

Neutron Sciences Directorate, Spallation Neutron Source,
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Curriculum Vitae Victor R. Fanelli

SUMMARY

5 years of experience as lead scientist in neutron scattering sample environments; 16 years of experience in experimental condensed matter physics and materials science research including design, assembly and operation of experimental probes for neutron scattering, high magnetic fields and low/high temperature experiments; 1½ years of experience in metallurgy industry; 9 years of experience teaching undergraduate and graduate Physics and Material Science courses.

EDUCATION

- 2009 **Ph.D. – Physics**, University of California Irvine, Irvine, CA, USA. Thesis: “Inelastic Neutron Scattering Study of the Intermediate Valence Compounds CePd₃ and YbAl₃”. GPA: 3.99.
- 2005 **M. Sc. – Physics**, University of California Irvine, Irvine, CA, USA.
- 1999 **M. Sc. – Material Sciences**, Instituto de Tecnología J. Sabato, Universidad Nacional de G. San Martín and Constituyentes Atomic Center, Comisión Nacional de Energía Atómica, Buenos Aires, Argentina. Thesis: “Sealability Criterion in Oil Tubes Connections”.
- 1997 **Licenciado en Física** (equivalent to M. Sc. in Physics), Universidad Nacional de Tucumán, Argentina. Thesis: “Ladder of Energy States Model for the Electron Analytic Microprobe”.
- 1993 **Bachiller Universitario en Física** (equivalent to B. Sc. in Physics), Universidad Nacional de Tucumán, Argentina.

PROFESIONAL EXPERIENCE

- 2016- Present Scientific Associate in the Instrument and Source Division at the Oak Ridge National Laboratory. Responsible for operations, upgrade and experiment readiness at two inelastic neutron scattering instruments at the Spallation Neutron Source.
- 2011 - 2016 Lead Scientist for Sample Environments at the Lujan Neutron Scattering Center, Los Alamos National Laboratory. Ensured scientific productivity was guaranteed by continuous operation support and by development of new sample environments capabilities. Thermometry, cryogenics, high temperature, vacuum and high magnetic field techniques.
- 2009 - 2011 Postdoctoral Research Associate at the National High Magnetic Field Laboratory (NHMFL) in Los Alamos National Laboratory, Seaborg Institute Fellow. Designed, built and utilized experimental probes to study thermodynamic and dielectric properties in actinides, superconductors and other materials at low and high temperature applying high magnetic fields. Inelastic Neutron Scattering studies of correlated electron systems.
- 2005 - 2009 Graduate Research Assistant: Department of Physics and Astronomy, University of California, Irvine. Stationed at the NHMFL in Los Alamos National Laboratory. Research

- on strongly correlated electron systems performing neutron scattering, low temperature and high magnetic fields experiments.
- 2004 Teaching Assistant: Department of Physics and Astronomy, University of California, Irvine. Courses: “Classical Physics”, “Laboratory of Experimental Physics”.
- 1999 – 2003 Teaching Assistant: Department of Physics, Universidad Nacional de Tucumán, Argentina. Full time teaching of undergraduate courses: “Experimental Physics II”, “Materials Science”, and a graduate course: “Solid State Physics”.
- 1998 – 1999 Graduate Research Assistant: Center of Industrial Research, Techint Org., Argentina. Research in metallurgy, performing and integrating both theoretical models and laboratory full- and small-scale experiments applied to oil industry.
- 1991 – 1996 Teaching Assistant: Department of Physics, Universidad Nacional de Tucumán, Argentina. Courses: “Laboratory of Experimental Physics I and II”, “States of Matter”.

RESEARCH AND DEVELOPMENT INTERESTS

My research interests are mostly in the area of Condensed Matter Physics with focus on correlated electron systems, elastic and magnetic properties. This includes developing unique capabilities for neutron scattering and extreme environments experiments.

I am currently developing the use of in-situ resonant ultrasound spectroscopy methods for neutron scattering experiments. I designed and built probes for low and high temperatures and for applied magnetic field sample environments, that provide means for tracking and identifying phase transitions and obtaining the elastic tensor, shear and bulk modulus, during neutron scattering data acquisition.

