**CURRICULUM VITA: Richard Jeffrey Wilkes**

**Personal Data:** Born in Chicago, Illinois, October 18, 1945
Married, two children
U.S. citizen

**Education:** BSE(EE), University of Michigan, College of Engineering, 1967
MS (Physics), University of Wisconsin, Madison, 1969
PhD (Physics), University of Wisconsin, Madison, 1974

**Employment:**
Professor Emeritus, Univ. of Washington, Dept. of Physics, 2016-
Kenneth K. Young Memorial Professor, Univ. of Washington, Dept. of Physics, 2001-
Research Professor, Univ. of Washington, Dept. of Physics, 1991-2001
Research Associate Professor, Univ. of Washington, Dept. of Physics, 1988-91
Senior Research Associate, Univ. of Washington, Dept. of Physics, 1984-88
Research Scientist, Univ. of Washington, Dept. of Physics, 1980-84
Research Associate, Univ. of Washington, Dept. of Physics, 1974-80

**Research interests and activities**

Current interests (since 2000) focus on neutrino and ultra-high energy particle astrophysics, accelerator beam studies of neutrino oscillations, and public outreach activities:

Neutrino physics and astrophysics.

- T2K Collaboration: 2nd-generation long-baseline neutrino oscillations experiment, US-Japan-Korea-Canada-UK-EU-Russia; chair of publication policy committee, chair of shift policy committee; 2002--
- Super-Kamiokande: Underground solar and atmospheric neutrino detector, proton decay detector; US-Japan Collaboration, 1994--
- K2K Collaboration: Long-baseline neutrino oscillations experiment, US-Japan-Korea Collaboration; US co-Spokesman, member of Executive Committee. 1996--2005
- DUMAND: Deep Undersea Muon and Neutrino Detector, Hawaii, 1990--1994

Ultra-high energy cosmic ray studies using secondary-school based detector networks.
Outreach programs to connect high school physics teachers and students with cosmic ray research:

- WALTA (Washington Area Large Time-coincidence Array), Project Director.1998-2016
- SALTA (Snowmass Area Large Time-coincidence Array), Project co-Creator and Director (with Gregory Snow, U. Nebraska), workshop for local teachers and students held during Snowmass 2001 - Summer Conference on the Future of Particle Physics

Summary of past research areas (prior to 1990)

Interactions and spectra of primary cosmic rays using balloon-borne particle detectors.

- JACEE (Japanese-American Cosmic ray Emulsion chamber Experiment; US Spokesman), 1979-1997.
- US-Japan Primary Electron Collaboration, 1974-81

Accelerator studies of lepton-nucleus interactions

- Fermilab E382 (muon interactions in nuclear emulsion stacks), US-Poland collaboration, 1978-1980
- Fermilab E664 (neutrino interactions in 15' bubble chamber with hybrid emulsion target), US-USSR-Poland collaboration, 1982--1986)
- Fermilab E665 (deep inelastic muon scattering), International collaboration, 1980--

Accelerator studies of hadron-nucleus interactions in nuclear emulsion detectors

- EMU-01 Collaboration (US-Sweden-Russia-China-India-Germany collaboration; US Spokesman), 1986-1990.
- Fermilab: Twelve separate experiments, all involving exposure of emulsion detectors to various particle beams, 1975--1990

**Teaching and University service activities**

- Chair, UW Faculty Senate Council on Teaching and Learning, 2014--2017
- Member, UW Faculty Senate Committee on Education and Outreach, 2003—2010; reorganized as UW Faculty Senate Committee on Teaching and Learning, 2010—.
- Chair and coordinator, UW Physics Professional MS Degree Program, 2009—2021
- UW Lifelong Learning Award, Selection Committee, member, 2007--2016
- 47 years experience teaching a wide range of undergraduate and graduate physics courses.
- Other UW Physics Dept. faculty committee chairs held: Technical Services (Shop) Committee (1994-2000), Safety Committee (1990-94).

**Other professional and community service activities:**

- Member, Puget Sound/BC chapter of Marine Technology Society.
- Educational outreach activities (lectures, demonstrations, creation of web content) for primary and secondary schools; member of public website committee in T2K Collaboration.
- Consulting work on underwater acoustics and environmental noise measurement.
- Review panel chair for NASA, review panel member for NSF, DOE, US Antarctic Program, and Australian funding agencies.
- Referee for major international physics journals; book reviewer for Oxford Press.

**Prizes and Awards:**

Co-recipient (member of T2K and Super-Kamiokande collaborations): 2016 Breakthrough Prize in Fundamental Physics
Co-recipient (T2K): Le Prix La Recherche, (France), 2012
Co-recipient (Super-Kamiokande): Asahi Science Prize (Japan), 1998.

