zheng), Mat. Res. Soc. Symp. Proc. 89, 125 (1987).

"Spatial Fourier Transform Method for Evaluating SQUID Gradiometers" (with P. Costa Ribeiro, A.C. Bruno, and C.C. Paulsen), Rev. Sc. Instr. 58, 1510 (1987).

"Effect of Injected Current Geometry on Gain of Long Josephson Junction" (with B. Lee and D.J. Zheng), Proc. of 1987 Int. Superc. El. Confer., Japan 1987, p. 207.

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"Critical Behavior of the Low Temperature Dielectric Constant of Si: As" (with J.S. Brooks, and T.G. Castner, Proc. 18th Int. Conf. on Low Temp. Physics, Kyoto, 1987. Jap. Journ. of App. Phys. 26, Supplement 26-3, 721 (1987).

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"High T Superconducting Shields" (with W.J. Yeh, D.J. Zheng, and S. Kulkarni) Proc. of Latin-American Conference on High Temperature Superconductivity, Brazil, p. (313), (1988).

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"Frequency Dependence of the Absorption Component of the Magnetic Susceptibility in Superconducting Y-Ba-Cu-O" (with S. Ducharme, R. Durny, J. Hautala and P.C. Taylor), High Temperature Superconductivity Proc. Mat. Res. Soc. 99, 845 (1988).

"Absorption Component of the Magnetic Susceptibility in Superconducting Y-$Ba_2Cu_2O_7$" (with R. Durny, S. Ducharme, J. Hautala and P.C. Taylor) HighTemperature Superconductivity Proc. Materials Research Society, 99, 849 (1988).

"High T_c R.F.-Biased SQUID" (with C. Harmston, W.J. Yeh, D.J. Zheng and S. Kulkarni) IEEE Trans. Magn. MAG-25, 878 (1989).

"Noise Characteristics and Instabilities of Long Josephson Junctions" (with B.S. Han, B. Lee, W. Yeh, D.J. Zheng) IEEE Trans. Magn. MAG-25, 1396 (1989).

"Dissipative Flow of Josephson and Abrikosov Fluxons in High T_c Superconductors" (with D.J. Zheng, R. Durny, S. Ducharme, and P.C. Taylor), Phys. Lett. A, 134, 72 (1988).

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"Measurements of Gradiometer Spatial Transfer Function" (with A.C. Bruno, C.C. Paulsen, and P. Costa Ribeiro), Biomagnetism '87, K. Atsumi et al, (Eds), Tokyo Denki Univ. Press, p. 454, (1988).

"Period Doubling in a Perturbed Sine-Gordon System, a Long Josephon Junction" (with W.J. Yeh and D.J. Zheng), Phys. Lett. A, 140, 225 (1989).

"Absorption of Microwaves in Superconducting $YBa_2Cu_30_7$ and Field-Cooling Effects" (with R. Durny, S. Ducharme, J. Hautala, D.J. Zheng, P.C. Taylor, and S. Kulkarni), J. Opt. Soc. Amer. B6, 465 (1989).

"Magnetic Shielding and Relaxation Characteristics of Superconducting Y Ba Cu O Tubes" (with W.J. Yeh and D.J. Zheng and S. Kulkarni), Journ. of Appl. Phys., 65, 2142 (1989).

"Absorption at Radio Frequencies in Superconducting YBaCuO" (with S. Ducharme, R. Durny, J. Hautala, D.J. Zheng, P.C. Taylor, and S. Kulkarni), J. of Appl. Phys., 66, 1252 (1989).

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"Magnetic Shielding with High T_c Superconductors" (with W.J. Yeh, D.J. Zheng, and S. Kulkarni) Proc. of High Temperature Superc. D.O.D. Workshop, Huntsville, AL, 1989.

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"Fluxon Tunneling in Long Josephson Junctions Below 1K" (with L. Baselgia and W.J. Yeh), Physica B. LT-19, III, 575 (1991).

"Characteristics of YBaCuO Magnetic Shields" (with M. Hurben, W.J. Yeh, S. Kulkarni, and M.A. Novak), IEEE Trans. on Magnetics, 27, 1874 (1991).

"Multi-Fluxon Steps in Long Josephson Junctions and their Application to Oscillators" (with L. Baselgia, and W.J. Yeh), IEEE Trans. on Magnetics, 27, 3257 (1991).

