James M. Wilkes, aka Mike Wilkes circa: 6/26/2022
What follows was resurrected from the remnants of an old resumé

WHERE HAVE I BEEN ALL MY LIFE?

Then again, why would anyone be interested?

I was born in Colorado in 1944 (a pre-Boomer baby), and lived until about age 16 in and around the western Kansas prairie town of Dodge City. That year we moved to Emporia on the east side of the state, where I graduated from high school in 1962. I lived at home while completing bachelor's degree work in 1966 at the Kansas State Teachers College (now Emporia State University), majoring in physics. After graduating, I attended one semester of graduate school in physics at the University of Kansas, then married and moved to Wichita, where I received a Master's degree in physics from Wichita State University in 1968. Two weeks after accepting a job at White Sands Missile Range (WSMR) near Las Cruces, New Mexico in late 1968, I was drafted and spent nearly three years in the Army (it was the Viet Nam war era . . . scary times, but I was fortunate in spending my entire military service stateside).

I returned to WSMR after discharge from the Army in late 1971, where I worked for about three years, then quit to return to graduate school in mathematics at New Mexico State University (NMSU) in Las Cruces. There I spent a year as a full-time student, then returned to WSMR in 1975, continuing to do graduate work in math part-time. I completed a Master's degree in mathematics at NMSU in 1978, and left WSMR in 1981 to work for the Agricultural Research Service, Cotton Ginning Research Laboratory, in Las Cruces.

I switched studies again, this time from math to electrical engineering, then finally back to physics in 1983, as I began pursuit of a doctorate part-time at NMSU. My PhD in physics was completed at NMSU in 1988, and I went to work at the High Energy Laser System Test Facility (HELSTF), located on White Sands Missile Range. I left HELSTF in 1992 to accept a research physics position at the Air Force Research Laboratory, Kirtland Air Force Base, in Albuquerque, New Mexico, where I retired from Federal Government service in 2002. I continued working as a consultant for SRI International, formerly Stanford Research Institute, in Albuquerque for three years after retiring, then finally retired "for good" and moved to upstate New York for less than a year (the weather was unbearable). We left the gloom of New York behind for the Sunshine State of Florida and its Treasure Coast in May 2006, where I began working part-time as an Adjunct instructor for Indian River State College (IRSC), Fort Pierce, in the Fall of 2006. I began tutoring in math and physics at the Academic Support Center (ASC) of IRSC's Chastain campus in 2008, which continued until the Covid-19 pandemic struck in early 2020.

During the years 1978–2005 I pursued independent research in theoretical physics and applied mathematics, often in collaboration with former teachers/mentors from New Mexico State University. Mathematics professor Dr. Joseph D. Zund, and my physics dissertation advisor, Dr. Richard L. Ingraham, both of whom retired from NMSU (each passing away in 2014), were major influences in my life. I miss their presence very much these days. Another defining experience personally and professionally was my association and collaboration with Dr. Christopher H. M. Jenkins while at the Air Force Research Laboratory. Dr. Jenkins recently retired as Professor and Head of the Department of Mechanical and Industrial Engineering at Montana State University in Bozeman, and remains a close friend.

I consider myself a lifelong learner with a passion to understand things, enjoying the challenge of a difficult problem, and tenacious in the pursuit of a solution. That doesn't mean I am always successful, far from it. I was inactive in research from around 2005 to 2016, most of my time at the ASC being occupied in trying to clarify to myself and students the most rudimentary elements of physics and mathematics.