Specific problems of interest include the determination of the spin fluctuation contribution to the inelastic neutron scattering of Intermediate Valence compounds. This involved a complete momentum transfer-dependence investigation of excitations beyond the usual Kondo single impurity scattering in the low temperature coherent Fermi liquid regime of CePd₃ and YbAl₃ Intermediate Valence metals.

Additionally, I studied the behavior of thermodynamic and transport properties of nuclear materials, strongly correlated electron systems, and other solid materials versus temperature, high magnetic field, electric field and pressure as well as the interplay among competing phases. This requires state-of-the-art experiments only feasible by pushing the limits of current instrumentation and experimental probes. I have designed, assembled and operated probes to measure specific heat, magnetic susceptibility, dielectric properties and elastic moduli. These probes are used in low temperature cryostats and in superconductor magnets.

Among other unique capabilities for neutron scattering, I designed and built a probe housing a zero neutron-scattering gas pressure cell (15 K and 800 K and up to 1 kbar), and I have provided directions for fabrication and commissioned a 7 Tesla superconducting magnet (0.3 K to 800 K) customized for total neutron scattering measurements.

FUNDED RESEARCH PROJECTS:

“In-situ ultrasound spectroscopy for neutron scattering”, project under the Complex Environments for Neutron Science Initiative (2019-2021).

Funding agency: Oak Ridge National Laboratory

Funding Type: Laboratory Directed Research and Development (LDRD)

Funding: 618 k\$ FY20, 570k\$ FY21

Period: October 2019 - present

Principal Investigators: R.P. Hermann (lead PI), V.R. Fanelli (co-PI), A. Flores-Bettancourt, C. Hua, E. Cakmak, Y. Shinohara.

OTHER TECHNICAL EXPERTISE

I provided **user support** for the US Department of Energy User Program at the Spallation Neutron Source in Oak Ridge National Laboratory (2016 to present day), as well as in Los Alamos National Laboratory at the Lujan Neutron Scattering Center (2011 to 2016) and at the National High Magnetic Field Laboratory (2005 to 2011).

Vast experience as a **neutron scattering user** (2005 to present day) on triple axis and time of flight spectrometers at the Pulsed Neutron and Muon Source, Rutherford Appleton Laboratory in UK, Intense Pulsed Neutron Source at Argonne National Laboratory, Center for Neutron Research at the National Institute of Standards and Technology, High Flux Isotope Reactor and Spallation Neutron Source at Oak Ridge National Laboratory and Lujan Neutron Scattering Center at Los Alamos National Laboratory.

Thermal and transport properties. Specific heat by thermal relaxation time method on a high precision set up. Designed a calorimetry probe adapted to superconductor magnets and ^3He fridges. Magneto-transport, electrical impedance spectroscopy, and magnetization at low temperatures under high magnetic fields. NHMFL, Los Alamos National Laboratory.

Metallurgy and tribology. Models of contact in metal-to-metal seals, sealability measurements in oil tubes connections, wear tests of machining tools. Materials characterization by optical metallography, scanning electron microscopy, and energy dispersive spectroscopy. Center of Industrial Research, Techint Org., Argentina.

PUBLICATIONS

h-index: 11, total number of citations: 270 according to webofscience.com (Researcher ID: A-4375-2015)

