

August 2019

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CURRENT ACADEMIC POSITION

Professor, Program in the History of Science, Technology, and Medicine & School of Physics and Astronomy,
University of Minnesota.

EDUCATION

Ph.D., 1995 History and Philosophy of Science, University of Pittsburgh. Dissertation: A Comparison
between Lorentz's Ether Theory and Einstein's Special Theory of Relativity in the Light of the Experiments of
Trouton and Noble.

Doctoraal (\approx M.S.), 1988 Theoretical physics, cum laude, Universiteit van Amsterdam. Thesis: Part 1:
Construction of a Symplectic Form on a Manifold of Field Configurations. Part 2: H. A. Lorentz's Attempt to
Give a Coordinate Free Formulation of Einstein's General Theory of Relativity.

Kandidaats (\approx B.S.), 1983 Physics, Universiteit van Amsterdam.

Kandidaats (\approx B.A.), 1982 Philosophy, cum laude, Universiteit van Amsterdam.

PAST ACADEMIC POSITIONS

Visiting Scholar, Max-Planck-Institut für Wissenschaftsgeschichte, Berlin, Spring 2016; academic year
2008–2009; summers 1994–1995, 1998–2007, 2015–2018.

Resident Fellow, Minnesota Center for Philosophy of Science, University of Minnesota, 2000–2018.

Affiliated Faculty Member, Department of Philosophy, University of Minnesota, 2011–2018.

Visiting Fellow, Center for Philosophy of Science, University of Pittsburgh, Fall 2015.

Associate Professor, Program in the History of Science, Technology, and Medicine & School of Physics and
Astronomy, University of Minnesota, 2005–2013 (Assistant Professor, 2000–2005).

Assistant Professor, Department of Philosophy, Boston University, 1997–2000 (Adjunct Assistant Professor,
1995–1997; Associate Director, Center for Einstein Studies, 1997–2000).

Co-Editor, Einstein Papers Project, Princeton University Press, 1998–1999 (Associate Editor, 1995–1998;
Contributing Editor, Summers 1991–1992, Fall 1999).

AWARDS & HONORS

Humboldt Research Award, The Alexander von Humboldt Foundation, 2016
 Corresponding Member, International Academy of the History of Science (elected 2015).
 Fellow, American Physical Society (elected 2010).
 George W. Taylor Career Development Award, Institute of Technology, University of Minnesota, 2005.
 John Clarke Slater Fellowship, American Philosophical Society, 1994–1995.
 Andrew Mellon Predoctoral Fellowship, 1993–1994.
 Fulbright Grant (Graduate Student Category), 1989–1990.

PUBLICATIONS

BOOKS AND EDITED VOLUMES

- *How Einstein Found His Field Equations. A Source Book.* With Jürgen Renn. New York: Springer, under contract.
- *Constructing Quantum Mechanics.* Vol. 1. *The Scaffold, 1900–1923.* Vol. 2. *The Arch, 1923–1927.* With Anthony Duncan. Oxford: Oxford University Press. Vol. 1 forthcoming Fall 2019, Vol. 2 expected 2022.
- *The Collected Papers of Albert Einstein.* Vol. 15. *The Berlin Years: Writings & Correspondence, June 1925–May 1927.* Princeton: Princeton University Press, 2018. Contributing editor. Editors: Diana Kormos Buchwald et al.
- “Making the History of Physics Dirtier: Solid State Physics in the Twentieth Century.” Special issue of *Historical Studies in the Natural Sciences* 45 (2015): 631–804. Co-edited with Joseph D. Martin
 - “Beyond the Crystal Maze: Twentieth-Century Physics from the Vantage Point of Solid State Physics.” With Joseph D. Martin. Pp. 631–640.
- *The Cambridge Companion to Einstein.* Co-edited with Christoph Lehner. Cambridge: Cambridge University Press, 2014.
 - “Introduction.” Pp. 1–37. Janssen, Lehner.
 - “‘No Success Like Failure ...’: Einstein’s Quest for General Relativity, 1907–1920.” Pp. 167–227.
 - “Appendix: Special Relativity.” Pp. 455–506.
- *Einstein’s Zurich Notebook.* Vol. 1, *Introduction and Source*, and Vol. 2, *Commentary and Essays.* Dordrecht: Springer, 2007. Co-authored with John D. Norton, Jürgen Renn, Tilman Sauer, and John Stachel.
 - “Introduction to Volumes 1 and 2: The Zurich Notebook and the Genesis of General Relativity.” Pp. 6–20. Janssen, Norton, Renn, Sauer, Stachel.
 - “A Commentary on the Notes on Gravity in the Zurich Notebook.” Pp. 489–714. Janssen, Renn, Sauer, Norton, Stachel.
 - “What Did Einstein Know and When Did He Know It? A Besso Memo Dated August 1913.” Pp. 785–837. Janssen.
 - “Untying the Knot: How Einstein Found His Way Back to Field Equations Discarded in the Zurich Notebook.” Pp. 839–925. Janssen, Renn.