**Patent held:**

US Patent 5,469,403, "Digital sonar system", with K. K. Young. Awarded November 21, 1995. Assignee: Board of Regents of the University of Washington (Seattle, WA).

**R. Jeffrey Wilkes: Selected Publications**
(since 2000 only, except for earlier papers with exceptional numbers of citations)

**Journal articles (refereed)**

1. "Emulsion Chamber Observations of Primary Cosmic Ray Electrons in the Energy Range 30-1000 GeV." J. Nishimura, et al, Astrophysical Journal 238, 394 (1980).
2. "Extremely High Multiplicities in High-Energy Nucleus-Nucleus Collisions", T.H. Burnett, et al, Physical Review Letters, 50, 2062 (1983).
3. "Evidence for oscillation of atmospheric neutrinos", The Super-Kamiokande Collaboration, Phys.Rev.Lett. 81 (1998) 1562-1567
4. "Search for Proton Decay via p -> e+ $p^0$ in a Large Water Cherenkov Detector", The Super-Kamiokande Collaboration, Phys.Rev.Lett. 81 (1998) 3319-3323.
5. "Comments on Antarctic Long-Duration Balloon Flights", R. J. Wilkes, Adv. Sp. Res. 26 (2000) 1349.
6. "GPS Time Synchronization System for K2K", H. G. Berns and R. J. Wilkes, IEEE Trans. Nucl. Sci. 47 (2000) 340.
7. "Design, construction and operation of SciFi tracking detector for K2K experiment", A.Suzuki et al. (K2K collab.), Nucl.Instrum.Meth. A453 (2000)165-176.
8. "Tau Neutrinos Favored over Sterile Neutrinos in Atmospheric Muon Neutrino Oscillations", Phys. Rev. Lett. 85 (2000) 3999-4003.
9. "Design, Construction, and Operation of SciFi Tracking Detector for K2K Experiment", Suzuki, A. et al. (K2K Collaboration, Nuclear Instruments & Methods in Physics Research, Section A (Accelerators, Spectrometers, Detectors and Associated Equipment), v 453, n 1-2, 11 Oct. 2000, p 165-76.
10. "Search for Neutrinos from Gamma-ray Bursts using Super-Kamiokande", Fukuda, S. et al. (Super-Kamiokande Collaboration) Astrophysical Journal, v 578, n 1, pt.1, (2002) p 317-24.
11. "Indications of Neutrino Oscillation in a 250 km Long-Baseline Experiment", Ahn, M.H. et al. (K2K Collaboration) Phys. Rev. Lett., v 90, n 4, (2003) p 041801/1-5.
12. "Search for Supernova Relic Neutrinos at Super-Kamiokande", Malek, M. et al. (Super-Kamiokande Collaboration), Phys. Rev. Lett., v 90, n 6, (2003) p 061101/1-5.
13. "The Super-Kamiokande Detector", The Super-Kamiokande Collaboration, Nucl.Instrum.Meth. A501 (2003) 418-462.