h-index: 12, total number of citations: 376 according to scholar.google.com

1. **Phonons, Q-dependent Kondo spin fluctuations, and 4f phonon resonance in YbAl_3 .** *Physical Review B* **102**, 205135 (2020). <https://doi.org/10.1103/PhysRevB.102.205135>. A.D. Christianson, V.R. Fanelli, L. Lindsay, S. Mu, M.C. Rahn, D.G. Mazzone, A.H. Said, F. Ronning, E.D. Bauer, J.M. Lawrence.
2. **3D scanning and 3D printing AlSi10Mg single crystal mounts for neutron scattering.** *Review of Scientific Instruments* **91**, 053902 (2020); <https://doi.org/10.1063/5.0008599>. D. M. Pajerowski, R. Ng, N. Peterson, Y. Zhang, M. B. Stone, A. M. dos Santos, J. Bunn, and V. Fanelli.
3. **Characterization of shielding materials used in neutron scattering instrumentation.** *Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment*, Volume **946**, 162708 (2019) <https://doi.org/10.1016/j.nima.2019.162708>. M.B. Stone; L. Crow, V.R. Fanelli, and J.L. Niedziela.
4. **Physical properties of the trigonal binary compound Nd_2O_3 .** *Phys. Rev. Materials* **2**, 114407 (2018). DOI: <https://doi.org/10.1103/PhysRevMaterials.2.114407>. G. Sala, M.B. Stone, B.K. Rai, A.F. May, C.R. Dela Cruz, H. Suriya Arachchige, G. Ehlers, V.R. Fanelli, V.O. Garlea, M.D. Lumsden, D. Mandrus, and A.D. Christianson.
5. **Coherent band excitations in CePd_3 : A comparison of neutron scattering and ab initio theory.** *Science*, Vol. **359**, Issue 6372, pp. 186-191 (2018). DOI: 10.1126/science.aan0593. Eugene A. Goremychkin, Hyowon Park, Raymond Osborn, Stephan Rosenkranz, John-Paul Castellán, Victor R. Fanelli, Andrew D. Christianson, Matthew B. Stone, Eric D. Bauer, Kenneth J. McClellan, Darrin D. Byler, and Jon M. Lawrence.

6. **Versatile strain-tuning of modulated long-period magnetic structures.** *Applied Physics Letters* **110**, 192409 (2017). <http://dx.doi.org/10.1063/1.4983473>. D.M. Fobes, Y. Luo, N. Leon-Brito, E.D. Bauer, V.R. Fanelli, M.A. Taylor, L.M. DeBeer-Schmitt, and M. Janoschek.
7. **Pressure/temperature fluid cell apparatus for the neutron powder diffractometer instrument: Probing atomic structure in situ.** *Rev. Sci. Instrum.*, **85**, 125116 (2014) <http://dx.doi.org/10.1063/1.4902838>. H.W. Wang, V.R. Fanelli, H.M. Reiche, E. Larson, M. Taylor, H. Xu, J. Zhu, J. Siewenie and K. Page
8. **Q-dependence of the spin fluctuations in the intermediate valence compound CePd₃.** *J. Phys.: Condens. Matter*, **26**, 225602 (2014). <http://dx.doi.org/10.1088/0953-8984/26/22/225602>. (**Institute Of Physics selected article**) V.R. Fanelli, J.M. Lawrence, E.A. Goremychkin, R. Osborn, E.D. Bauer, K.J. McClellan, J.D. Thompson, C.H. Booth, A.D. Christianson, and P.S. Riseborough
9. **Temperature dependence of elastic moduli of polycrystalline beta plutonium.** *Phys. Rev. B*, **84**, 064105 (2011). <http://dx.doi.org/10.1103/PhysRevB.84.064105> (**Editor's suggestion**). Y. Suzuki, V.R. Fanelli, J.B. Betts, F.J. Freibert, C.H. Mielke, J.N. Mitchell, M. Ramos, T.A. Saleh, and A. Migliori
10. **Elastic and anelastic relaxations associated with the incommensurate structure of Pr_{0.48}Ca_{0.52}MnO₃,** *Phys. Rev. B*, **82**, 134123 (2010). <http://dx.doi.org/10.1103/PhysRevB.82.134123>. M.A. Carpenter, C.J. Howard, R.E.A. McKnight, A. Migliori, J.B. Betts, and V.R. Fanelli
11. **Digital ultrasonics for materials science**, in McGraw Hill 2010 Yearbook of Science & Technology, McGraw-Hill Professional Publishing, New York, NY, USA, 2010. Pages 106-109. ISBN-10: 0071639284, ISBN-13: 978-0262620772. A. Migliori, Y. Suzuki, J.B. Betts and V. Fanelli
12. **Rhenium diboride's monocrystal elastic constants, 308 to 5 K,** *J. Acoust. Soc. Am.*, **127**, 2797 (2010). <http://dx.doi.org/10.1121/1.3372629>. Y. Suzuki, J.B. Levine, A. Migliori, J.D. Garrett, R.B. Kaner, V.R. Fanelli, and J.B. Betts
13. **Kondo behavior, ferromagnetic correlations, and crystal fields in the heavy-fermion compounds Ce₃X (X=In,Sn),** *Phys. Rev. B*, **81**, 235132 (2010). <http://dx.doi.org/10.1103/PhysRevB.81.235132>. C.H. Wang, J.M. Lawrence, A.D. Christianson, E.A. Goremychkin, V.R. Fanelli, K. Gofryk, E.D. Bauer, F. Ronning, J.D. Thompson, N.R. de Souza, A.I. Kolesnikov, and K.C. Littrell
14. **Heavy holes as a precursor to superconductivity in antiferromagnetic CeIn₃,** *Proc. Natl. Acad. Sci. U.S.A.* **106**, 7741 (2009). <http://dx.doi.org/10.1073/pnas.0811859106>. S.E. Sebastian, N. Harrison, C.D. Batista, S.A. Trugman, V. Fanelli, M. Jaime, T.P. Murphy, E.C. Palm, H. Harima, and T. Ebihara
15. **Simplifying strong electronic correlations in uranium: Localized uranium heavy-fermion UM₂Zn₂₀ (M=Co, Rh) compounds,** *Phys. Rev. B*, **78**, 115120 (2008). <http://dx.doi.org/10.1103/PhysRevB.78.115120>. E.D. Bauer, C. Wang, V.R. Fanelli, J. M. Lawrence, E.A. Goremychkin, N.R. de Souza, F. Ronning, J.D. Thompson, A. Silhanek, V. Vildosola, A.M. Lobos, A.A. Aligia, S. Bobev, D. Garcia, and J.L. Sarrao
16. **Magnetic order in the induced magnetic moment system Pr₃In,** *Physica B*, **403**, 1368 (2008). <http://dx.doi.org/10.1016/j.physb.2007.10.152>. V.R. Fanelli, A.D. Christianson, M. Jaime, J.D. Thompson, H.S. Suzuki, J.M. Lawrence