To my surprise, in 2015 I met (through the Quora website) a brilliant young student of physics and mathematics, Mr. Siddhant Das. I had gotten interested in Quora as a question and answer forum, and at some point decided to try my hand at answering some of the questions concerning math and physics. These were posted for the most part by students, sometimes as homework problems they were needing help with. For anyone curious about it, this is the link to my profile page, specifically to questions I have answered (you will have to highlight the whole URL, then copy and paste it into a browser window in order to see it):

`https://www.quora.com/profile/Mike-Wilkes/answers`

It will give you an idea of the types of problems being posted there. At other times, the questions were more formidable, involving sometimes quite advanced techniques. This is the particular problem that led to my meeting Siddhant :

https://www.quora.com/How-can-I-integrate-the-following-displaystyle-int_-0-infty-frac-1-sqrt-2-pi-s-e-z-2-2s-cdot-frac-1-2-e-s-2-ds

We continued to correspond, and in 2016 I began working with him on trying to extend some research he had published earlier. This continued for several months with not much success, and he moved on to studying the fascinating topic of arrival time experiments, using Bohmian Mechanics (an alternative to orthodox quantum mechanics). This work will soon be the subject of his PhD dissertation at the Mathematisches Institut, Ludwig-Maximilians-Universitat München (LMU for short) in Munich, Germany. My informal collaboration with him eventually led me to write a *review paper* on the fundamental equation governing the quantum mechanics of this topic (the Pauli equation), which was published in 2020 by the European Journal of Physics. It had been some 16 years since my last publication in a refereed professional journal. I must say that the past few years have been some of the most satisfying of my career. For that, I am especially thankful to Siddhant and his late (and truly great) dissertation advisor, Professor Detlef Dürr. Perhaps it is not over for me yet.

WHAT DID I USED TO KNOW?

Fields of specialization and interest: (1) Applied Mathematics: tensor analysis; exterior differential calculus, (2) Continuum Mechanics: linear and geometrically nonlinear theories of membrane, plate, and shell laminates; asymptotic methods; fluid flow and structure interactions, and (3) Theoretical Physics: electrodynamics of continuous media; vector diffraction theory; Newman-Penrose formulation of general relativity.

Computer skills: Experience with Linux, Mac, and Windows operating systems; MS Word, Excel, PowerPoint; FORTRAN programming; LaTeX typesetting program; Mathematica; Internet; File conversions from/to dvi, ps (PostScript), pdf, and eps (Encapsulated PostScript) formats; learning to program the TI-83/TI-84 graphing calculators, and teaching myself functional programming using Haskell.

EDUCATION DETAILS

Bachelor of Arts (Physics), Kansas State Teachers College, Emporia, KS 1966

Master of Science (Physics), Wichita State University, Wichita, KS 1968

Master of Science (Mathematics), New Mexico State University, Las Cruces, NM 1978

Doctor of Philosophy (Physics), New Mexico State University, Las Cruces, NM 1988

PROFESSIONAL EXPERIENCE

Senior Technical Advisor • 2002 - 2005

SRI International • 1611 North Kent St, Arlington, VA 22209

Air Force Research Laboratory • Kirtland Air Force Base, NM 87117-5776

Developed a fluid-structure interaction theory to aid in understanding the damping and stiffening effects of air on vibrations of an adaptive membrane mirror. Completed an extensive two-volume Air Force Research Laboratory

(AFRL) Technical Report detailing development of theories and solutions applicable to the analysis and modeling of large lightweight optical quality mirrors. Received third-year Air Force Office of Scientific Research (AFOSR) award of $70,000 in FY 2003 to continue research program on initially curved stress-coated membranes. Initiated research program to analyze the effects of slewing forces and vibrations on the surface shapes of large lightweight optical quality membrane mirrors.

Research Physicist • 1992 - 2002 (Retired, Federal Civil Service, 2002)

Air Force Research Laboratory • Kirtland Air Force Base, NM 87117-5776

Derived, by asymptotic methods, linear and geometrically nonlinear theories of initially curved stress-coated membranes for use in designing and analyzing near-net-shape optical quality membranes. AFOSR award of $70,000 in FY2001, and $72,000 in FY 2002, to pursue this work. Applied the Hencky-Campbell power series solutions of geometrically nonlinear membrane theory to the understanding of membrane reflector optics, and the design of laboratory experiments to characterize the optical performance of a membrane reflector. Applied vector diffraction theory to derive expressions for the diffraction pattern and diffraction efficiency of ferroelectric liquid crystal-based spatial light modulators used for real-time holographic correction of residual membrane reflector aberrations.