- “2005: The Centenary of Einstein’s Annus Mirabilis.” Special issue of *Studies in History and Philosophy of Modern Physics* 37 (2006): 1–242. Guest Editor.
 - “Introduction.” Pp. 1–4.
- *The Collected Papers of Albert Einstein*. Vol. 7. *The Berlin Years: Writings, 1918–1921*. Princeton: Princeton University Press, 2002. Lead editor. Other editors: Robert Schulmann, József Illy, Christoph Lehner, and Diana Kormos Buchwald.
- *The Collected Papers of Albert Einstein*. Vol. 8. *The Berlin Years: Correspondence, 1914–1918*. Princeton: Princeton University Press, 1998. Co-edited with Robert Schulmann, A. J. Kox, and József Illy.
- *The Collected Papers of Albert Einstein*. Vol. 4. *The Swiss Years: Writings, 1912–1914*. Princeton: Princeton University Press, 1995. Contributing editor. Editor: Martin J. Klein et al.
- *Einstein Studies*. Vol. 5. *The Attraction of Gravitation. New Studies in the History of General Relativity*. Boston: Birkhäuser, 1993. Co-edited with John Earman and John D. Norton.

ARTICLES AND CHAPTERS IN EDITED VOLUMES¹

- “How did Lorentz find his theorem of corresponding states?” *Studies in History and Philosophy of Modern Physics* (Available online 2 August 2017).*
- “Arches and Scaffolds: Bridging Continuity and Discontinuity in Theory Change.” To appear in: Alan C. Love and William C. Wimsatt (eds.), *Beyond the Meme. Articulating Dynamic Structures in Cultural Evolution*. Minneapolis: University of Minnesota Press. Expected fall 2018.*
- “Ce que l’on doit aux mathématiques.” With Jürgen Renn. *La Recherche* 16 (2015): 18–21.
- “Einstein was no lone genius.” With Jürgen Renn. *Nature* 527, 298–300 (19 November 2015).
- “Arch and scaffold: How Einstein found his field equations.” With Jürgen Renn. *Physics Today*, November 2015, pp. 30–36. Japanese translation: *Parity* 2017 (10): 21–30.*
- “Von verbogenen Räumen und krummen Zeiten.” With Jürgen Renn. *Kultur & Technik*, 2015, No. 4, pp. 10–15.
- “Einsteins Weg zur allgemeinen Relativitätstheorie.” With Jürgen Renn. *Spektrum der Wissenschaften*, October 2015, pp. 48–55.
- “The Stark Effect in the Bohr-Sommerfeld Theory and in Schrödinger’s Wave Mechanics.” With Anthony Duncan. Pp. 217–271 in Finn Aaserud and Helge Kragh (Eds.), *One Hundred Years of the Bohr Atom. Proceedings from a Conference. (Scientia Danica. Series M, Mathematica et Physica, Vol. 1)*. Copenhagen: Det Kongelige Danske Videnskabernes Selskab, 2015.*
- “The Trouble with Orbits: The Stark effect in the Old and the New Quantum Theory.” With Anthony Duncan. *Studies in History and Philosophy of Modern Physics* 48 (2014): 68–83.*
- “Kuhn Losses Regained: Van Vleck from Spectra to Susceptibilities.” With Charles Midwinter. Pp. 137–205 in: Massimiliano Badino and Jaume Navarro, Eds., *Research and Pedagogy: A History of Early Quantum Physics through its Textbooks*. Berlin: Edition Open Access, 2013.*
- “(Never) Mind your p ’s and q ’s: Von Neumann versus Jordan on the Foundations of Quantum Theory.” With Anthony Duncan. *The European Physical Journal H—Historical Perspectives on Contemporary Physics* 38 (2013): 175–259.*

¹ Refereed articles are marked with an asterisk.

