Academic Year 2013-2014  
College of Science Annual Report  
Department: Physics

I. Research and Innovation

A. Research Expenditures

<table>
<thead>
<tr>
<th>PI</th>
<th>Expenditures</th>
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<tbody>
<tr>
<td>Arav</td>
<td>$63,499.75</td>
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<tr>
<td>Heflin</td>
<td>$58,911.97</td>
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<tr>
<td>Heremans</td>
<td>$95,237.78</td>
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<tr>
<td>Huber</td>
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<tr>
<td>Khodaparast</td>
<td>$51,692.38</td>
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<tr>
<td>Link</td>
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<td>Mariani</td>
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<td>Mather</td>
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<tr>
<td>Minic</td>
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<td>Nguyen</td>
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<td>Vogelaar</td>
<td>$407,708.17</td>
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Total        $2,287,498.40
B. Notable new research awards in 2013-14 (incl. PIs, Amount, Title and Funding Agency)

1. **Arav**
   - PI: NASA HST-AR-13233.01, Arav’s budget $93,420
   - Co-I: NASA HST-GO-13184.04, Arav’s budget $27,684

2. **Farrah**
   - Source of Support: STScI, Admin PI, Award Amount: $6,000, Award Period: 10/01/2013 - 09/30/2016, HST-AR-13241.04
   - Source of Support: European Union, Award Amount: Unfunded co-investigator, award amount to EU participants was $2,000,000, Award Period: 09/01/2014 - 04/14/2019, Title: The Herschel Extragalactic Legacy Project

3. **Heflin**

4. **Heremans**
   - US Navy (NAVAIR) SBIR Phase II subcontract to Nanosonic Inc. (Pembroke VA “Selfassembled Nanocluster Based Photodetectors” (01/01/2013-12/31/2014). J. J. Heremans is PI at project location VT (VT part = $60K).

5. **Khodaparast**
6. **Link**
   - Department of Energy, “Study of Electroweak Interactions: Task N,” funded at $580,000 (5/1/2013-3/31/2016) as a part of the DOE HEP umbrella grant. (Co-PI on the umbrella grant. The amount listed is my contribution.)

7. **Mariani**
   - National Science Foundation, supplement through Columbia University $8,000 from 07-01-2013 till 06-30-2014.

8. **Mather**
   - *A Queueing Framework for Synthetic Circuits in E. coli.* Principal investigator. National Science Foundation Award #1330180. Award amount to date: $961,252.

9. **Minic**
   - I am on Task A (theory) of our new DOE grant (Piilonen; Link; Minic) just awarded in January 2013, following the new comparative review guidelines. This new grant is starting in April 2013. Around 100,000 for 3 years. A supplement of 20,000 was also awarded in the middle of 2013.

10. **Nguyen**
    - National Science Foundation support “EAGER: Microstructure of Er optical center in the large-bandgap semiconductor GaN” award with total amount of $61,985 (period: 09/01/2013 - 08/31/2014).

11. **Park**

12. **Petty**
    - Source of Support: STScI, (Co-Investigator), Award Period: 10/01/2013 - 09/30/2016, HST-AR-13241.04

13. **Piilonen**
Laboratory, Purpose: WBS 1.4 (KLM Systems) for the US Belle II Project


- Title: Studies in Elementary Particle Physics, PI: L. Piilonen, Dates: May 1, 2013 to March 31, 2014, Amount: $270,000, Source: DOE Research Contract DE-FG02-13ER41917, Purpose: Belle and Belle II experiments

- Title: PhysTEC Comprehensive Site Grant, PI: John Simonetti, CoPIs: Leo Piilonen, George Glasson, Brenda Brand, Dates: August 1, 2013 to July 31, 2014, Amount: $99,350 (allocated to Piilonen: 0%), Source: American Physical Society

14. Pitt

- Southeastern Universities Research Association Inc. (SURA) – Principal Investigator, “Graduate Student Research Assistant in Accelerator Physics at Jefferson Lab,” Awarded in 2013 - $107k total for 2013 – 2017

15. Sharpe

- Plessier, R., Sharpe, E., “A regional conference series in mathematical string theory,” 2013-2016, NSF PHY 1316774, total award: $12,000 (VT portion: $0)

