Vern P. Hart

CURRICULUM VITAE
March 2013

Froedtert Hospital
Department of Radiation Oncology
The Medical College of Wisconsin
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Milwaukee, WI 53226

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Current Positions

The Medical College of Wisconsin	Postdoctoral Research Fellow	03/2012-
Carroll University	Adjunct Instructor of Physics	01/2013-
Accdon LLC	Science Editor	09/2012-
Tutor.com Inc	Physics Tutor	10/2010-

Previous Positions

Clear Creek High School	AP/Honors Physics Teacher	10/07-08/08
Sylvan Learning Center	Science Instructor	08/08-12/08

Education

Utah State University	Physics	PhD 2012
Brigham Young University	Physics	BS 2006

Courses Taught

Physics 102 – Introductory Physics II	Carroll University	Spring 2013
Physics 2200L – Introductory Physics Lab	Utah State University	Spring 2009
AP Physics, Honors Physics	Clear Creek High School	2007-2008

Postdoctoral Courses Taken

Radiotherapy 421 – Cross-Sectional Anatomy	Medical College of Wisconsin	Fall 2012
Medical Physics S1 – Radiobiology	Medical College of Wisconsin	F12/S13
Medical Physics S2 – Radiation Therapy	Medical College of Wisconsin	F12/S13

Honors, Awards, and Scholarships

- Recipient of the New Century Scholarship
- Recipient of the Centennial Scholarship
- Recipient of the Seely-Hinckley Scholarship
- Three-Time Member of Dean's Honor List
- Elected to National Physics Honor Society (Sigma Pi Sigma)
- Outstanding Presentation Award (2nd Place) Intermountain Graduate Symposium

Professional Memberships and Organizations

- American Association of Physicists in Medicine
- American Physical Society
- Sigma Pi Sigma

Research Experience

Postdoctoral Fellow	The Medical College of Wisconsin Department of Radiation Oncology	2012-
Research Assistant	Utah State University Department of Physics	2009-2012
Research Fellow	Brigham Young University Department of Physics	2005-2006

Teaching Experience

Adjunct Instructor	Carroll University Waukesha, Wisconsin	2013-
AP Physics Teacher	Clear Creek High School League City, Texas	2007-2008
Teaching Assistant	Utah State University	2009

Publications

Refereed Journal Articles

1. **V.P. Hart**, T.E. Doyle, M.J. Taylor, B.L. Carruth, P.-D. Pautet, and Y. Zhao, "Tomographic reconstruction of mesospheric airglow using 2-station ground-based image measurements," Applied Optics **51**, 7 (2012).

2. T.E. Doyle, R.E. Factor, C.L. Ellefson, K.M. Sorensen, B.J. Ambrose, J.B. Goodrich, **V.P. Hart**, S.C. Jensen, H. Patel, and L.A. Neumayer, "High-frequency ultrasound for intraoperative margin assessments in breast conservation surgery: a feasibility study," BMC Cancer **11**, 444 (2011).

Articles in Review

1. **V.P. Hart**, and T.E. Doyle, "Monte Carlo simulation of diffuse light propagation in biological tissue using an optical spheroidal scattering solution," Applied Optics.

2. **V.P. Hart**, T.E. Doyle, M.J. Taylor, B.L. Carruth, P.-D. Pautet, and Y. Zhao, "Tomographic reconstruction of polar mesospheric cloud profiles from image data collected during the NASA AIM satellite mission," Journal of Geophysical Research.

3. E.Z. Dalah, C. Yang, **V.P. Hart**, and X.A. Li, "Mapping transient hypoxia from *in-situ* activation of ^{15}O by photon beams," International Journal of Radiation Oncology.

4. T.E. Doyle, J.B. Goodrich, B.J. Ambrose, **V.P. Hart**, S.C. Jensen, K.M. Sorensen, R.E. Factor, H. Patel, C.L. Ellefson, and L.A. Neumayer, "High-frequency ultrasound for the evaluation of margins during breast conservation surgery," Journal of the Acoustical Society of America.

Articles to be Submitted

1. **V.P. Hart** and X.A. Li, "Deformable registration of CT and cone-beam CT images for adaptive radiotherapy planning," International Journal of Radiation Oncology. (April 2013)

Presentations

Conference Papers

1. **V. Hart**, T. Liu, K Fishman, J. Wilson, and X. Li, **"**Deformable registration of CT and ultrasound images for radiation treatment of skin cancer," 2013 AAPM Annual Meeting, 4-8 August 2013, Indianapolis, Indiana.