17. **Inelastic neutron scattering in CePd₃**, *Physica B*, **403**, 783 (2008).
<http://dx.doi.org/10.1016/j.physb.2007.10.243>. J.M. Lawrence, V.R. Fanelli, E.A. Goremychkin, R. Osborn, E.D. Bauer, K.J. McClellan, A.D. Christianson
18. **Nonlocal magnetic field-tuned Quantum Criticality in cubic CeIn_{3-x}Sn_x (x=0.25)**, *Phys. Rev. Lett.* **96**, 206401 (2006). <http://dx.doi.org/10.1103/PhysRevLett.96.206401>. A.V. Silhanek, Takao Ebihara, N. Harrison, M. Jaime, Koji Tezuka, V. Fanelli, and C.D. Batista
19. **Irreversible dynamics of the phase Boundary in U(Ru_{0.96}Rh_{0.04})₂Si₂ and implications for ordering**, *Phys. Rev. Lett.* **96**, 136403 (2006). <http://dx.doi.org/10.1103/PhysRevLett.96.136403>
A.V. Silhanek, M. Jaime, N. Harrison, V.R. Fanelli, C.D. Batista, H. Amitsuka, S. Nakatsuji, L. Balicas, K.H. Kim, Z. Fisk, J.L. Sarrao, L. Civale, and J.A. Mydosh
20. **Localized excitation in the hybridization gap in YbAl₃**, *Phys. Rev. Lett.* **96**, 117206 (2006).
<http://dx.doi.org/10.1103/PhysRevLett.96.117206>. A.D. Christianson, V.R. Fanelli, J.M. Lawrence, E.A. Goremychkin, R. Osborn, E.D. Bauer, J.L. Sarrao, J.D. Thompson, C.D. Frost, and J.L. Zarestky
21. **Sealability of stationary metal-to-metal seals**, *Journal of Tribology* (Am. Soc. Mechanical Engineers) **126**, 591 (2004). <http://dx.doi.org/10.1115/1.1715103>. G.R. Murtagian, V. Fanelli, J.A. Villasante, D.H. Johnson, and H.A. Ernst

PRESENTATIONS IN CONFERENCES

Invited Talk:

1. **Elastic Moduli, Debye Waller and Electron Localization in Plutonium**, Plutonium Futures The Science 2010, Keystone, Colorado, USA, September 19-23, 2010.
V.R. Fanelli, A. Migliori, Y. Suzuki, and J. Betts

Contributed Talks and Poster Presentations:

2. **Science with Neutron and Coherent X-ray Scattering at the Frontier of High Magnetic Fields**, Neutron Scattering in Magnetic Fields Above 15 Tesla, Helmholtz-Zentrum Berlin für Materialien und Energie, Berlin, Germany, October 2014. H. Nakotte, V.R. Fanelli, E. Fohtung
3. **Science with Neutron and Coherent X-ray Scattering at the Frontier of High Magnetic Fields**, National High Magnetic Field Laboratory – Pulse Field Facility Strategy Meeting, Los Alamos, NM Los Alamos, NM, June 2014. V.R. Fanelli, E. Fohtung
4. **Momentum Transfer dependence of the Spin Fluctuations in the Intermediate Valence Compound CePd₃**, American Conference in Neutron Scattering 2012, Washington, DC, June 2012. V.R. Fanelli, E.D. Bauer, K.J. McClellan, J.D. Thompson, J.M. Lawrence, E.A. Goremychkin, J.P. Castellan, R. Osborn, C.H. Booth, A.D. Christianson, M.B. Stone, P.S. Riseborough, T. Guidi
5. **Thermodynamic signatures for the phase transition at the pseudogap temperature in underdoped YBCO (6.56)**, American Physical Society March Meeting, Dallas, TX, March 2011. V.R. Fanelli, S.C. Riggs, A. Shekhter, Y. Suzuki, J.B. Betts, A. Migliori, G.S. Boebinger, B. Ramshaw, R. Liang, W. Hardy, D. Bonn
6. **Elastic Moduli of Pure Delta Plutonium**, Plutonium and Actinide Research Strategy Workshop, Los Alamos National Laboratory, Los Alamos, NM, February 2–3 and March 2, 2011, V. Fanelli, A. Migliori, J. Betts, Y. Suzuki, J. Mitchell, F. Freibert, T. Saleh

7. **Resonant Ultrasound Spectroscopy signatures of $\text{YBa}_2\text{Cu}_3\text{O}_{6.56}$ Phase Diagram in the range 20 K - 310 K**, The International Conference on Strongly Correlated Electron Systems Santa Fe, NM, June 2010. V.R. Fanelli, S.C. Riggs, A. Shekhter, Y. Suzuki, J.B. Betts, A. Migliori, G.S. Boebinger, D. Bonn, W. Hardy, R. Liang
8. **Elastic Moduli of Pure Alpha, Beta, and Gamma Plutonium. Three Different Metals**, 2010 Materials Research Society Spring Meeting, San Francisco, CA, April 2010. A. Migliori, Y. Suzuki, V.R. Fanelli, J. Betts, I. Stroe, J.N. Mitchell, F. Freibert
9. **Elastic measurements of detwinned orthorhombic optimally doped $\text{La}_{2-0.16}\text{Sr}_{0.16}\text{CuO}_4$** , American Physical Society March Meeting, Portland, OR, March 2010. V.R. Fanelli, J. Betts, A. Migliori, Y. Suzuki, J. Yan
10. **Alpha, Beta and Gamma Plutonium, three different metals**, Seaborg Institute Lectures, Los Alamos National Laboratory, Los Alamos, NM, December 2009. V.R. Fanelli
11. **Magnetic Scattering in the 4f-Intermediate Valence Compounds CePd_3 and YbAl_3** , International Conference on Neutron Scattering ICNS 2009, Knoxville, TN, May 2009. V.R. Fanelli, J.M. Lawrence, C.H. Wang, A.D. Christianson, E.A. Goremychkin, E.D. Bauer, K.J. McClellan, R. Osborn, M.D. Lumsden
12. Ph. D. Thesis Defense: **“Inelastic Neutron Scattering Study of the Intermediate Valence Compounds CePd_3 and YbAl_3 ”**, Department of Physics and Astronomy, University of California Irvine, Irvine, CA, January 2009. V.R. Fanelli
13. **Low temperature magnetic scattering in CePd_3** , American Conference in Neutron Scattering ACNS 2008, Santa Fe, NM, May 2008. V.R. Fanelli, J.M. Lawrence, A.D. Christianson, E.A. Goremychkin, C. Wang, E.D. Bauer, K.J. McClellan, J.W. Lynn, Y. Chen, M.D. Lumsden
14. **Magnetic order in the induced magnetic moment system Pr_3In** , The International Conference on Strongly Correlated Electron Systems, Houston, TX, May 2007. V.R. Fanelli, A.D. Christianson, M. Jaime, J.D. Thompson, H.S. Suzuki, J.M. Lawrence
15. **Effect of magnetic field on the induced moment system Pr_3In** , American Physical Society March Meeting, Denver, CO, March 2007. V.R. Fanelli, A.D. Christianson, M. Jaime, J.D. Thompson, C.D. Batista, H.S. Suzuki, J.M. Lawrence
16. **Effect of magnetic field on the induced moment system Pr_3In** , Institute of Complex and Adaptive Matter, ICAM/I2CAM Annual Workshop, Santa Fe, NM, November 2006. V.R. Fanelli, A.D. Christianson, M. Jaime, J.D. Thompson, C.D. Batista, H.S. Suzuki, J.M. Lawrence
17. **Irreversible dynamics of the phase boundary in $\text{U}(\text{Ru}_{1-x}\text{Rh}_x)_2\text{Si}_2$** , American Physical Society March Meeting, Baltimore, MD, March 2006. V.R. Fanelli, A.V. Silhanek, M. Jaime, N. Harrison, C.D. Batista, H. Amitsuka, L. Balicas, J.L. Sarrao, and J.A. Mydosh