Physicist • 1989 - 1992

High Energy Laser Systems Test Facility • White Sands Missile Range, NM 88002-5148

Developed a model of heat conduction in a heavy metal fluoride glass window irradiated by a high-energy laser, to explain anomalous thermocouple data from tests. Provided expertise in the analysis of fracture strength data on heavy metal fluoride glass samples. Managed contractors in a project to provide real-time telemetry data from scanning spectrometers directly to the central data acquisition and processing system.

Research Physicist • 1981 - 1989

USDA Southwestern Cotton Ginning Research Laboratory • Mesilla Park, NM 88047

Developed theory relating interferometer and transverse area measurements to the indices of refraction of multiple-index fibers of irregular transverse cross-section, establishing the theoretical foundations necessary for the interpretation of interferograms produced by naturally occurring irregular fibers such as cotton. Provided theoretical analysis for the real-time prediction of moisture content from measurements of phase angle and bulk density made by the electronic and pneumatic subsystems of an electronic cotton moisture measuring system. Provided analysis of the fluid flow properties of a fluidic permeability measurement bridge. Co-owner of patent on this device: Waldie, A.H., Gillum, M.N., and Wilkes, J.M., Fluidic Permeability Measurement Bridge. U.S. Patent No. 4,649,738 issued March 17, 1987.

Physicist • 1971 - 1981

ARMTE Simulation Branch • White Sands Missile Range, NM 88002

Developed mathematical models of ground-to-air guided missiles and their supportive subsystems (ground-based guidance computer software, and tracking radar). Analyzed and compared simulation predictions and fight test data. Authored technical report describing a controlled test vehicle Patriot missile model, and the programming of this model. Verified by an independent derivation the optimal control algorithm used in the Patriot missile system. Derived the general expression for a three-angle rotation matrix, and implemented this algorithm as a FORTRAN subroutine (this work was published in 1979, and selected by the Soviets for translation verbatim into Russian and subsequent republication in their journal Rocket Technology and Cosmonautics, June 1979).

TEACHING EXPERIENCE

Indian River State College • Fort Pierce, FL 34981

• Adjunct Faculty Member, Academic Support Center, 2008-Present. I have been tutoring math and physics at the Chastain campus ASC since the Fall of 2008.

• Adjunct Faculty Member, Departments of Mathematics and Physics, 2006-2008. Taught MAT1033 (Intermediate Algebra), MAC1105 (College Algebra), and PHY1020 (Principles of Physics).

Albuquerque TVI and Community College • Albuquerque, NM 87106

• Part-time faculty member, Department of Mathematics, 1995-1998. Taught Math 120 (Intermediate Algebra) and Math 121 (College Algebra).

New Mexico State University • Las Cruces, NM 88003

• Graduate Teaching Assistant, Department of Mathematics, 1975. Taught Math 125 (Mathematics for Business Majors), which included introductions to calculus, linear programming, and probability and statistics.