"Femtosecond Dynamics of Quasi-Particles in $YBa_2Cu_3O_{7-\delta}$ Superconductor Films" (with S. G. Han, Z.V. Vardeny, and G. Koren), IEEE Trans. on Magnetics, 27, 1548 (1991).

"Femtosecond Optical Detection of Quasiparticle Dynamics in High-T $YBa_2Cu_3\ O_{7-\delta}$ Superconducting Thin Films" (with S. G. Han, Z. V. Vardeny, K. S. Wong, and G. Koren) Phys. Rev. Lett. 65, 2728 (1990).

"Superconductivity" Encyclopedia of Computer Science and Technology (1991).

"Exchange Interactions and Magnetic Dimension in $Cu(L\text{-}Ala)_2$ (with R. Calvo, M.C.G. Passeggi, M.A. Novak, S.B. Oseroff, O.R. Nascimento and M.C. Terrile) Phys. Rev. B, 43, 1074 (1991).

"Quasiparticle Relaxation in a High-T_c Superconductor" (with S.G. Han, Z.V. Vardeny, and G. Koren) Phys. Rev. Lett. 67, 1053 (1991).

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"Macroscopic Quantum Tunneling in Long Josephson Junctions" (with L. Baselgia), Physics Letters A 166, 399 (1992).

"Room Temperature Tunneling Characteristics of Ultra Small Tunnel Junctions" (with R. Li and M. Reeve) Modern Phys. Lett. B 6, 273 (1992).

"Tunneling Studies of Mesoscopic all NbN Junctions" (with M.D. Reeve and R.Li), IEEE Trans. on Appl. Superc. 3, 2547 (1993).

"Large steps in Long Josephson Junctions" (with L. Baselgia-Stahel and D.J. Zheng), IEEE Trans. on Appl. Superc. 3, 2547 (1993).

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"Formation of AlCuFe quasicrystalline thin films by solid state diffusion" (with T. Klein), Appl. Phys. Lett. 64, 431 (1994).

"Low Temperature Physics", 8th edition of Encyclopedia of Science and Technology (1994).

"Does the quasicrystal AlCuFe follow Ohm's Law?" (with T. Klein), Phys. Rev. Lett. 73, 2248 (1994).

"Scattering times and mean free path in AlCuFe quasicrystalline thin films". (with T. Klein and C. Paulsen), Phys. Rev. B, 51, 12805 (1995).

"Observation of a narrow pseudo-gap near the Fermi level of AlCuFe Quasicrystalline thin films", (with T. Klein, D.N. Davydov and A.G.M. Jansen), Phys. Rev. Lett., 74, 3656 (1995).

"Macroscopic Quantum Tunneling in Long Josephson Junctions", In Quantum Tunneling of the Magnetization, ed. Barbara & Gunther, NATO ASI Series, Vol. 301, 481 (1995).

"Metallurgy of Thin Films of Quasicrystals", Proceed. of "New Horizons in Quasicrystals: Research and Applications", Ames, Iowa, P. 181 (1997).

"Quasicrystal Thin Films for Biomedical Applications" (with W. Park and D. Kieda), Surface Modification Technologies XI, Paris, ed. by Sudarshan, Jeandin, and Khor, P. 1051 (1998).

"Energy Conversion using Thermoacoustic Devices," Proc. of 18th Intern. Conf. on Thermoelectricity, Baltimore, P. 645 (1999).

"Miniaturization of Thermoacoustic Devices for Thermal Management of Microelectronics," Heat Transfer and Transport Phenomena in Microscale, Begell House, Inc., , p. 335 (2000).

"Application of Thermoacoustic Engines to Heat Transfer in Microcircuits" (with E. Abdel-Rahman, Y. Kwon, M. Emmi, and R. Behunin), Thermal Challenges in Next Generation Electronic Systems THERMES 2002, P. 171.

"Heat Transfer with High Frequency Thermoacoustic Engines," 2nd International Conference on Heat Transfer Fluid Mechanics and Thermodynamics, Zambia (2003).

"Design and Development of High-Frequency Thermoacoustic Engines for Thermal Management in Microelectronics," (with E. Abdel-Rahman, Y.Kwon, and R. Behunin), Microelectronics Journal, 35, 185 (2004).

"The Magnetic Imaging of Oil Paintings," (with P. Costa Ribeiro, H. Lins de Barros, J.C. Portinari, C.S. Wolff, S.M. Kafensztok, H.R. Carvalho, D. Acosta-Avalos), Superconductor Science and Technology, 17, L25 (2004).