2. **V. Hart** and X. Li, "A variable-kernel smoothing technique for improved convergence during CT-Cone Beam CT deformable image registration," 2013 AAPM Annual Meeting, 4-8 August 2013, Indianapolis, Indiana.
3. **V. Hart**, T. Doyle, B. Carruth, Y. Zhao, and M. Taylor, "Tomographic imaging of noctilucent clouds," 2010 Four Corners Section of the American Physical Society Fall Meeting, 15-16 October 2010, Ogden, Utah.
4. T.E. Doyle, **V. Hart**, and B. Ambrose, "Simulation of ultrasonic scattering in breast tissue based on cell and tissue morphology," 158th Meeting of the Acoustical Society of America, 26-30 October 2009, San Antonio, Texas. Abstract: Journal of the Acoustical Society of America **126** (4, Pt. 2), 2274 (2009).
5. S. Jensen, T. Doyle, **V. Hart**, J. Goodrich, L. Neumayer, R. Factor, and C. Ellefson, "The *ex-vivo* detection of human breast cancer through high-frequency ultrasound," 2010 Four Corners Section of the American Physical Society Fall Meeting, 15-16 October 2010, Ogden, Utah.
6. C. Yang, I. Moraru, E. Dalah, **V. Hart**, E. Paulson, B. Erickson, X. A. Li, "Improving Target Delineation by Using Deformably Registered Multi-modality Images for Radiation Therapy of Pancreatic Cancer," 2013 AAPM Annual Meeting, 4-8 August 2013, Indianapolis, Indiana.
7. S. Martini, R.J.T. Pichardo, S.C. Jensen, **V. Hart**, and T.E. Doyle, "Monitoring bubble dynamics in soybean oil," 101st American Oil Chemists Society Annual Meeting and Expo, 16-19 May 2010, Phoenix, Arizona.

International Conference Papers

1. T.E. Doyle, S. Martini, S.C. Jensen, R.J.T. Pichardo, and **V. Hart**, "Ultrasonic spectral analysis of cavitation bubbles in vegetable oils," Second Pan-American/Iberian Meeting on Acoustics, 15-19 November 2010, Cancun, Mexico. Abstract: Journal of the Acoustical Society of America **128** (4, Pt. 2), 2314 (2010).

Additional Presentations

1. **V. Hart** and X.A. Li, "A variable-kernel smoothing technique for improved convergence during CT-Cone Beam CT deformable image registration," MCW Cancer Imaging Retreat 2013, Wauwatosa, Wisconsin, March 15, 2013.
2. **V. Hart** and T. Doyle, "Tomography of limited-angle projection data," Intermountain Graduate Research Symposium, Logan, Utah, March 24, 2011.
3. **V. Hart** and T. Doyle, "The application of tomographic methods to the translation of multipole fields in multiple scattering," Intermountain Graduate Research Symposium, Logan, Utah, March 31, 2010.
4. **V. Hart** and J.-F. Van Huele, "Airy wave packets as quantum solutions for recovering classical trajectories," Spring Research Conference, Provo, Utah, March 11, 2006.

Poster Sessions

1. **V. Hart** and J.-F. Van Huele "Is there a quantum mechanical description of Thomson's e/m experiment?" College of Physical and Mathematical Sciences - Homecoming Week Alumni Poster Session, Brigham Young University, Provo, Utah, October 14, 2005.

Theses and Dissertations

1. Airy Wave Packets as Quantum Solutions for Recovering Classical Trajectories
2. The Application of Tomographic Reconstruction Techniques to Sparse Imaging Configurations in Atmospheric Science and Biomedical Optics

Research Activities

Medical Physics and Biophysics

→ Developed novel Monte Carlo simulation techniques based on spheroidal scattering for modeling of diffuse light propagation in biological tissue.
→ Assisted in experimental acoustic testing of breast cancer lesions extracted during lumpectomy surgeries.
→ Developed optical scattering models and tomographic inversion methods for imaging of biological tissue.

Deformable Image Registration

→ Implemented numerical methods such as least-squares optimization and optical flow for use in registration of CT and cone-beam CT images.
→ Applied finite element methods and solid modeling algorithms for use in deformable image registration techniques.

Digital Image Analysis

→ Created algorithms for use in computer vision applications such as edge detection, object recognition, and image segmentation.
→ Designed algorithms to model the geometry of organs using skeletal structures formed from medial locus representations.