PUBLICATIONS

1. **Wilkes, J. M.**, "Rotations as solutions of a matrix differential equation," American Journal of Physics 46(6), 685-687 (1978).
2. **Wilkes, J. M.**, and Zund, J. D., "A note on the Ruse-Lanczos identity," Tensor, N.S. 32(3), 355-356 (1978).
3. **Wilkes, J. M.**, "Comments on Sen's dual-spin spacecraft dynamics," IEEE Transactions on Aerospace and Electronic Systems 14(5), 819-821 (1978).
4. **Wilkes, J. M.**, "General expression for a three-angle rotation matrix," Journal of Guidance and Control 2(2), 156-158 (1979).
5. **Wilkes, J. M.**, and Zund, J. D., "Maxwell's equations and Meray's theorem," Tensor, N.S. 34(1), 58-62 (1980).
6. Debney, G. C., **Wilkes, J. M.**, and Zund, J. D., "A spin-coefficient approach to Type N fields with twist," Tensor, N.S. 35(3), 267-275 (1981).
7. **Wilkes, J. M.**, and Zund, J. D., "Group-theoretic approach to the Schwarzschild solution," American Journal of Physics 50(1), 25-27 (1982).
8. **Wilkes, J. M.**, and Zund, J. D., "Type N twist-free Hauserlike gravitational fields," Tensor, N.S. 37(1), 16-18 (1982).
9. Debney, G. C., **Wilkes, J. M.**, and Zund, J. D., "A type III solution with twist," Tensor, N.S. 37(1), 90-92 (1982).
10. **Wilkes, J. M.**, and Zund, J. D., "An operator derivation of some Kronecker delta identities," Tensor, N.S. 37(1), 162-164 (1982).
11. Debney, G. C., **Wilkes, J. M.**, and Zund, J. D., "A derivation of Hauser's differential equation in general relativity," Tensor, N.S. 38, 159-162 (1982).
12. **Wilkes, J. M.**, "Calculating fiber index of refraction from laser back-scattering data," Textile Research Journal 52(7), 481-482 (1982).
13. **Wilkes, J. M.**, and Zund, J. D., "A new form of the Hauser type N solution in general relativity," Letters to Nuovo Cimento 36(12), 382-384 (1983).
14. **Wilkes, J. M.**, and Zund, J. D., "General transformation formulae for spin-coefficients," Tensor, N.S. 42, 35-41 (1985).
15. **Wilkes, J. M.**, and Zund, J. D., "A theorem on rigorously spherically symmetric electromagnetic fields," Tensor, N.S. 42, 83-85 (1985).
16. **Wilkes, J. M.**, "Theory of the interferometric determination of the refractive indices of multiple-index fibers having irregular transverse cross sections," Textile Research Journal 55(10), 601-606 (1985).

17. **Wilkes, J. M.**, "Derivation of a formula used to interpret interferometric data on fibers of irregular transverse cross section," Textile Research Journal 55(11), 712 (1985).

18. **Wilkes, J. M.**, and Waldie, A. H., "Analysis and modeling of an on-line cotton moisture measuring system," Textile Research Journal 57(1), 29-39 (1987).

19. Ingraham, R. L., and **Wilkes, J. M.**, "Inhibition of degeneracy by intense magnetic fields: derivation and astrophysical application," Astrophysics and Space Science 135, 87-104 (1987).

20. Zund, J. D., and **Wilkes, J. M.**, "The significance and generalization of two transformation formulas in Hotine's mathematical geodesy," Bolletino di Geodesica e Scienze Affini 47(1), 77-86 (1988).

21. **Wilkes, J. M.**, and Zund, J. D., "A differential form approach to the Newman-Penrose method of spin coefficients I: General Theory," Tensor, N.S. 47, 1-7 (1988).

22. **Wilkes, J. M.**, and Zund, J. D., "A differential form approach to the Newman-Penrose method of spin coefficients II: Applications," Tensor, N.S. 47, 8-19 (1988).

23. Zund, J. D., Rogers, G. S., and **Wilkes, J. M.**, "Oblique leg systems and parametric adjustment theory," Bolletino di Geodesia e Scienze Affini 48(1), 1-26 (1989).

24. **Wilkes, J. M.**, and Ingraham, R. L., "Ripple structure in degenerate electron gas-dominated stars with intense magnetic fields," Astrophysical Journal 344, 399-403 (1989).

25. Ingraham, R. L., and **Wilkes, J. M.**, "Quantum Hall effect at finite temperatures," Physical Review B 41(4), 2229-2233 (1990).

26. **Wilkes, J. M.**, and Zund, J. D., "A differential form approach to the Newman-Penrose method of spin coefficients III: Flat Spacetime," Tensor, N.S. 49(2), 198-203 (1990).

27. **Wilkes, J. M.**, and Zund, J. D., "Specializations of Hotine's (ω, φ, N) coordinate system in differential geodesy," Bolletino di Geodesia e Scienze Affini 53(3), 245-263 (1994).

28. **Wilkes, J. M.**, and Zund, J. D., "Bromwich's method for solving the source-free Maxwell equations," Tensor, N.S. 55(2), 192-196 (1994).