"Magnetic Memory of Oil Paintings" (with P. Costa Ribeiro, A.C. Bruno, H.R. Carvalho, S.M. Kafensztok, P.O. Almeida, and C.S. Wolff) J. of Appl. Phys., 102, 074912 (2007).

"Helmholtz-like resonators for thermoacoustic prime movers" (with B. Andersen) J Acoust. Soc. Am, Vol125, Issue 2, pp. 787-792 (2009).

"Optimization of Thermoacoustic Devices for Energy Conversion", O.G. Symko and I. Rodriguez, Proc. of 9th International Conference HEFAT, 2012.

"Ultrasonic Thermoacoustic Energy Converter", M. Flitcroft and O.G. Symko, Ultrasonics, 53, 672 (2013).

"Annular 2kHz – 4 kHz thermoacoustic prime movers" (with I. Rodriguez, M. Urry and R. Behunin) in preparation.

"Synchronization of mid-audio frequency thermoacoustic engines" (with B.Gillman) in preparation.

"Synchronization of Ultrasonic thermoacoustic devices" (with M. Flitcroft) in preparation.

"Pressurized mid-audio frequency prime mover" (with N. Webb) in preparation.

Thermoacoustic and thermoelectricity – a comparison", in preparation.

PRESENTATIONS AT CONFERENCES

- A.P.S. Meeting, Cincinnati, 1991, "Measurements of the Superconducting Gap and Optical Phonon Lifetime in YBaCuO by the Femptosecond Photomodulation Technique," S.G. Han, Z.V. Vardeny, O.G. Symko, and G. Koren.

- A.P.S. Meeting, Seattle, 1993, "Experimental Considerations for Observing Single Electron Tunneling at Room Temperature," M.D. Reeves, O.G. Symko, and S. Liang.

- A.P.S. Meeting, Pittsburgh, 1994, "Transport Properties of AlCuFe Quasicrystalline Thin Films," T. Klein, O.G. Symko, and C. Paulsen.

- A.P.S. Meeting, San Jose, 1995, "Density of States in AlCuFe Quasicrystalline Thin Films from Tunneling Experiments," T. Klein, O.G. Symko, D. Davidov, and A.G.M. Jansen.

- A.P.S. Meeting, Los Angeles, 1998, "Optical Measurement of Pseudogap in Quasicrystalline AlCuFe," W. Park and O.G. Symko.

- A.P.S. Meeting, Los Angeles, 1998, invited talk, "Thin Films of Quasicrystals: Optical, Electronic, and Mechanical Properties," O.G. Symko.

- A.P.S. Meeting, Atlanta, 1999, "Electronic Density of States in Quasicrystalline AlCuFe Films from Optical Studies," E. Abdel-Rahman, and O.G. Symko.

- ONR Workshop on Acoustic Refrigeration, University of Mississippi, 1999, "High Frequency Thermoacoustic Engines," O.G. Symko.

- A.P.S. Meeting, Minneapolis, 2000, "Surface Characteristics of Quasicrystal Thin Films of AlCuFe," O.G. Symko, E. Abdel-Rahman, M. Emmi, and S. Zudova.

- DARPA Meeting on HERETIC, Seattle, 2000, "Thermoacoustic Refrigerator," O.G. Symko.

- Acoustical Society of America Meeting, Newport Beach, 2000, "Fluctuations at Onset of Oscillations in Acoustic Oscillator," Y. Kwon and O.G. Symko.

- A.P.S. Meeting, Seattle, 2001, "Effects of Pseudogap at Surface of Quasicrystal Thin Films in i-AlCuFe," E. Abdel-Rahman, M. Emmi, and O.G. Symko.

- A.P.S. Meeting, Seattle, 2001, "Fluctuations and Onset of Coherence in a Thermoacoustic Engine," Y.S. Kwon and O.G. Symko.

- Acoustical Society of America Meeting, Chicago, 2001, "Performance of High Frequency Thermoacoustic Refrigerator," E. Abdel-Rahman, A. Frates, and O.G. Symko.

- Acoustical Society of America Meeting, Fort Lauderdale, 2001, "Investigation of Stack Material for Miniature Thermoacoustic Engines," E. Abdel-Rahman, Y.S. Kwon, and O.G. Symko.

- A.P.S. Meeting, Seattle, 2001, "Effects of Pseudogap at Surface of Quasicrystal Thin Films in i-AlCuFe," E. Abdel-Rahman, M. Emmi, and O.G. Symko.