Tomographic and Acoustic Imaging

→ Designed tomographic inversion algorithms for use in reconstructing vertical profiles of airglow emissions and polar mesospheric clouds from ground-based and satellite imagery.
→ Performed experimental testing of the effects of ultrasound on the crystallization properties of lipids at the microscopic level.
→ Studied cavitation and crystallization in lipid systems using computational models to interpret ultrasonic data.

Educational Activities

Curriculum Development

- Developed course curriculum for Standard, Pre-AP, Honors, and Advanced Placement physics students at Clear Creek High School while working as a physics teacher.
- Assisted in Developing test preparation material for students preparing to take the AP Physics exam.
- Designed a physical science section study course for students preparing to take the TAKS (Texas Assessment of Knowledge and Skills) exam.

Mentoring Experience

- Mentored science students at St. Matthias Parish School in Milwaukee during 2012-2013 school year.
- Participated in St. Matthias science fair judging, planning, and mentoring.

Tutoring Experience

- Tutor.com - Physics e-tutor (2010-Present)
- Sylvan Learning Center, Orem, Utah (2008)
- Clear Creek High School TAKS Preparation Program (2008)
- Utah State University Department of Physics Learning Center (2009)

Additional Qualifications

Editing Experience

ACCDON LLC

Science Editor - Reviewed journal articles for language and technical content, provided clients with feedback in preparation for publication.

Clinical Experience

Froedtert Hospital Cancer Center

Quality Assurance – Performed monthly inspection of imaging and radiotherapy machines, including CT, CBCT, and linear accelerators to ensure proper calibration and alignment for patient radiotherapy dosage.

Programming Experience

- C++
- MATLAB
- FORTRAN
- LaTex
- Maple
- Labview

Research Projects

RC Grant, Utah State University (2011)
Three-Dimensional Optical CT Scanner for Breast and Prostate Cancer
Role: Assistant Researcher $19,058

NSF, Grant No. ATM 0536876 (2006 – 2011)
Development and Optimization of Tomographic Imaging Methods for Advanced Gravity Wave Studies in the MLT Region
Role: Assistant Researcher $494,148

NIH-NCI, Grant No. 1 R21 CA131798-01A1 (2008 – 2010)
Histology-Based Computational Tools for Ultrasonic Differentiation of Neoplasms
Role: Assistant Researcher $334,846

Co-Authored Proposals and Annual Reports

1. RC Grant, Utah State University (2011) "Three-Dimensional Optical CT Scanner for Breast and Prostate Cancer," Funded in 2010 ($19,058).

2. Year-end (2010) report for NSF, Grant No. ATM 0536876, "Development and Optimization of Tomographic Imaging Methods for Advanced Gravity Wave Studies in the MLT Region."

3. NIH Allergy and Infectious Diseases (2012), Grant No. FP00004459, "Mitigation of Radiation Nephropathy."

4. NIH (2013) Grant No. Pending, "Ultrasound-Guided Tomotherapy for Malignant Skin Lesions."

Collaborators and Advisors

- Medical College of Wisconsin, Milwaukee, WI (Dr. X. Allen Li PhD)
- Center for Atmospheric and Space Sciences, Logan, UT (Dr. Michael J. Taylor PhD)
- Utah Valley University, Orem, UT (Dr. Timothy E. Doyle PhD)

- Huntsman Cancer Center, Salt Lake City, UT (Dr. Leigh Neumayer MD)
- Froedtert Hospital, Milwaukee, WI (Dr. J Frank Wilson MD)

Outreach Participation

- Science Fair Judge (Clear Creek High School)
- BYU Science Demonstration Team (performed demo shows at local elementary schools)
- Participated in USU "Physics Day at Lagoon," an outreach program for secondary science students in the state of Utah, summer 2009, 2010, and 2011 (assisted with physics knowledge bowl competition).

Volunteer Experience

- Y Group Leader, BYU New Student Orientation, summer 2005, fall 2005, fall 2006 (assisted in campus orientation of incoming freshman).
- Transfer Student Group Leader, BYU New Student Orientation, winter 2006 (assisted in campus orientation of incoming transfer students).
- Y Group Captain, BYU New Student Orientation, summer 2006 (conducted orientation seminar for new Y group leaders).

Additional Employment

Inventory Specialist - Quickutz, Inc. Orem, Utah, 2003-2004 (provided inventory management for scrapbooking company, used computer software to track supply quantities and predict shortages).

Humanitarian Service

Missionary service in Nebraska, Iowa, and Kansas, aided in tornado clean-up and relief efforts, participated in various community and church service projects.

Interests and Hobbies

Spending time with family, movies, sports.

Personal Site

http://vernhart.yolasite.com