29. **Wilkes, J. M.**, and Zund, J. D., "The significance and generalization of two transformation formulas in Hotine's mathematical geodesy-II," Bolletino di Geodesia e Scienze Affini 54(3), 1-8 (1995).

30. **Wilkes, J. M.** and Zund, J. D., "A note on the existence of a canonical form for the curvature tensor in Riemannian geometry," Tensor, N.S. 60(2), 1998.

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33. Ash, J. T., Jenkins, C. H., Marker, D. K., and **Wilkes, J. M.**, "Shape achievement of optical membrane mirrors using coating/substrate intrinsic stresses," AIAA Journal of Spacecraft and Rockets, 41(4), 551-557, 2004.

34. **Wilkes, James M.**, "The Pauli and Lévy-Leblond equations, and the spin current density," European Journal of Physics, 41, 2020.

OTHER WORK

- Gruneisen, M. T. and **Wilkes, J. M.**, "Compensated Imaging by Real-Time Holography with Optically Addressed Spatial Light Modulators," in Spatial Light Modulators, G. Burdge and S. C. Esener, eds., OSA TOPS 14, 220-226, 1997.
- Marker, D. K., Carreras, R. A., **Wilkes, J. M.**, Jenkins, C. H., Duneman, D., Rotgé, J. R., and Hogge, C. B., "Optical Evaluation of Membrane Mirrors with Curvature," in Novel Optical Systems and Large-Aperture Imaging, K. D. Bell, M. K. Powers, and J. M. Sasian, eds., Proceedings of the SPIE 3430, 202-208, 1998.
- Jenkins, C. H., Marker, D. K., and **Wilkes, J. M.**, "Improved Surface Accuracy of Precision Membrane Reflectors through Adaptive Rim Control, " in AIAA Adaptive Structures Forum, AIAA Paper 98-1083 (A98-24233), 1998.
- **Wilkes, J. M.**, "Applications of power series solutions of membrane equilibrium equations to the optical evaluation of membrane mirrors with curvature," Technical Report AFRL-DE-PS-TR-1998-1069, Air Force Research Laboratory, December 1998.
- Gruneisen, M. T., Wick, D. V., Martinez, T., and **Wilkes, J. M.**, "Correction of Large Dynamic Aberrations by Real-Time Holography Using Electro-Optical Devices and Nonlinear Media," in Artificial Turbulence for Imaging and Wave Propagation, J. D. Gonglewski and M. A. Vorontsov, eds., Proceedings of the SPIE 3432, 137-150, 1998.
- Rotgé, J. R., Marker, D. K., Carreras, R. A., **Wilkes, J. M.**, and Duneman, D., "Large Optically Flat Membrane Mirrors," in High-Resolution Wavefront Control: Methods, Devices, and Applications, J. D. Gonglewski and M. A. Vorontsov, eds., Proceedings of the SPIE 3760, 207-212, 1999.
- **Wilkes, J. M.**, Jenkins, C. H., Marker, D. K., Carreras, R. A., Duneman, D. C., and Rotgé, J. R., "Concave Membrane Mirrors from Aspheric to Near-Parabolic," in High-Resolution Wavefront Control: Methods, Devices, and Applications, J. D. Gonglewski and M. A. Vorontsov, eds., Proceedings of the SPIE 3760, 213-223, 1999.
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- **Wilkes, J. M.**, "Mechanics of a Near Net-Shape Stress-Coated Membrane. Volume II: Boundary Value Problems and Solutions," Technical Report AFRL-DE-PS-TR-2002-1063, Vol. II, Air Force Research Laboratory, June 2003.
- Gunderson, L., Jenkins, C. H., **Wilkes, J. M.**, and Marker, D. K., "Pressure-Augmented Near Net-shape Membrane Mirror," in 45th AIAA Structures, Structural Dynamics, and Materials Conference, AIAA Paper 2004-1501, 2004.

Did I hear someone cry "uncle"? Or was it "dear God will this ever end?"