- Horizons 2002: Innovations and Commercialization, Salt Lake City, "Quasicrystals and their Unusual Properties," O.G. Symko.

- ITHERM 2002, San Diego, "Size Considerations in Interfacing Thermoacoustic Coolers with Electronic Circuits," O.G. Symko, E. Abdel-Rahman, N.C. Azenui, and I. Korovyanko.

- Thermal Management Workshop, O.N.R., Arlington, 2003, "Acoustic Heat Management for Electronics," O.G. Symko.

- 2nd International Conference on Heat Transfer, Fluid Mechanics, and Thermodynamics, Zambia, Africa, 2003, "Heat Transfer by High-Frequency Thermoacoustic Engines," O.G. Symko , E. Abdel-Rahman, R. Behunin, and Y.S. Kwon.

- A.P.S. Meeting, Austin, 2003, "Microscale Surface Friction of Thin Films of i-AlCuFe," E. Abdel-Rahman and O.G. Symko.

- Eurotherm 75, Microscale Heat Transfer 2 Conference, Reims, France, 2003, "Acoustic Approach to Microscale Heat Transfer," O.G. Symko.

- Energy and Thermal Management Workshop, Air Force, 2004, Ohio, "Thermoacoustic Approach to Energy and Thermal Management," O.G. Symko.

- Direct Energy Conversion Review and Workshop, DARPA, San Diego, 2004, "Acoustic Heat Management of Electronics," O.G. Symko.

- A.P.S. Meeting, Montreal, 2004, "Synchronization of an Array of Miniature Acoustic Engines," Y.S. Kwon, and O.G. Symko.

- ONR Direct Energy Conversion Meeting, Coronado, 2004," Thermoacoustic Approach to Thermal Management of Electronics," O.G. Symko.

- Acoustical Society of America Meeting, Vancouver, 2005, "High Frequency Operation of Thermoacoustic Coolers and Prime Movers," H. El-Gendy, Y. Kwon, and O.G. Symko.

- 9th International Conference on Quasicrystals, Ames, 2005, "Surface Composition of Thin Films of i-AlCuFe," O.G. Symko and E. Abdel-Rahman.

- ExHFT-6, Sixth World Conference on Experimental Heat Transfer, Fluid Mechanics, and Thermodynamics, Matushima, Japan, 2005, "Application of Small Thermoacoustic Devices to Thermal Management and Energy Conversion," O.G. Symko.

- Acoustical Society of America Meeting, Minneapolis 2005 "Ultrasonic Acoustic Cooler" H. El-Gendy, Y. Kwon, O.G. Symko.
- Acoustical Society of America Meeting, Providence, R.I. 2006, "Optimizing Miniature Thermo-Acoustic Coolers" H. El-Gendy, L. Lyard, and O.G. Symko.
- Office of Naval Research, Thermal Management Review, Berkley, California, September 18, 2006, "Acoustic Cooling of Electronics". O.G. Symko.
- Acoustical Society of America Meeting, Honolulu, December 2006, "Anharmonic Acoustic Resonators in Miniature Thermoacoustic Cooler" H. El-Gendy, L. Lyard, and O.G. Symko.
- 2007 International Congress on Ultrasonics, Vienna, Austria, April 2007, "Ultrasonic Thermoacoustic Devices" O.G. Symko.
- Acoustical Society of America Meeting, Salt Lake City, June 2007, "Performance of annular high frequency acoustic engines" (I.A. Rodriguez, O.G. Symko), "Synchronization of small thermoacoustic oscillators" (B. Gillman and O.G.Symko), "Acoustic Conversion of heat to sound at mid-audio frequencies" (B. McLaughlin and O.G. Symko), "Pressurization of high-frequnecy acoustic heat engines for power applications" (N.D. Webb and O.G. Symko), "Minature acoustic prime mover operating at 10kHz" (M.L Flitcroft and O.G. Symko).
- Acoustical Society of America Meeting, Portland, Oregon, May 2009, "Particle Image Velocimetry study of acoustic field in miniature traveling wave device" (I.A. Rodriguez & O.G. Symko);"Coupling mid-audio frequency thermoacoustic prime movers" (B. Gillman & O.G. Symko); "Miniature traveling wave thermoacoustic engines" (I.A. Rodriguez & O.G. Symko); "Ultrasonic thermoacoustic prime movers" (M. Flitcroft & O.G. Symko); "Helmholtz-like resonators for thermoacoustic prime movers" (B. Andersen & O.G. Symko).
- Acoustical Society of America, San Antonio, Texas, October 2009, "Effects of Heat Exchanger Size on Gain of Thermoacoustic Prime Mover" B.J. Anderson and O.G. Symko, J.A.S.A. 126, 2161 (2009)
- APS March Meeting, Portland, Oregon, March 19 (2010), "Heat to Electricity Using Thermoacoustics", I. Rodriguez and O.G. Symko
- 7th International Conference on Heat Transfer, Fluid Mechanics, and Thermodynamics, HEFAT, Antalya, Turkey, July 19, 2010 "Miniaturized Acoustic Traveling Wave Heat Engine", I.A. Rodriguez and O.G. Symko, (2010)
- 17th International Conference on Sound and Vibrations, ICSV17, Cairo, Egypt, July 21, 2010 "High Frequency Thermoacoustic Devices", O.G. Symko, "Teaching Acoustics at the Undergraduate Level" (Invited Talk), O.G. Symko
- Acoustical Society of America Meeting, Sand Diego, California, November 2, 2011 "Synchronization of Ultrasonic Thermoacoustic Devices", M. Flitcroft and O.G. Symko, "Performance of Thermoacoustic Device and Its Thermal Contact to a Source", I. Rodriguez, O.G.