Invited Seminars and Colloquia:

- Lecture on Neutron Scattering Sample Environments at the 10th LANSCE School on Neutron Scattering "Geosciences & Materials in Extreme Environments", Los Alamos, NM, January 2014.

FELLOWSHIPS AND SCHOLARSHIPS

- Seaborg Postdoctoral Fellowships, Seaborg Institute, LANL, Los Alamos, NM, USA, 2009 to 2011.
- Materials Science M.Sc. Fellowship, Comisión Nacional de Energía Atómica and Instituto de Tecnología, Universidad Nacional de Gral. San Martín, and Centro de Investigación Industrial (CINI) of Organización Techint, Department of Mechanical Technology, Argentina, 1997 to 1999.
- Physics Thesis Research Scholarship, Consejo de Investigaciones de la Universidad Nacional de Tucumán, Argentina, 1995.
- IB-CAB 1994 and 1995 (Solid State Physics School). Comisión Nacional de Energía Atómica and Instituto Balseiro, Argentina, 1994 and 1995.

POSTGRADUATE COURSES, SCHOOLS

- Neutron Scattering Winter School 2004 (Magnetism), Lujan Neutron Scattering Center, Los Alamos National Laboratory, Los Alamos, NM, USA, 2004.
- Introduction to Materials Science, Solid State Physics, Thermodynamics, Crystallography and X Ray Diffraction, Defects in Crystals, Diffusion, Electronic Microscopy and Microanalysis, Solidification and Phase Transformations, Mechanical Properties, Mechanical Metal Working, Properties and Process Modeling in Materials, Fracture Mechanics, Steels, Corrosion, Radiation Damage, Physics and Metallurgy of Welding, Non Destructive Tests and Non Destructive Metallography. Centro Atómico Constituyentes, Buenos Aires, Argentina, 1997-1998.
- Microanalysis with Electron Microprobe, National Committee of X Rays Spectroscopy, Dr. Jorge Trincavelli, Córdoba, Argentina, 1996.
- 304 hours of courses in Solid State Physics and Superconductivity in Instituto Balseiro, Centro Atómico Bariloche, Argentina, 1994-1995.

LANGUAGES

- Spanish (native language), English (very proficient), Italian (very proficient).

A handwritten signature in black ink that reads "Victor Fanelli". The signature is written in a cursive style and is underlined with a single horizontal line.

Victor Roberto Fanelli,
Oak Ridge, May 2021