Jordan C. Hanson, PhD
Science and Learning Center, 212 • Dept. of Physics and Astronomy, Whittier College • Whittier, CA, 90602 • cell: 562-351-0047 • email: jhanson2@whittier.edu

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Position

Assistant Professor of Physics, Department of Physics and Astronomy, Whittier College, 2017-Present

Skills

I have extensive experience in experimental hardware design, testing, and deployment, Monte Carlo simulation, data analysis, and teaching.

- Physics teaching experience at high-school, college, and graduate levels
- Terabyte-scale data analysis and high-performance computing (Ohio State Univ. and UC Irvine)
- Building complex Monte Carlo simulations and theoretical models
- Independently organizing and leading expeditions to Antarctica to deploy physics hardware
- Performing radio-glaciological field measurements in support of physics objectives
- RF circuit design and testing/validation
- Fluency in C, C++, Python, MATLAB, Octave, ROOT, OpenMP, MySQL, SQLite3
- Organizing workshops and conferences, public speaking, outreach coordination

Education

- Doctor of Philosophy (PhD), Physics, University of California, Irvine (March 2013)
- Master of Science (M.S), Physics, University of California, Irvine (August 2008)
- Bachelor of Science (B.S), Intensive Track, in Physics, Yale University (June 2007)

Research Experience

The Ohio State University — Fall 2015 – 2017

- Created a fully analytic model of the Askaryan effect adopted by the physics community
- Leading the data analysis to discover the world-record highest energy neutrinos
- Organized a workshop at Ohio State pertaining to improved analysis efficiency
- Investigating ways to use smartphones as cosmic ray detection arrays

University of Kansas — Spring 2013 – Fall 2015

- Simulated radar-echoes of cosmic ray extensive air showers for the TARA collaboration
- Deployed radar detectors as part of the TARA remote station program
- Performed anechoic chamber measurements to calibrate the ARIANNA detectors
- Predicted the neutrino signal shape in the ARIANNA systems from the anechoic chamber measurements, which led to the discovery of cosmic-ray signals in ARIANNA
- **Gained teaching and mentoring experience through the QuarkNet program**
- **Created and taught a summer physics course**

University of California, Irvine — Summer 2007 - Spring 2013

- Designed, constructed, tested, and deployed the first ARIANNA neutrino detector in Antarctica
- Led the analysis of the first data collected by ARIANNA stations, constraining the ultra-high energy cosmogenic neutrino flux
- Independently organized and led expeditions to Antarctica to perform glaciological measurements in support of physics objectives

Yale University — Summer 2006

- Performed Monte Carlo calculations of the interaction length of relativistic electrons in super-fluid helium in support of the XENON dark-matter detector innovation
- Designed a laser-scanning system to reveal helium molecules in superfluid helium

Los Alamos National Laboratory Summer 2005

- Measured the muon Cherenkov tank event-rates over an altitude range of 0-14,000 ft. from the base to the summit of Mt. Evans, in Colorado, as part of the Milagro collaboration (now High Altitude Water Cherenkov detector)
- Compared results to cosmic-ray theory and presented at Milagro collaboration meeting

References

- Amy Connolly, PhD … Prof. of Physics, The Ohio State University
- Steven Barwick, PhD … Prof. of Physics, University of California, Irvine
- Dave Besson, PhD … Prof. of Physics, University of Kansas
- Gaurang Yodh, PhD … Prof. of Physics, University of California, Irvine
- Albrecht Karle, PhD … Prof. of Physics, University of Wisconsin

Published Papers

*Primary or Corresponding author

- *J.C. Hanson et al. "Observation of classically 'forbidden' electromagnetic wave propagation and implications for neutrino detection." Journal of Cosmology and Astroparticle Physics. **(2018)** (2018)
- Abdul, U.L. et al. "Measurement of the real dielectric permittivity ε_r of glacial ice." *in press.* arXiv:1712.03301 (2017).
- *J.C. Hanson and A. Connolly. "Complex Analysis of Askaryan Radiation: A Fully Analytic Treatment including the LPM effect and Cascade Form Factor." Astroparticle Physics. (**91)** pp. 75-89 (2017).
- The ARIANNA Collaboration. "Radio detection of air showers with the ARIANNA experiment on the Ross Ice Shelf", Astroparticle Physics **(90)** pp. 50-68 (2017).
- The TARA Collaboration. "First Upper Limits on the Radar Cross Section of Cosmic-Ray Induced Extensive Air Showers", Astroparticle Physics **(87)** pp. 1-17 (2017).
- The ARIANNA Collaboration. "Live-time and sensitivity of the ARIANNA Hexagonal Radio Array." Proceedings of the International Cosmic-Ray Conference 2015, The Hague, The Netherlands (2015).
- The ARIANNA Collaboration. "Performance of the ARIANNA Hexagonal Radio Array." Proceedings of the International Cosmic-Ray Conference 2015, The Hague, The Netherlands (2015).
- The ARIANNA Collaboration. "A First Search for Cosmogenic Neutrinos with the ARIANNA Hexagonal Radio Array." Astroparticle Physics Journal **(70)** pp. 12-36 (2015)
- *J.C. Hanson et al. "Time-Domain Response of the ARIANNA Detector." Astroparticle Physics Journal (**62**) pp. 139-151 (2015).
- *J.C. Hanson et al. "Radio-frequency Attenuation Length, Basal Reflectivity, Depth, and Polarization Measurements from Moore's Bay in the Ross Ice-Shelf." Journal of Glaciology **(61)** 227, pp. 438-446(9)
- The ARIANNA Collaboration. "Design and Performance of the ARIANNA HRA-3 Neutrino Detector Systems." IEEE Transactions on Nuclear Science **(62)** 5 pp. 2202-2215 (2015).
- The TARA Collaboration. "Telescope Array Radar (TARA) observatory for Ultra-High Energy Cosmic Rays." Nuclear Instrumentation and Methods in Physics Research, A (**767**) 322-338 (2014).
- S. Kleinfelder et al. "Design and Performance of the Autonomous Data Acquisition System for the ARIANNA High Energy Neutrino Detector." IEEE Transactions on Nuclear Science (**60)** 2, 612-618 (2013).
- *J.C. Hanson, for the ARIANNA Collaboration. "Ross Ice Shelf Thickness, Radio-Frequency Attenuation and Reflectivity: Implications for the ARIANNA UHE Neutrino Detector". Proceedings of the 32nd International Cosmic Ray Conference, Beijing, China (2011).
- L. Gerhardt, S.R. Klein, T. Stezelberger, S.W. Barwick, K. Dookayka, J.C. Hanson, R. Nichol. "A prototype station for ARIANNA: A detector for cosmic neutrinos." Nuclear Instrumentation and Methods in Physics Research, A (**634)** 85-91, (2010).
- W.G. Rellergert, S.B. Cahn, A. Garvan, J.C. Hanson, W.H. Lippincott, J.A. Nikkel, and D.N. McKinsey. "Detection and Imaging of He_2 Molecules in Superfluid Helium." Physical Review Letters (**100)** 025301 (2008).