- “The Twins and the Bucket: How Einstein Made Gravity rather than Motion Relative in General Relativity.” *Studies in History and Philosophy of Modern Physics* 43 (2012): 159–175.*
- “Lorentz als wegbereider voor de speciale relativiteitstheorie.” With Anne J. Kox. *Nederlands Tijdschrift voor Natuurkunde* 77 (2011): 344–347.
- “From Canonical Transformations to Transformation Theory, 1926–1927: The Road to Jordan’s Neue Begründung.” With Anthony Duncan. *Studies in History and Philosophy of Modern Physics* 40 (2009): 352–362.*
- “Drawing the Line between Kinematics and Dynamics in Special Relativity.” *Studies in History and Philosophy of Modern Physics* 40 (2009) 26–52.*
 - Expanded version of sec. 2 reprinted as: “The Drag Coefficient from Fresnel to Laue.” Pp. 47–60 in: Ad Maas and Henriëtte Schatz, Eds., *Physics as a Calling. Science for Society. Studies in Honour of A. J. Kox*. Leiden: Leiden University Press, 2013.
- “Pascual Jordan’s Resolution of the Conundrum of the Wave-Particle Duality of Light.” With Anthony Duncan. *Studies in History and Philosophy of Modern Physics* 39 (2008): 634–666.*
- “Lorentz, Hendrik Antoon (Postscript).” With Anne J. Kox. Pp. 333–336 in: Noretta Koertge (ed.), *Complete Dictionary of Scientific Biography*. Vol. 22. Detroit: Charles Scribner’s Sons, 2008.
- “On the Verge of Umdeutung in Minnesota: Van Vleck and the Correspondence Principle.” 2 Pts. With Anthony Duncan. *Archive for History of Exact Sciences* 61 (2007): 553–624, 625–671.*
- “From Classical to Relativistic Mechanics: Electromagnetic Models of the Electron.” With Matthew Mecklenburg. Pp. 65–134 in: V. F. Hendricks, K. F. Jørgensen, J. Lützen, and S. A. Pedersen (eds.), *Interactions: Mathematics, Physics and Philosophy, 1860–1930*. Berlin: Springer, 2007.*
- “Of Pots and Holes: Einstein’s Bumpy Road to General Relativity.” *Annalen der Physik* 14, Supplement (2005): 58–85.*
- “Relativity.” Pp. 2039–2047 in: Maryanne Cline Horowitz et al. (eds.), *New Dictionary of the History of Ideas*. New York: Charles Scribner’s Sons, 2004.
- “L’Optica e l’elettrodinamica dei corpi in movimento.” With John Stachel. Pp. 363–379 in: Sandro Petruccioli et al. (eds.), *Storia Della Scienza*, Vol. 8. Rome: Istituto della Enciclopedia Italiana, 2004;
 - English original, “Optics and Electrodynamics in Moving Bodies,” to appear in: John Stachel, *Going Critical*. Dordrecht: Springer.
- “Local Sidemen Go Back to the Tracks: Unsung Heroes of a Dylan Masterpiece Restage Seward Sessions.” *Seward Profile* 34 (2004) No. 12, pp. 1, 5.
- “A Glimpse Behind the Curtain of the Wizard/Un coup d’œil derrière le rideau du magicien.” In: *The Einstein-Besso Manuscript: From Special Relativity to General Relativity/Le manuscrit Einstein-Besso: De la Relativité Restreinte à la Relativité Générale*. Paris: Scriptura and Aristophile, 2003.
 - Reprint and translation of essay for Christie’s auction catalog, *The History of Quantum Mechanics and the Theory of Relativity*. Earlier versions:
 - “The Einstein-Besso Manuscript, the Perihelion Motion of Mercury, and the Genesis of the General Theory of Relativity.” In: *The Einstein-Besso Working Manuscript* (Christie’s Auction Catalog), 1996;
 - “Einstein Manuscripts on Relativity.” In: *The History of Quantum Mechanics and the Theory of Relativity* (Christie’s Auction Catalog), 2002. Pp. 99–113, pp. 119–122.
- “Albert Einstein.” Pp. 205–208 in: John S. Rigden (ed.), *Building Blocks of Matter: A Supplement to the Macmillan Encyclopedia of Physics*. New York: Macmillan, 2003.

- “Presentism and Relativity.” With Yuri Balashov. *The British Journal for the Philosophy of Science* 54 (2003): 327–346.
 - Reprinted in: L. Nathan Oaklander (ed.), *The Philosophy of Time: Time and Physics*. Vol. 4. London: Routledge, 2008.*
- “The Trouton Experiment, $E = mc^2$, and a Slice of Minkowski Space-Time.” Pp. 27–54 in: Abhay Ashtekar et al. (ed.), *Revisiting the Foundations of Relativistic Physics: Festschrift in Honor of John Stachel*. Dordrecht: Kluwer, 2003.
- “COI Stories: Explanation and Evidence in the History of Science.” *Perspectives on Science* 10 (2002): 457–522.*
- “Reconsidering a Scientific Revolution: the Case of Lorentz versus Einstein.” *Physics in Perspective* 4 (2002): 421–446.*
 - Earlier version: Pp. 153–167 in: Peter Galison, Michael Gordin, and David Kaiser (Eds.). *Science and Society. The History of Modern Physical Science in the Twentieth Century*. Vol. 1. *Making Special Relativity*. New York, Routledge, 2001.
- “Rotation as the Nemesis of Einstein’s Entwurf Theory.” Pp. 127–157 in: Hubert Goenner et al. (eds.), *Einstein Studies*. Vol. 7. *The Expanding Worlds of General Relativity*. Boston: Birkhäuser, 1999.*
- *‘‘On the Dating of a Recently Published Einstein Manuscript: Could These Be the Calculations that Gave Einstein Heart Palpitations?’’ With Robert Schulmann. *Foundations of Physics Letters* 11 (1998): 379–389.*
- “Einstein’s Explanation of the Motion of Mercury’s Perihelion.” With John Earman. Pp. 129–172 in: John Earman et al. (eds.), *Einstein Studies*. Vol. 5. *The Attraction of Gravitation. New Studies in the History of General Relativity*. Boston: Birkhäuser, 1993.
- “H. A. Lorentz’s Attempt to Give a Coordinate-Free Formulation of the General Theory of Relativity.” Pp. 344–363 in: J. Eisenstaedt and A.J. Kox (eds.), *Einstein Studies*. Vol. 3. *Studies in the History of General Relativity*. Boston: Birkhäuser, 1992.
- “Honderd jaar ‘Michelson and Morley’.” *Nederlands Tijdschrift voor Natuurkunde* A54(1) 1988: 8–11.
- “De tweelingparadox en relativiteit van gelijktijdigheid.” *Stroom* 2 (10) 1988: 13–25.