16. Vogelaar

- NSF Grant “Collaborative Research: Beta-decay Angular Correlation Measurements with Cold and Ultracold Neutrons” (PI, Pitt as co-PI;2 years;$70k; with NCSU as lead)

C. Faculty awards/honors (e.g., Humboldt Fellowships, NSF CAREER awards, etc.):

1. Anderson

- London Mathematical Society Travel Grant (Approx. $3000)– Grant providing travel and living costs to give a series of invited lectures over two weeks in 2014 at the following universities in the United Kingdom: University of Surrey, Imperial College London and the University of Oxford.
2. **Arav**  
VT Scholar of the week the week of April 29, 2013

3. **Heflin**

4. **Mariani**

5. **Minic**
   - Gravitational Research foundation, honorable mention 2013 (Is quantum gravity a superquantum theory, with Lay Nam Chang, Zack Lewis and Tatsu Takeuchi)

6. **Piilonen**
   - The William E. Hassinger, Jr. Senior Faculty Fellow in Physics (three-year term that started Fall 2010; three-year reappointment by College of Science in Fall 2013)
7. **Sharpe**
   - Mentioned at Virginia Tech’s 8th annual authors recognition day, in recognition of a conference proceedings I helped to edit in 2012
   - Invitations to speak at conferences (declined): Workshop on heterotic string compactifications, Texas A&M, April 28-May 2, 2014

8. **Tauber**
   - In November 2013, I was elected *Fellow of the American Physical Society (APS).*
   - I was invited to the 2014 *American Physical Society (APS)* March Meeting to present the talk *Environmental versus demographic variability in stochastic lattice predator-prey models.*
   - I was invited to give two lectures *Critical dynamics near and far from equilibrium* and *Stochastic predator-prey models,* as well as the talk *Non-equilibrium relaxation and aging kinetics in driven diffusive systems* at the *ITAP Summer School,* Institute for Theoretical and Applied Physics, Turunc, Marmaris, Turkey, August 2014.

9. **Vogelaar**
   - *Elected Fellow of the American Physical Society -
     “For significant contributions to neutrino physics and underground science, especially through his leadership in calibrating the Borexino detector, with the first real-time detection of 7Be solar neutrinos, and his creation of the Kimballton Underground Research Facility, which is opening up new opportunities for fundamental physics experiments.”*

D. **Number of manuscripts, books, and book chapters (CY 2013); list high impact papers**
   - One Book (Tauber),
   - One Book Chapter (Heflin)
E. Number of presentations (CY 2013); notable invited lectures:

- 179 presentations

- Huber:
  - Neutrino Theory*, (this is about as big as talks get in our field, this is the one plenary neutrino theory talk with an audience somewhere around 500 people), Neutrino Physics with Project X, CP violation reach in the next decade and beyond, Snowmass at the Mississippi, July 26 -- August 6, 2013, Minneapolis

F. Links and support from university’s research investment institutes (ICTAS, VTCRI, VBI, Fralin, VTTI, ISCE, ICAM, ICAT)

1. Farrah
   - Source of Support: VT, ICTAS, PI (75%). White Paper (used as downselect for full proposal), Award Amount: $100,000, Award Period: 04/15/2014 -04/14/2016, Title: Development of an ultra low frequency radio interferometer in space

2. Heremans
   - Member of the ICTAS Faculty Board (steering and review duties)

3. Khodaparast
   - ICTAS “High Intensity Nano-Optics and Fabrication” 12,500 for one year (100% effort)
   - Review proposals for ICTAS
   - Served in the Advisory Board of ICTAS
   - Served in the ICTAS PhD Scholar Committee and reviewed ~ 30 applications

4. Nguyen
   - Institute for Critical Technology and Applied Science (ICTAS) – Virginia Tech: “Filming” biomolecules in action with terahertz spectroscopy” award with total amount of $120,000 (period: 07/01/2013 - 06/30/2015).
5. Petty
   - Source of Support: VT, ICTAS, Co-Investigator White Paper (used as downselect for full proposal), Award Period: 04/15/2014 - 04/14/2016, Title: Development of an ultra low frequency radio interferometer in space

G. Number of post-doctoral positions in STEM-H research areas
   - 14 postdoctoral associates, research associates, and research scientists

H. Examples of links with NCR for research into issues of security and resiliency

I. Examples of partnerships with external collaborators which have enabled VT to compete more effectively for external funding

1. Anderson
   - In Oct. 2013 I was invited to visit both Harvard University (Center for the Fundamental Laws of Nature) and MIT (Center for Theoretical Physics) to work with collaborators (spent 1 week).