Invited Lectures

- "Ultra-high Energy Neutrinos, Antarctica, Greenland, and the Askaryan Effect: A Summary." (2016) *Invited speaker for the particle physics seminars at Weizmann Institute, Rehovot, Israel, and at Technion University, Haifa, Israel.*

- "U*ltra-high Energy Neutrinos, Antarctica, Greenland, and the Askaryan Effect: A Summary." (2016) Invited speaker to the TeV Particle Astrophysics (TeVPA) conference at CERN, Geneva, Switzerland.*
- *"*A Review of UHE neutrino detection using the Askaryan effect*." (2016) Invited speaker to the Very High Energy particle Astrophysics (VHEPA) conference at the University of Hawa'i, Honolulu, Hawa'i.*
- *"*A Review of UHE neutrino detection using the Askaryan effect*." (2016) Invited speaker to the KICP Workshop, UHEAP 2016, University of Chicago, Chicago, IL.*
- *"*A Review of UHE neutrino detection using the Askaryan effect*."* (2015) *Invited speaker to the KICP Workshop on the Giant Radio Array for Neutrino Detection, University of Chicago, Chicago, IL.*
- "Future Prospects of UHE neutrino detection with Electromagnetic Fields." (2014) *Invited speaker to the Very High Energy particle Astrophysics (VHEPA) conference at the University of Tokyo (Kashiwa), Kashiwa, Japan.*
- "Searching for Cosmic Rays with the Telescope Array Radar Experiment." (2014) *Department colloquium at the University of Kansas.*
- "Ultra-high Energy Neutrino Detection in Antarctica with ARIANNA and ARA." (2013) *Invited seminar in High Energy Physics at the University of Wichita.*
- *"*Under-water and Under-Ice Neutrino Astronomy*." (2013) Invited speaker to the 14th ICATPP Conference on Astroparticle, Particle, Space Physics and Detectors for Physics Applications, Villa Olmo, Como, Italy.*
- "Developing the Next Generation of UHE Neutrino Detectors in Antarctica." (2012) *Seminar in High Energy Physics at the University of Kansas.*

Service

- **Whittier College Committees:**
  - **Enrollment and Student Affairs Committee (ESAC), 2018**
- **Whittier College Awards:**
  - **Student Life Award for Outstanding Organization Advisor, CRU (Campus Crusade Christian Fellowship), 2018**
- Public Panels and Lectures:
  - *"*Our Home*." (2016) Upper Arlington Library Summer Astronomy Series.*
  - "Experimental Particle Astrophysics in Antarctica." (2016) *New Vistas in Astronomy Public Lecture Series, Columbus Astronomical Society. Columbus, OH.*
  - "The Martian." *Participated in a public question/answer panel following screening of The Martian at The Gateway Independent Theater.*
- Current Volunteer Work
  - Volunteer at the Knights of Columbus, St. Matthew the Apostle Parish, Gahanna, OH (2016-present):
    - *Serving food for the homeless at YWCA Women and Family Center*
    - *Volunteer at Columbus Catholic Diocese Soccer Tournament*
    - *Volunteer Cook/Dishwasher, St. Matthew's Parish Annual Fish Fry*
  - Volunteer, Ohio State Department of Astronomy Observatory (2015-present) (public observing)
    - *Providing and operating a 114-mm Newtonian reflector for public observing*
  - Instructor for Young Scholars Program (YSP), Ohio State Department of Physics
- Volunteer at the Knights of Columbus, St. John the Evangelist Parish, Lawrence, Kansas (2013-2015)
  - *Volunteer Cook/Dishwasher, St. John's Parish Annual Fish Fry*
  - *Volunteer Groundskeeper, St. John's Parish*