BOOK REVIEWS

- Helge Kragh, *Niels Bohr and the Quantum Atom. The Bohr model of Atomic Structure, 1913–1925* (Oxford: Oxford University Press, 2012). In: *Isis* 108 (2017): 219–220.
- Jeroen van Dongen, *Einstein’s Unification* (Cambridge: Cambridge University Press, 2010). In: *Science*, March 6, 2015, Vol. 347, Issue 6226, p. 1078.
- Robert E. Kennedy, *A Student’s Guide to Einstein’s Major Papers* (Oxford: Oxford University Press, 2012). In: *Classical and Quantum Gravity* 30 (2013) 239001.
- Hans C. Ohanian, *Einstein’s Mistakes. The Human Failings of Genius* (New York: Norton, 2008). In: *Physics Today*, June 2009.

TALKS

- Putting Probabilities First. How Hilbert Space Generates and Constrains Them.
 - With Michael Janas and Michael E. Cuffaro. New Directions in the Foundations of Physics, Viterbo, Italy, May 25, 2019
 - Seminar, Final Theory Program Research Group, *Max-Planck-Institut für Wissenschaftsgeschichte*, June 5, 2019
- Einstein and the Genesis of General Relativity, 1907–1920.
 - Black Hole Initiative, Cambridge, MA, April 23, 2019
- The trouble with the I in IBE. Symposium Norton for Everyone?
 - University of Pittsburgh, October 27, 2018.
- Einstein: The Old Sage versus the Young Turk.
 - History of Science and Technology, University of Minnesota, November 15, 2002.
 - Center for Philosophy of Science, University of Pittsburgh, March 21, 2003.
 - *Geschiedenis en grondslagen natuurkunde, Universiteit Utrecht*, Utrecht, February 6, 2004.
 - *Einstein und wie man der Natur ihre Geheimnisse ablauscht. Vortragsreihe Der andere Einstein, Max-Planck-Institut für Wissenschaftsgeschichte*, Berlin, November 4, 2004.
 - St. John’s University, Collegeville, MN, March 29, 2005.
 - Pacific Northwest Association of College Physics (PNACP), Portland, Oregon, April 15, 2005.
 - Seven Pines IX, Stillwater, Minnesota, May 7, 2005.
 - Department of Physics, University of Maryland, September 12, 2005.
 - Department of Physics, University of Pittsburgh, October 24, 2005.
 - University of Wisconsin–Barron County, October 6, 2006.
 - Committee on the History and Philosophy of Science, Distinguished Speaker Series, University of Colorado at Boulder, February 26, 2007.
 - Bar Hillel Lecture Series, The Cohn Institute for the History and Philosophy of Science and Ideas, Tel Aviv University, October 28, 2013.
 - Bard College, Annandale-on-Hudson, NY, April 6, 2018.
- Dirac, Jordan, and von Neumann: Hilbert Space and Transformation Theory.
 - Colloquium, Department of Physics, University of Colorado Boulder, February 7, 2018.
 - Colloquium, Department of Physics, Georgia Tech, April 2, 2018
- Mermin in Bananaworld: Bub on quantum mechanics.
 - Colloquium, Department of Physics and Astronomy, Minnesota State University Mankato, September 28, 2017.
 - Lunchtime talk, Center for Philosophy of Science, University of Pittsburgh, March 13, 2018.
- Wave Mechanics versus Matrix Mechanics.
 - Invited talk, American Physical Society March Meeting (Session: The Author in Dialogue: A. Douglas Stone’s *Einstein and the Quantum*), Los Angeles, March 6, 2018.
- Einstein from Field Equations to Gravitational Waves (1912–1918).
 - Keynote lecture. 32nd Boulder Conference on HPS, *Gravity: Its History and Philosophy*. University of Colorado at Boulder, October 28–30, 2016.
- From Common Origin Inference to Common Origin Idea.