2. Cheng
   - *Gordon Research Conference on Soft Condensed Matter Physics*, New London, NH, August 18-23, 2013: The Gordon Research Conference (GRC) on soft condensed matter physics is a major biannual conference for the soft matter community to discuss the recent progress in the field. I attended the 2013 GRC on soft matter and presented a poster on the self-assembly of microtubules. At this conference, I met with Dr. Uri Raviv from the Hebrew University of Jerusalem in Israel, who is an experimentalist working on the self-assembly of microtubules *in vivo*. We started a collaboration to work on the self-assembly mechanism and nanomechanics of microtubules.
3. **Heremans**  
- Collaboration on magnetoelectric effects in the solid-state and on multiferroic materials for electronic control of magnetic properties, with faculty and students in Materials Science and Engineering, and UT San Antonio.
- Collaborations on materials with Princeton University (L. Pfeiffer & M. Shayegan), UCSB (C. Palmstrøm), and University of Oklahoma (M. Santos).
- Quantum phenomena in InAs accumulation layers: InAs layer growth by Louis Guido (MSE/ECE), and sample fabrication and measurements by Yao Zhang.
- Other long-term collaborations: Argonne & U. of Northern Illinois; Victoria U. of Wellington, New Zealand; LANL; FNRS& UCL, Belgium.

4. **Khodaparast**  
- My group has been collaboration with the group of Chris Palmstrøm at the Univ. of California in Santa Barbara who provided us with samples to understand the magneto-optical response of InAsP based structures. We have an invited talk that will be presented by Brenden Magill (Post Doc) on the collaborative efforts.
- I have a long lasting collaboration with the theory group of Stanton at Univ.of Florida and we are working on two publications, one is in the final stages of preparations for the submission. Stanton and my group have also close interactions with the group of Wessels at Northwestern to study ferromagnetic semiconductors. We have a pending DOE proposal.
- I continued my interactions with the Ecole Polytechnique in France, as we have been working on a project. More measurements are required to wrap up one publication and I was invited for a month in summer to work on finalizing our efforts.

5. **Minic**  
- I am currently involved in synergetic activities with Perimeter Institute in Canada (via Prof. Laurent Freidel), with the Aristotle University in Thessaloniki, Greece (via Prof. Tassos Petkou) and with the Witwatersrand University in Johannesburg, South Africa (via Prof. Vishnu Jejjala). Grant collaborations are also pursued via these synergetic connections.
6. **Nguyen**
   - Prof. Ian Ferguson, University of North Carolina at Charlotte, The William States Lee College of Engineering, Energy Production and Infrastructure Center (EPIC). We have submitted a letter of intent to the Energy Frontier Research Center (ERFC), DOE Office of Science in the area of rare earth doped wide band gap materials titled “Center for Multifunctional Rare Earth Enabled Devices (MREED)”.

7. **Petty**
   - Collaborating with astrophysicists at CUA, Caltech, and NASA/GSFC for Hubble Space Telescope, Proposals deadline April 11, 2014
   - Collaborating with other members of the Physics Department, and external institutes, to prepare a proposal for a Small Explorer class mission to NASA, due in late 2014.
   - Collaborating with members from the Great Observatories All-sky LIRG Survey (GOALS) team (primarily at NRAO/UVA, and Spitzer/Caltech)

8. **Piilonen**
   - I worked with my US colleagues at Pacific Northwest National Laboratory, University of Hawaii, University of Cincinnati, Indiana University, Wayne State University, University of Pittsburgh and University of South Alabama on the US Belle II Project, the detector construction effort for the next-generation Belle II experiment. This project has received CD-0 and CD-1 approvals from the DOE (in 2011 and 2012, respectively). The Virginia Tech portion of this proposal, to construct the new detector elements for the KL meson and muon subsystem (KLM), was deemed complete by the DOE review panels and so was granted CD-2a and CD-3a approvals to begin construction in late 2012. (This is the only section of the proposal that has received these approvals so far.) We completed the fabrication of the detector modules at Virginia Tech in August 2013, shipped the modules to KEK in four lots of 9 modules each, and then commissioned and installed the modules into the Belle II detector’s magnet iron yoke by November 2013.
9. Pitt