14. "Search for Electron Neutrino Appearance in a 250 km Long Baseline Experiment", The K2K collaboration, M.H. Ahn et al, Phys. Rev. Lett. 93 (2004) 051801.
15. “Evidence for an oscillatory signature in atmospheric neutrino oscillation”, The Super-Kamiokande Collaboration, Phys.Rev.Lett. 93, 101801 (2004).
16. “Search for Dark Matter WIMPs using Upward Through-going Muons in Super-Kamiokande”, The Super-Kamiokande Collaboration, Phys.Rev. D70 (2004) 083523.
17. “Low-Cost Data Acquisition Card for School-Network Cosmic Ray Detectors”, S. Hansen, T. Jordan, T. Kiper, D. Claes, G. Snow, H. Berns, T. H. Burnett, R. Gran, and R. J. Wilkes, IEEE Trans. On Nucl. Sci. 51, 926 (2004).
18. “WALTA school-network cosmic ray detectors”, R. J. Wilkes, H.-G. Berns, T. H. Burnett, R. Gran, IEEE Trans. On Nucl. Sci. 51, 1385 (2004).
19. “Evidence for muon neutrino oscillation in an accelerator-based experiment”, K2K Collaboration, E. Aliu, et al, Phys. Rev. Lett. 94 (2005) 081802.
20. “Measurement of Atmospheric Neutrino Oscillation Parameters by Super-Kamiokande I”, Super-Kamiokande Collaboration, Phys.Rev. D71 (2005) 112005.
21. “Search for nucleon decay via modes favored by supersymmetric grand unification models in Super-Kamiokande-I “, Super-Kamiokande Collaboration, Phys.Rev. D72 (2005) 052007.
22. “Search for coherent charged pion production in neutrino-carbon interactions”, K2K collaboration, Phys.Rev.Lett. 95 (2005) 252301.
23. “Measurement of Atmospheric Neutrino Oscillation Parameters by Super-Kamiokande I”, Super-Kamiokande Collaboration, Phys.Rev. D71 (2005) 112005.
24. “Search for nucleon decay via modes favored by supersymmetric grand unification models in Super-Kamiokande-I “, Super-Kamiokande Collaboration, Phys.Rev. D72 (2005) 052007.
25. “Solar neutrino measurements in Super-Kamiokande-I”, Super-Kamiokande Collaboration, Phys. Rev. D73, 112001 (2006).
26. “Improved search for muon neutrino to electron neutrino oscillation in a long-baseline accelerator experiment”, The K2K collaboration, Phys. Rev. Lett. 96 (2006) 181801.
27. “Three flavor neutrino oscillation analysis of atmospheric neutrinos in Super-Kamiokande”, Super-Kamiokande Collaboration, hep-ex/0604011, Phys.Rev. D74 (2006) 032002.
28. “Measurement of Neutrino Oscillation by the K2K Experiment”, K2K collaboration: M. H. Ahn, et al, hep-ex/0606032, Phys. Rev. D 74, 072003 (2006).
29. “A Measurement of Atmospheric Neutrino Flux Consistent with Tau Neutrino Appearance”, The Super-Kamiokande Collaboration, arXiv:hep-ex/0607059, Phys.Rev.Lett. 97 (2006) 171801.
30. “High energy neutrino astronomy using upward-going muons in Super-Kamiokande-I”, The Super-Kamiokande Collaboration: K. Abe, et al, , arXiv:astro-ph/0606413, Astrophys.J. 652 (2006) 198.
31. “Search for Diffuse Astrophysical Neutrino Flux Using Ultra-High-Energy Upward-Going Muons in Super-Kamiokande I”, The Super-Kamiokande Collaboration: M.E.C. Swanson, et al, , arXiv:astro-ph/0606126, Astrophys.J. 652 (2006) 206-215.

32. "Search for Matter-Dependent Atmospheric Neutrino Oscillations in Super-Kamiokande", The Super-Kamiokande Collaboration, Phys. Rev. D 77, 052001 (2008) , hep-ex/arXiv:0801.0776
33. Observation of the Anisotropy of 10 TeV Primary Cosmic Ray Nuclei Flux with the Super-Kamiokande-I Detector, The Super-Kamiokande Collaboration, Phys.Rev. D 75, 062003 (2007) , astro-ph/0508468
34. Study of TeV Neutrinos with Upward Showering Muons in Super-Kamiokande, The Super-Kamiokande Collaboration, Astropart. Phys. 29, 42 (2008) , hep-ex/arXiv:0711.0053v1
35. "Search for Neutrinos from GRB 080319B at Super-Kamiokande", Super-Kamiokande Collaboration, Astophys. J. 697, 730-734 (2009), arXiv:0903.0624
36. "Search for Astrophysical Neutrino Point Sources at Super-Kamiokande", Super-Kamiokande Collaboration, Astrophys. J. 704 (2009) 503-512, arXiv:0907.1594
37. Atmospheric neutrino oscillation analysis with sub-leading effects in Super-Kamiokande I, II and III, The Super-Kamiokande Collaboration, Phys. Rev. D 81, 092004 (2010), arXiv:1002.3471
38. The T2K Experiment, The T2K Collaboration, Nuclear Instruments and Methods A, 659, 106-135, 2011, DOI 10.1016/j.nima.2011.06.067, arXiv:1106.1238v2.
39. Indication of Electron Neutrino Appearance from an Accelerator-Produced Off-Axis Muon Neutrino Beam, The T2K Collaboration, Phys. Rev. Lett. 107, 041801 (2011)
40. First muon-neutrino disappearance study with an off-axis beam, The T2K Collaboration, Phys. Rev. D 85, 031103(R) (2012) arXiv:1201.1386.
41. The T2K ND280 Off-Axis Pi-zero Detector, The T2K Collaboration, Nuclear Instruments and Methods A 686 (2012) 48–63 DOI: 10.1016/j.nima.2012.05.028
42. Evidence for the Appearance of Atmospheric Tau Neutrinos in Super-Kamiokande, The Super-Kamiokande Collaboration, Phys. Rev. Lett. 110, 181802 (2013), arXiv:1206.0328.
43. Evidence of electron neutrino appearance in a muon neutrino beam, K. Abe et al., (T2K Collaboration), Phys. Rev. D 88, 032002 (2013).
44. Measurement of Neutrino Oscillation Parameters from Muon Neutrino Disappearance with an Off-Axis Beam, K. Abe et al. (T2K Collaboration), Phys. Rev. Lett. 111, 211803 (2013).
45. Precise Measurement of the Neutrino Mixing Parameter θ_{23} from Muon Neutrino Disappearance in an Off-axis Beam, K. Abe, et al (T2K Collaboration), to be published in Phys. Rev. Lett., 2014 (arXiv:1403.1532).
46. Measurements of neutrino oscillation in appearance and disappearance channels by the T2K experiment, K. Abe, et al (T2K Collaboration), Phys. Rev. D 91, 072010 (2015).
47. Upper bound on neutrino mass based on T2K neutrino timing measurements, K. Abe, et al (T2K Collaboration), Phys. Rev. D 93, 012006 (2016), DOI: 10.1103/PhysRevD.93.012006.
48. Real-Time Supernova Neutrino Burst Monitor at Super-Kamiokande, The Super-Kamiokande Collaboration, submitted to Astroparticle Physics Jan/2016 (arXiv:1601.04778).