- Center for Philosophy of Science, University of Pittsburgh, September 18, 2015.
- HSTM colloquium, University of Minnesota, September 9, 2016
- Arches and Scaffolds: Bridging Continuity and Discontinuity in Theory Change.
 - *Séminaire d'histoire et philosophie de la physique de l'UMR SPHere, Université Paris VII Denis Diderot*, Paris, March 15, 2016.
 - *Forschungskolloquium zur Wissenschaftsgeschichte, Institut für Philosophie, Literatur-, Wissenschafts- und Technikgeschichte, Technische Universität*, Berlin, May 25, 2016.
- *Het Einstein–De Sitter debat (1916–18): Het start schot voor de moderne kosmologie.*
 - *Lezingenserie “Einstein & Friends,” Museum Boerhaave*, Leyden, January 26, 2016.
- Arch and Scaffold. How Einstein Found His Field Equations.
 - Colloquium, Department of Physics and Astronomy, University of Pittsburgh, November 3, 2015.
 - Conference, *General Relativity at 100*, Institute for Advanced Study, Princeton, November 5, 2015.
 - Joint Colloquium, Departments of Physics and Philosophy, Macalester College, November 23, 2015.
- $\frac{1}{2} + \frac{1}{2} = 1$. The Accidental Success of the Old Quantum Theory.
 - With Anthony Duncan. HQ4, conference on the history of quantum physics, San Sebastián, Spain, July 16, 2015.
- Minkowskian Pedagogy: Explanation in Special Relativity.
 - Harveyfest, University of Oxford, July 14, 2015.
- Einstein’s 1913 Vienna Lecture: Modeling Gravitational Theory on Electrodynamics.
 - With Jürgen Renn. Session Einstein and the relation between physics and mathematics. History of Science Society, Chicago, November 6, 2014.
 - Colloquium, School of Physics and Astronomy, University of Minnesota, February 18, 2015.
 - Symposium, *100th Anniversary of General Relativity*, Center for Philosophy and History of Science & Center for Einstein Studies, Boston University, March 27, 2015.
- ‘No Success Like Failure ...’: Einstein’s Quest for General Relativity, 1907–1920.
 - *Außerordentliches Seminar in Theoretischer Physik, Eidgenössische Technische Hochschule*, Zurich, June 25, 1998.
 - Einstein Papers Project, Caltech, Pasadena, California, April 25, 2002.
 - Gravity Theory Seminar, Department of Physics, University of Maryland, April 28, 2010.
 - Senior Seminar, Physics & Astronomy / Joint Colloquium, Physics & Astronomy and Philosophy, Macalester College, St. Paul, February 18, 2011.
 - Colloquium, Astrophysics Group, Michigan State University, East Lansing, MI, April 7, 2011.
 - Symposium, *100th Anniversary of General Relativity*, Center for Philosophy and History of Science & Center for Einstein Studies, Boston University, March 27, 2015.
- From the Einstein-De Sitter Debate to the Expanding Universe.
 - Colloquium, Department of Physics, Swenson College of Science and Engineering, University of Minnesota Duluth, March 5, 2015.
- Arches and Scaffoldings in the Construction of Relativity and Quantum Theory.

- Keynote lecture, Conference *Continuity and Discontinuity in the Physical Sciences Since the Enlightenment*. Center for History of Physics, American Institute of Physics. Washington, DC, July 30, 2011.
- HSTM colloquium/Kuhnfest Keynote lecture, University of Minnesota, November 30, 2012.
- Annual Alumni Lecture, Department of History and Philosophy of Science, University of Pittsburgh, March 21, 2013.
- *Mara Beller Memorial Lecture*, Van Leer Institute, Jerusalem, October 30, 2013.
- Third International Interdisciplinary Summer School on History and Philosophy of Science, Forum Scientiarum, Eberhard Karls Universität Tübingen, August 4–8, 2014 [five lectures].
- Workshop *Beyond the Meme: Articulating Dynamic Structures in Cultural Evolution* Minnesota Center for Philosophy of Science, University of Minnesota, October 17, 2014.
- Kuhn Losses Regained: Van Vleck from Spectra to Susceptibilities
 - Session *Research and Pedagogy: A History of Quantum Physics through the Textbooks*. (II) *Quantum Books in a Time of Fast Change*, History of Science Society (HSS), Phoenix, AZ, November 21, 2009.
 - With Charles Midwinter. Session: *J. H. Van Vleck: Quantum Theory and Magnetism*. American Physical Society, March Meeting, Dallas, TX, March 22, 2011.
 - Physics and Astronomy Colloquium, University of Minnesota, October 31, 2012.
 - Science Studies Colloquium, University of California at San Diego, February 11, 2013.
 - Session *Historical Perspectives on Teaching Physics*, American Association of Physics Teachers (AAPT), Minneapolis, MN, July 28, 2014.
- “Building Castles in the Sky ...”: Why Einstein Introduced the Cosmological Constant.
 - Symposium *Einstein in Berlin: the First Ten Years*. The Boston Colloquium for the Philosophy and History of Science, March 3, 1997.
 - *Geschiedenis en grondslagen natuurkunde*, Universiteit Utrecht, Utrecht, June 19, 1998.
 - Department of Physics, University of Minnesota, January 23, 2002.
 - Department of Physics, University of Pittsburgh, March 15, 2002.
 - Department of Physics, Universiteit van Amsterdam, June 20, 2002.
 - Society for History of the Exact Sciences and Niels Bohr Archive, Copenhagen, October 1, 2002.
 - *Einstein en De Sitter aan de wieg van de relativistische kosmologie*. *Studium Generale*, Universiteit van Leiden, Leyden March 16, 2005.
 - Astrophysics Colloquium, University of Minnesota, October 20, 2006.
 - Seven Pines XII, Stillwater, Minnesota, May 8, 2008.
 - Cosmology Lunchtime Seminar, School of Physics and Astronomy, University of Minnesota, March 10, 2014
- Stark Contrasts Between the Old and the New Quantum Theory.
 - With Anthony Duncan. Conference, *One hundred years of the Bohr atom*, Copenhagen, June 11, 2013.
- How to Make Judicious Use of Current Physics in Reconstructing its History.
 - Pais Prize Session for Roger Stuewer, American Physical Society, April Meeting, Denver, CO, April 15, 2013.
- Pascual Jordan’s Resolution of the Conundrum of the Wave-Particle Duality of Light.