- Qweak experiment at Jefferson Lab: This was another very busy year for our group on the Qweak experiment. Data-taking completed in May 2012, and we have been contributing in many ways to the data analysis since then. Both Anna Lee and Wade Duvall are doing their Ph.D. thesis work on this experiment. Pitt continued as chair of the collaboration’s governing Institutional Council and is the convenor of three of the eight “focus groups” into which the analysis is organized.

- 12 GeV MOLLER experiment at Jefferson Lab: This is a new Standard Model test planned for the JLAB 12 GeV upgrade. I was appointed as an initial member of the governing Executive Board last year (and I have been appointed as chair of the EB and deputy spokesperson beginning in February 2014). I did some work on improving beam charge monitor response that will continue into this year. We expect to get more feedback from DOE this year on the funding prospects for this experiment.

10. Scarola

- Collaboration with a group at U. of Illinois: I am part of a collaboration with an experimental group run by Prof. Brian Demarco (Illinois). We are constructing a formalism to explore Brian’s experiments on ultracold atoms trapped in optical lattices. We regularly meet at conferences and discuss progress over Skype. This year we submitted a joint Theory/Experiment proposal to DOE.

- Oakridge Collaboration: I have started a collaboration with Thomas Maier (Senior Research Staff Computer Science and Mathematics Division & Center for Nanophase Materials Sciences, Oakridge National Laboratory) to pair my computational methods with his expertise in Dynamical Mean-Field Theory to study disorder in the Hubbard model. Through this collaboration my group was awarded a grant of computing time on Oakridge supercomputing facilities. Group members will travel to Oakrdige as part of the collaboration.
11. Vogelaar

- **LENS**: Micro-LENS is running, and we are transitioning to the construction of mini-LENS itself. Shake-down of electronics and analysis has taken longer than planned, but we are making steady progress. A major proposal last year to the NSF (in which we were joined by University of North Carolina and North Carolina Central University) was declined. The NSF explained that with sequestration they were not funding any ‘new’ starts. Our Indian collaborators have received about $400k in research funding for LENS this year and this could help. Focus has shifted also a bit towards CNO neutrinos and the broader capabilities of a LENS-style design. We have resubmitted a significantly improved proposal this year, with LSU as the lead institution (a strategic choice to avoid being marked as potentially ‘over-extended’ due my normal ‘Solar Neutrino’ proposal also being evaluated this year). While LENS is a solid experiment, the expected cost of $50-$100M makes competition for resources a major concern. However, the novel detector design has multiple applications, and we have every intention of pushing LENS forward if possible and at least through the mini-LENS phase (which is designed to give a more complete understanding of LENS itself).

- **KURF**: We currently have 13 institutions making use of KURF on over eight projects. We have about 35 fully trained researchers. Most recently we had the “Watchman” group from LLNL develop a detector on the second level of the mine. There are three other groups which are working towards utilization of KURF. There is also a recent interest in using Kimballton for CO2 sequestration (the lime plant makes a nice pointsource). This is a natural extension from an existing MOU between VT and two universities in England, and also an agreement between the NSF and its counterpart in England to have joint proposals with review by only one side. (It has ICTAS, VCCER, Dean of Engineering, Geoscience, etc interest.) They are discussing another building next to our current lab. Many hurdles exist along the way, but the continued interest in KURF from multiple fronts is encouraging, and something we should capitalize on. The work on Watchboy has already led to both the Watchman and HyperK and other groups scheduling their collaboration meetings at VT later this Spring. This is exactly what CNP & KURF can help accomplish. (We need to formalize the new contract between VT and Lhoist developed to enable new programs, such as DIANA.)

- **DIANA**: We competed to have the DIANA experiment hosted at KURF. This was a potential $30-40M NSF facility with a 20-30 year research program. The other competing sites were SURF and
Soudan. SURF was selected, but then entire DIANA experiment was then defunded. (Sadly, not unlike what happened with DUSEL.) There remain options on a smaller scale to build up an astrophysics program at KURF, and we should continue to talk with the NSF, since the science reviewed very well (even at the National Academy), and KURF was clearly a more sustainable site for DIANA (SURF was selected for other reasons, but those reasons are very volatile, and can change rapidly.)