**Selected Published Conference Papers (since 2000 only)**

1. "Results on Upward-going Muons from Super-Kamiokande", R. Jeffrey Wilkes, invited talk at COSPAR-98, published in Advances in Space Research, 26:1813-1822 (2000).
2. "Results from K2K", R.J. Wilkes for the K2K collaboration), 9th International Symposium on Neutrino Telescopes, Venice, Mar 2001, in "Venice 2001, Neutrino telescopes", vol. 1, pp 179-190.
3. "Simulation of 10-100 TeV Calorimeter Interactions", E. Zager and R. J. Wilkes, Proc 27th ICRC (Hamburg, 2001), p 1437.
4. "New Results from Super-K and K2K", R. J. Wilkes, Proc. 30$^{th}$ SLAC Summer Institute, 2002, SSI-2002-TTH02, Dec 2002; Econf C020805:TTH02,2002, HEP-EX 0212035.
5. "The Washington Large Area Time Coincidence Array", H. G. Berns, et al, Proc 28th ICRC (Tsukuba, 2003), p 1065.
6. "Atmospheric Neutrino Oscillations in SK-I", A. Habig, et al, Proc 28th ICRC (Tsukuba, 2003), p 1255.
7. "A Search for Astronomical Neutrino Sources with the Super-Kamiokande Detector", K. Washburn, et al, Proc 28th ICRC (Tsukuba, 2003), p 1285.
8. "UNO", published in "XIth International Workshop on Neutrino Telescopes", pp 291-310, Istituto Veneto di Scienze, Lettere ed Arti, Venice, 2005.
9. "K2K", R. J. Wilkes, Chapter in "Neutrino Oscillations, Present Status and Future Plans", Jennifer Thomas and Patricia Vahle, eds., World Scientific, 2008.
10. "Next Generation Nucleon Decay and Neutrino Detectors 2006", R. J. Wilkes, ed., AIP Conference Proceedings #994, AIP, New York, 2007.
11. "Recent Results from Super-Kamiokande", "XIVth International Workshop on Neutrino Telescopes", Venice, 2012; published in "Proc. 14th International Workshop on Neutrino Telescopes," p.33, Mezzetto Mauro, ed., Edizione Papergraf, Piazzola sul Brenta, Italy, 2011, ISBN 9788897645016.
12. Time synchronization improvements in the T2K long-baseline neutrino experiment", J. Wilkes, et al, Proc. XV Int. Workshop on Neutrino Telescopes, Proceedings of Science, paper PoS (Neutel conference 2013) 083, 2014.

**Edited Books and Conference Proceedings**

1. "The Sun And Similar Stars: Cosmic Ray Spectra And Composition," J.L. Culhane, R. D. Bentley, G. Doyle and R.J. Wilkes, eds., Proceedings of COSPAR Scientific Assembly, (Nagoya, Japan, 1998), Adv. In Space Research vol. 26, pp 1707-1885, (Pergamon, New York, 2001).
2. "NNN06: Next Generation Nucleon Decay And Neutrino Detectors (Seattle, 2006)", R. J. Wilkes, ed., AIP Conference Proceedings 944 (AIP, New York, 2007).