Symko, and M. Flitcroft.

- 9th International Conference HEFAT 2012 (Heat Transfer, Fluid Mechanics, and Thermodynamics), Malta, July 2012, "Optimization of Thermoacoustic Heat Engines for Energy Conversion", O.G. Symko and I. Rodriguez. (Outstanding paper award).
- Am. Phys. Soc. March Meeting 2014, Denver, "Raising Power Output in an acoustic Energy Converter" (M. Primrose and O.G. Symko)
- APS Four Corners Meeting, October 17, 2014, Invited Talk, "Development of Miniature Acoustic Energy Converter".
- Acoustical Society Meeting in Salt Lake City, May 2016, "Entrainment of Two Thermoacoustic Engines", M. Flitcroft. B. Gilman, I. Rodriguez, O.G. Symko, C. Wilson
- APS March Meeting, March 2019, Boston, "Development of Thermoacoustic Arrays for Power. O.G. Symko and Seo Ahn.

ACHIEVEMENTS.

Orest G. Symko, Professor of Physics.

- Development of Refrigeration Technologies.
  (i) Nuclear Cooling, Ph.D. thesis 1967; first demonstration of nuclear cooling of bulk samples; thesis was "cook-book" for all research groups starting in this new field.

  (ii) Developed with J. Wheatley and L. DeLong in 1971 a 1K evaporative cooler which is used now in all low temperature experiments.

  (iii) Developed with J. Wheatley and R. Johnson in 1970 cooling process for liquid and solid ^{3}He to ultra low temperatures, by squeezing on the liquid; studied melting curve of ^{3}He.

  (iv) Developed in 2000, high-frequency thermoacoustic devices for small scale applications such as thermal management and energy conversion; is the pioneer of this field.

- Superconductivity.
  (i) Long Josephson junctions: basic phenomena and applications to electronics, analog-to-digital.

  (ii) High Tc superconductors: properties and microwave losses, applications.

  (iii) Applications of SQUIDS to magnetic resonance detection.

- Magnetism.
  (i) Spin glasses.

  (ii) Very dilute magnetic alloys.

  (iii) Magnetic semiconductors.

  (iv) Biomagnetism.

  (v) Magnetism of Paintings

New Materials.

(i) Quasicrystals: developed with T. Klein the process for making thin films of quasicrystals, two patents with over 24 claims, applications to coatings of surgical blades, frying pans, low friction coatings, etc.

(ii) Basic studies of quasicrystals: optical, scanning tunneling microscope, atomic force microscope, friction, surface properties, transport properties.

Centers.

Utah State Center of Excellence.

"Center for Acoustic Cooling Technology" in Physics Department, University of Utah – Director since 2000-2005. This center is funded by the state for industrial application of high frequency thermoacoustic

technology.

TAPEC (Thermo Acoustic Piezoelectric Energy Conversion), Ear-marked funds, supported by U.S. Army Space & Missile Defense Command. 5-year project on conversion of waste heat to electricity, multi-million dollar project, collaboration with University of Mississippi and Washington State University. This center is at the University of Utah; it has 6 graduate students, 1 post-doctoral fellow, 1 engineer, 1 technician, 1 administrative assistant and the P.I.