- GEM*STAR: This program is multi-faceted and has many very fertile avenues at this point in time. Presentations are going on in DC, LLNL, LANL, BNL, Europe and Asia. An immediate focus is on the application of GEM*STAR technology to the disposition of weapons grade plutonium to satisfy treaty requirements with Russia (made more timely with the recent demise of the MOX facility in SC). I am currently trying to develop a framework for VT, ADNA Corp, and Muons Inc. (and others) to work constructively together. This process has involved many internal as well as external advisors. On a more practical immediate front, I am confirming results regarding the equilibrium isotopic distributions when burning weapons grade plutonium. The GEM*STAR story line is compelling and has opened lots of doors, both at the NNSA, CSIS, the Russian National Academy, BARC in India, etc. In fact, the DOE has now even taken some small steps towards ‘accelerator driven systems’. (We are not waiting for the DOE …)

II. The Life of the Mind

A. Faculty and departmental teaching awards (incl. college, university and national awards)

1. Arav
   - College of Science Certificate of Teaching Excellence for 2014
B. Undergraduate student achievements and awards (e.g., Goldwater Scholars, Man/Woman of the Year)

C. Graduate student achievements and awards (including college, university and national awards)

1. Heremans
   - Graduate student Shaola Ren received the Ray F. Tipsword Graduate Scholarships for 2013.
   - Graduate student Yao Zhang received the James A. Jacobs Memorial Graduate Fellowship for 2013.

D. Grants in undergraduate teaching and learning (e.g., PhysTec)

1. Simonetti
   - “The Virginia Tech PhysTEC Project,” Physics Teacher Education Coalition (AIP, APS, AAPT), PI: Beate Schmittmann/John Simonetti, Co-PIs: George Glasson, Brenda Brand, Leo Piilonen, $298,835. 2011-2014 (three years), with continuing support from the University in years 4-6 (total support from University: $269,751).
   - Horton Foundation Grants supporting research, teaching, and outreach at the Martin Observatory: $5250 (2000 -- present), $4000 (2001 -- present). These funds continue to be available until spent out.
   - PhysTEC is a program aimed at producing better educated high school physics teachers. In particular, the program aims to producing high school physics teachers from the ranks of undergraduate physics majors.
   - Another goal of PhysTEC is to promote the transformation of the teaching of physics utilizing physics education research. As part of the program we are teaching PHYS 2305 and 2306 to our physics majors in a Scale-Up approach.
   - In Fall 2012 I introduced an undergraduate Learning Assistant program to expose more undergraduate physics majors to the benefits of teaching (e.g., increased learning on physics, through teaching), and the faculty to the benefits of including Learning Assistants in their teaching (e.g., LAs become better students in
upper-division courses, better results in classes with LAs, and more enjoyable student-professor interactions).

- LA program has continued through 2013 (and is still continuing in 2014).
- LAs signed up for an Independent Study course (I am the instructor of record). Through this course they received 2 credits for their work as LAs.
- New LAs in AY 2013-2014 were required to take Mary Norris’s Physics Teaching and Learning course in Fall 2013 (originally started by Alma Robinson in Fall 2012. In this course the students learned about student-centered teaching techniques, practiced teaching, and heard from guest speakers. Guest speaker Dr. Shelli Fowler appeared as part of the Brown Bag Teaching Lunch I organize.

E. Grants in graduate education (e.g., IGERTS)

F. One to two notable events or programs related to undergraduate education (e.g., first year of a signature course or FYE)

1. **Anderson**
   - I have been actively involved in mentoring with the VT Honors Program (including attending Faculty/Student lunches and Honors dinners, scholarship preparation sessions for undergraduates and other events).