- With Anthony Duncan. HQ1, conference on the history of quantum physics, Max-Planck-Institut für Wissenschaftsgeschichte, Berlin, July 2–6, 2007
- Philosophy of Physics Research Seminar, University of Oxford, October 23, 2008.
- Colloquium History of Science and Technology, University of Minnesota, October 30, 2009.
- Physics and Astronomy Colloquium, University of Minnesota, February 17, 2010.
- Maryland Center for Fundamental Physics Colloquium, University of Maryland, April 29, 2010.
- Physics & Philosophy Seminar, Macalester College, November 8, 2012.
- Einstein’s Most Revolutionary Work: The Young Turk’s Contributions to Early Quantum Theory.
 - Colloquium, Chemistry Department Seminar, Carleton College, January 20, 2012.
- (Never) Mind your p ’s and q ’s: von Neumann versus Jordan on the Foundations of Quantum Theory.
 - With Anthony Duncan. New Directions in the Foundations of Physics, Washington, DC, April 30, 2010.
 - With Anthony Duncan. HQ3, conference on the history of quantum physics, *Max-Planck-Institut für Wissenschaftsgeschichte*, Berlin, July 3, 2010.
- Van Vleck and Slater: Two Americans on the Road to Matrix Mechanics.
 - Seven Pines VIII, Stillwater, Minnesota, May 6, 2004.
 - New Directions in Foundations of Physics, Washington, DC, April 29, 2005.
 - Session *The Practices of Quantum Mechanics*, History of Science Society (HSS), Minneapolis, November 5, 2005.
 - With Anthony Duncan. HQ0, workshop on history of quantum physics, *Max-Planck-Institut für Wissenschaftsgeschichte*, Berlin, June 14 and July 6, 2006.
 - Physics & Astronomy Colloquium, University of Minnesota, September 13, 2006.
 - Lectures on Quantum Phenomena, Public Lecture Series of Pacific Institute of Theoretical Physics (PITP), University of British Columbia, Vancouver, January 10, 2007.
 - Physics and Astronomy Colloquium, Minnesota State University Mankato, March 29, 2007.
 - Department of History and Philosophy of Science, Indiana University, October 5, 2007.
 - Session 80 Years of Quantum Mechanics, American Physical Society, St. Louis, Missouri, April 14, 2008.
 - Mack Lecture, Department of Physics, University of Wisconsin–Madison, September 18, 2009.
 - Physics Colloquium, St. Olaf College, Northfield, MN, October 7, 2009.
- Transformation Theory from the *Dreimännerarbeit* to Jordan’s *Neue Begründung*.
 - With Anthony Duncan. HQ2, conference on the history of quantum physics, Institute for History and Foundations of Science, Universiteit Utrecht, July 14, 2008.
- How to Draw the Line between Kinematics and Dynamics.
 - Symposium *Time and Relativity*, Institute for Advanced Study, University of Minnesota, October 26, 2007.
 - Colloquium Foundations of Physics, University of Maryland, November 5, 2007.
 - Boston Colloquium for Philosophy of Science, Boston University, March 17, 2008.
- How Einstein Found His Field Equations.
 - Department of Mathematics, University of Minnesota, February 22, 2005.

- With Jürgen Renn. Seventh International Conference on the History of General Relativity (HGR7), Tenerife, Spain, March 11, 2005
- Department of Physics, University of Maryland, September 12, 2005.
- With Jürgen Renn. 11th Marcel Grossmann Meeting on General Relativity, Freie Universität, Berlin, July 27, 2006.
- Common Origin Inferences.
 - *Wissenschaftstheorie und Wissenschaftsgeschichte Kolloquium*, University of Berne, Berne, June 16, 2000.
 - University of British Columbia, Vancouver, September 27, 2001.
 - History of Science Society (HSS), Denver, Colorado, November 11, 2001.
 - Conference *Assessing Evidence in Physics*, Department of Philosophy, University of Western Ontario, London, Ontario, May 13, 2005.
 - Department of Philosophy, Johns Hopkins University, September 14, 2005.
- The Trouton Experiment and $E = mc^2$.
 - Workshop *Space-time, Quantum Entanglement, and Critical Epistemology*, Max-Planck-Institut für Wissenschaftsgeschichte, Berlin, June 6, 1998.
 - Minnesota American Association of Physics Teachers (MAAPT), Augsburg College, St. Paul, October 25, 2003.
 - Session *Einstein in Historical and Philosophical Perspective*, American Association for the Advancement of Science (AAAS), Washington, DC, February 20, 2005.
 - Symposium *Heuristics, Discovery and Innovation Culture: Einstein's Annus Mirabilis*. Berne, Switzerland, July 8, 2005.
- The Einstein-Besso Manuscript: The Problem of Mercury's Perihelion and the Problem of Rotation.
 - The Boston Colloquium for the Philosophy and History of Science, Boston University, May 5, 1998.
 - Department of Physics, University of Minnesota, December 2, 1999.
 - Session *Einstein and Friends*, American Physical Society (APS), Tampa, Florida, April 17, 2005.
 - Symposium *Heuristics, Discovery and Innovation Culture: Einstein's Annus Mirabilis*. Berne, Switzerland, July 7, 2005.
- Emergence and Interpretation of Lorentz Invariance.
 - Seven Pines VI, Stillwater, Minnesota, May 16, 2002.
 - American Physical Society (APS), Division of Atomic, Molecular, and Optical Physics (DAMOP), Lincoln, Nebraska, May 21, 2005.
- Einstein: From Unification to Relativity and Back Again.
 - Plenary lecture, American Association of Physics Teachers (AAPT), Albuquerque, NM, January 11, 2005.
- The Electromagnetic View of Nature and the Transition from Classical Particle Mechanics to Relativistic Field Mechanics.
 - Sixth International Conference on the History of General Relativity (HGR6), Universiteit van Amsterdam, June 26, 2002.
 - Conference *The interaction between Mathematics, Physics and Philosophy from 1850 to 1940*, Copenhagen, September 28, 2002.