SUMMARY OF CONTRIBUTIONS AT UNIVERSITY OF UTAH

Teaching Contributions

- Developed course, "Physics of Music," PY-311
- Developed course, "Physics for Scientists and Engineers" for physics majors, PY-271, 272, 273.
- Co-developer of Master of Instrumentation Program
- Director of Master of Instrumentation Program, 1978-1988
- Developed graduate course "Electric and Magnetic Transducers," PY-577
- Developed course "Physics of Hi-Fi" which is now called "Physics of Audio and Video: from Analog to Digital" and associated lab, 1977-present. Over 10,000 students have taken this course.
- Developed course, "Introduction to Digital and Audio and Video: Bits and Bytes of Physics," and associated lab, LE-230, 1991.
- Wrote Textbook "Physics of Hi-Fi," 1995, Kendall-Hunt.
- Development of course "Digital Audio & Video", 2009.

Research Contributions

- Set up ultra low temperature laboratory based on 3He – 4He dilution refrigerator
- Development of SQUID magnetometry and its applications to magnetic resonance, magnetic studies, and biophysics.
- Set up of thin-film facility for studies of superconducting electronics based on Josephson Junctions.
- Studies of High-Tc Superconductors, magnetic shields, microwave absorption.
- Development of a facility for the fabrication and study of thin films of quasicrystals
- Set up Center for Acoustic Cooling Technology. It is a Center of Excellence funded by the State of Utah for the development and industrialization of miniature thermoacoustic devices for thermal management and energy conversion; it is in its fifth year.
- TAPEC (Thermo-Acoustic-Piezo Energy Conversion): P.I. in a collaboration of University of Utah with University of Mississippi and Washington State University for the development of light high power density sources of electricity from heat and heat management in radar installation for Army Missile Defense System. It is a multi-million dollar project with one million appropriated for the first year. It deals with power generation from waste heat using acoustic energy converters.
- Industrialization of Thermoacoustic Devices for thermal management of waste heat in computers, lap-tops, and high power electronics, and for direct heat to electricity conversion in power plants.

Service to University and Community

- Referee for: Physical Review Letters, Physical Review, Journal of Applied Physics, Journal of Low Temperature Physics, Review of Scientific Instruments, Superconductor Science and Technology, Journal of Physics, Philosophical Magazine, Journal of Power and Energy, Journal of Mechanical Engineering, Science, Proc. of the Royal Society of London.
- Editorial Board of Review of Scientific Instruments, 1988-1990
- Panel Member of National Research Council Fellowships, 1998-2005

- Served on University Committees such as Senate, Executive Committee of Senate, University Teaching Committee, Science General Education Committee, University review of Electrical Engineering, review of Continuing Education Program, College of Science RTP Committee, Bachelor of University Studies Committee, Personnel and Elections Committee, University Committee on the Tanner Lectures on Human Values.
- Popular lectures at annual Science Day at the University of Utah.
- Popular lectures to Summer School High school students (annual), to University freshmen, at Junior Science Symposia, to local High schools.
- Frontiers of Science Lecture, University of Utah, November 28, 2007

OREST G. SYMKO

STUDENTS:

- Ruiyong Li
- Dan Dolan
- Jeff Day
- Michelle Bullock
- Ed Jaehne
- Miguel Novak
- Ludi Baselgia
- Ehab Abdel-Rahman
-Brigham Stoker
- Bill Lee
- Tracy Steelhammer
-John Gerhke
- Steve Pearce
- Mark Green
- Angie Russell
- Mark Reeve
- Ivan A. Rodriguez
- Bonnie McLaughlin
- Brenna Gilman
- Young Sang Kwon
- Nicholas Webb
- Ivanna Korovyanko
- Wu Wei Yang
- Snezhana Zudova
- Ntsanderh Christian Azenui
- Michael Barbarian
- Hussam El-Gendy
- Myra Flitcroft
- Marie Urry
- Wanjun Park

POST-DOCS:

- Thierry Klein
- Chris Doran
- Larry Moberly
- Steve Kral
- Ehab Abdel-Rahman
- Miguel Novak
- Wei Yeh
- DeJuan Zheng
- Bao Shan Han
- Jean-Pierre van der Weid
- Laurence Lyard
- Ivan Rodriguez
- Roy Roshko
-