- Department of Physics, University of Minnesota, February 19, 2003.
- *Oberseminar Geschichte der Mathematik, Johannes Gutenberg-Universität, Mainz*, November 9, 2004.
- Dogs, Fleas, and Tree Trunks: Marking the Territory of Boltzmann's H -Theorem.
 - History of Science Society (HSS), Milwaukee, Wisconsin, November 8, 2002.
 - Center for Austrian Studies, University of Minnesota, February 13, 2003.
- Einstein, Hilbert, and Klein: The Background to Noether's Theorems.
 - With Tilman Sauer. Seven Pines VI, Stillwater, Minnesota, May 17, 2002.
- What Did Einstein Know and When Did He Know It? A Besso Memo Dated August 1913.
 - Fifth International Conference on History and Foundations of General Relativity (HGR5), University of Notre Dame, July 10, 1999.
 - Department of Physics, University of British Columbia, Vancouver, British Columbia, Canada, September 27, 2001.
- Planck's Derivation of His Black-Body Radiation Law Revisited.
 - Symposium *Max Planck and the Quantum*. The Boston Colloquium for the Philosophy and History of Science, Boston University, May 3, 2000.
- Einstein's Zurich Notebook: Coordinate Restrictions and the Search for Gravitational Field Equations.
 - Mark M. Horblit Colloquia in the History of Science, Harvard University, February 29, 2000.
- The Twin Paradox and an Unorthodox Solution to the Problem of Absolute Space.
 - The Boston Colloquium for the Philosophy and History of Science, Boston University, January 25, 1999.
- The Trouton-Noble Experiment: Making a Better Case for Special Relativity.
 - Colloquium Max-Planck-Institut für Bildungsforschung, Berlin, 1994.
 - *Geschiedenis en grondslagen natuurkunde, Universiteit Utrecht*, Utrecht, 1995.
 - Department of Philosophy, Boston University, 1996.
 - Department of Philosophy, University of Notre Dame, January 22, 1999.
- What Einstein Got Right and What he Got Wrong in his First Paper on Gravitational Waves.
 - With Dan Kennefick. Symposium *Einstein in Berlin: the First Ten Years*. The Boston Colloquium for the Philosophy and History of Science, March 3, 1997.
- Rotation as the Nemesis of Einstein's Entwurf theory.
 - Fourth International Conference on History and Foundations of General Relativity (HGR4), Berlin, 1995.
- The Hole Argument: A Cloud over Absolute Space-Time?
 - *Geschiedenis en grondslagen natuurkunde, Universiteit Utrecht*, Utrecht, 1993.
- H. A. Lorentz and the Special Theory of Relativity.
 - Symposium on History and Philosophy of Physics, Nederlandse Natuurkundige Vereniging (NNV), Utrecht, 1989.
- Lorentz's Geometrical Approach to General Relativity.
 - Second International Conference on History of General Relativity (HGR2), Luminy, France, 1988.

SERVICE

PROGRAM IN THE HISTORY OF SCIENCE, TECHNOLOGY (& MEDICINE), UNIVERSITY OF MINNESOTA

- Director of Graduate Admissions (2017–2019)
- Director of Graduate Studies (HSTM), 2010–2014.
- Chair of Search Committee, tenure-track position (in the School of Physics and Astronomy) in the history of the physical sciences pre-1800, 2011–2012.
- Chair of Search Committee, tenure-track position (in the Department of Earth Sciences) in the history of the environmental and earth sciences, 2017–2018.
- Director of Undergraduate Studies (HST), 2002–2008.

UNIVERSITY OF MINNESOTA

- Coordinator, Physics Interest Group (PIG), Minnesota Center for Philosophy of Science, since Fall 2007 (with the exception of the academic years 2008–9 and 2015–6).
- Member of search committee, tenure-track position in philosophy of science, Department of Philosophy, 2001–2002, 2002–2003.

THE HISTORY AND PHILOSOPHY OF SCIENCE PROFESSION

- Member of the selection committee for the Abraham Pais Prize for history of physics of the American Physical Society (2017–2019)
- Member of the Editorial Advisory Board for Einstein Studies book series (since March 2017)
- Member of International Advisory Board, Vossius Center for History of Humanities and Sciences, University of Amsterdam (since 2016).
- Member of the Committee for Integrated History and Philosophy of Science (since December 2015).
- Member of Wissenschaftlicher Beirat for the 2005 exhibit, Albert Einstein—Ingenieur des Universums, Max-Planck-Institut für Wissenschaftsgeschichte, Berlin (2003–2005).
- Member of Wissenschaftlicher Beraterkreis of Arbeitsstelle Albert Einstein, Max-Planck-Institut für Wissenschaftsgeschichte, Berlin (1994–1997).

CONFERENCE ORGANIZATION

- Chair of the Advisory Board for The Seven Pines Symposium. 2007–2012 (Vice-chair 2005–2007).
- Member of Organizing Committee for series of international conferences on History of Quantum Physics (Utrecht 2008 [HQ2], Berlin 2007 [HQ1], Berlin 2006 [HQ0]).
- Co-organizer (with Antigone Nounou) of Symposium, Time and Relativity, Institute for Advanced Study, University of Minnesota, October 25–27, 2007
- Program director (with Jeremy Butterfield) of Conference, 2005: The Centenary of Einstein's Annus Mirabilis 1905, British Academy, London, March 4–5, 2005.

- Member of Organizing Committee for the series of international conferences on History and Foundations of General Relativity (Tenerife 2005 [HGR7], Amsterdam 2002 [HGR6], Notre Dame 1999 [HGR5], Berlin 1995 [HGR4], Johnstown 1991 [HGR3]).
- EDITORIAL WORK
- Member of Editorial Advisory Board of *Physics in Perspective* (since spring 2008), *Studies in History and Philosophy of Modern Physics* (since fall 2001), and *The European Physical Journal H—Historical Perspectives on Contemporary Physics* (2009–2014).
- Referee for *American Journal of Physics*, *The British Journal for the Philosophy of Science*, *Canadian Journal of Physics*, *Endeavour*, *European Physical Journal H—Historical Perspectives on Contemporary Physics*, *Historical Studies in the Natural Sciences*, *Isis*, *Philosophy of Science*, *Physics in Perspective*, *Science*, *Studies in History and Philosophy of Modern Physics*, *Synthese*.

REVIEWING & CONSULTING

- Reviewing book manuscripts for Harvard University Press, Houghton Mifflin, Oxford University Press, Princeton University Press, University of Pittsburgh Press.
- Reviewing grant proposals for National Science Foundation (NSF), Nederlandse Organisatie voor Wetenschappelijk Onderzoek (NWO), The Leverhulme Trust.
- Consulting and on-camera interview for BBC Horizon special on Einstein, 2005.
- Consulting and on-camera interview for History Channel program on Einstein, 2014.
- Consulting for The 19th Century Shop (rare book and manuscript dealer) on Einstein material, 2005.
- Consulting for Christie's on auction of Einstein manuscripts, 1996, 2002.

OUTREACH

- Quantum mechanics à la Bananaworld. Co-taught with Peter Grul and Michael Janas. Washburn High School, Minneapolis, May 23, 24, and 25, 2018.
- *The Age of Entanglement: Ten Years Later* (with Louisa Gilder). Co-organized with David Russell and Brian Woodcock. Target Performance Hall, Openbook, Minneapolis, April 12, 2018.
- Einstein and Judaism. Beth El Synagogue, St. Louis Park, October 17, 2017.
- *Einstein: A Stage Portrait*. Q&A. Matchbox Theater, Minneapolis, Three shows. September–October 2017.
- Einstein and the Eclipse of 1919. Bell Museum of Natural History, Pre-Eclipse Block Party, August 13, 2017
- Einstein: The Old Sage versus the Young Turk. Café Scientifique, Bryant-Lake Bowl & Bell Museum of Natural History, University of Minnesota, October 21, 2014.
- Does God play dice or does He just not make up His mind? Washburn High School, Minneapolis, May 29, 2014.
- Relativity. Washburn High School, Minneapolis, February 6, 2014.
- Science of Klein gallery talk. With Eric Crosby. Exhibit: Yves Klein: with the void, full powers. Walker Art Center, January 13, 2011.
- Einstein in Exile. John F. Kennedy School in Berlin-Zehlendorf, German department, for about 150 students, grades 11 and 12, January 23, 2009.

- Dinosaurs: how do we know what they looked like? Marcy Open Elementary School. Class of 2nd & 3rd graders, Minneapolis, March 2004.
- Quantum Mechanics, Squirrels, and Quarterbacks. Elders Learning Institute, University of Minnesota, January 24, 2002.
- Foundations of Special Relativity. Symposium Fysica of metafysica. Studium Generale, Landbouwhogeschool Wageningen. 1988.