2. **Arav**
   - Taught the “Virginia Tech Signature experience” courses: PHYS 1056 (S13) and PHYS 1055 (F13), Spot evaluations: 5.11 and 5.09, respectively

3. **Farrah**
   - I proposed, developed and gave two new courses this calendar year, both 4000/5000 level conjoined courses; one on Modern Cosmology, and one on the Physics of Galaxies. Both are now permanent course offerings. These two courses go a long way to filling the void of advanced undergraduate astrophysics courses at VT.
4. **Heflin**

- Although I only taught the first few weeks of the NANO 3015 - Nanoscale Synthesis, Fabrication, and Characterization course, I and Tim Long (originally, we had planned to co-teach the course, but Tim's teaching assignment in Chemistry precluded him doing more than a handful of lectures in 3015) did put a great deal of time into identifying the subject matter for the lectures and labs for the course. Since this two-semester lecture/laboratory sequence is the core of the impending Nanoscience B.S. degree and is unlike any other course at any other institution, a significant amount of care and time was necessary to develop a coherent syllabus in which the students would learn about and synthesize a type of nanomaterial in one week followed by learning about and carrying out appropriate nanoscale characterizations in the following three weeks. For example in one four-week module of lectures/labs, the students functionalized carbon nanotubes in one week followed by learning about and performing Raman spectroscopy, Auger spectroscopy, and thermal analysis of those nanotubes in the succeeding three weeks.

5. **Khodaparast**

- As part of an initiative to launch an undergraduate program in the area of nanoscience, I developed a new course entitled “**Quantum Physics of Nanostructures**”. This Course and the lab were offered in Spring of 2013. The lab for this class has some overlaps with the existing modern physics lab and several new experiments will be added in 2014. We used the lab instructions developed by Mark Pitt and before each lab I worked with the course TA to review the labs and the procedures to ensure the proper operations of the equipment.

6. **Piilonen**

- Continued pedagogical development in PHYS 2305 and 2306: applied active-learning and peer-instruction techniques almost exclusively, with little or no formal lecturing, to the physics majors in the SCALE-UP classroom. In class, the students answered quick multiple-choice questions and did work on written assignments in pre-assigned groups of three. (This year, I kept the same groups throughout each semester rather than rearranging them after the second midterm.) In Fall 2013, I had an undergraduate learning assistant, Matt Kriete, with me during the class sessions to assist the students, using the Socratic method, during their in-class work. (I didn’t have an LA in Spring 2013 because of scheduling difficulties among the pool of LAs.) This worked out quite well for
the students. My student grades did not suffer, and they were again able to demonstrate mastery of the most challenging end-of-chapter problems from the textbook—something that I was not able to pull off in past years. In the SPOI comments for PHYS 2305 at the end of Fall 2013, there were three negative scores about my overall rating and a negative comment regarding the pedagogy: one student would have preferred traditional lectures. It is interesting to note that the students’ SPOI scores rise for the SCALE-UP experience from PHYS 2305 to PHYS 2306. This has happened twice now: is a pattern developing?

- These pedagogical developments reflect my implementation of the funded Phys-TEC proposal with Beate Schmittmann, John Simonetti, and colleagues in the School of Education to increase the number of BA/MAED graduates who intend to pursue a career in high school physics teaching. I encourage my students to consider a career in teaching and they have good role models for active learning pedagogy in their eager Learning Assistants and graduate Teaching Assistants.

7. **Simonetti:**
   - **PHYS 2325-2326 Seminar for Physics Majors, Spring-Fall 2013**
     - A First Year Experience course. In correspondence with the FYE office (e.g., internal proposals), I have entitled this program, “Thinking like a Physicist.” I converted this sequence to an FYE program course in 2011. Within a few years, all entering Freshman and transfer students will be required to take a First Year Experience (FYE) course. Some of these courses are being developed by Colleges --- in which case the students will get a generic course. In Physics we have the PHYS 2325-2326 Seminar for Physics Majors that already satisfies some of the requirements of an FYE course (e.g., collaboration with University Libraries).
       - The Spring semester (2326) was the 2nd semester of the first year the sequence was part of the FYE program.
       - I wrote an internal grant proposal for support money from the FYE program for a GTA for the AY 2012-2013; it was funded.
       - I also wrote a continuing grant proposal (in 2013) for support starting in Fall 2013 and continuing into Spring 2014; it was also funded.
G. One to two notable events or programs related to graduate recruitment and/or education

1. Khodaparast
   - In Fall of 2013, I taught the graduate classical mechanics, the book by Goldstein was adopted but supplementary materials from other books were added. In addition to HW assignments, regular in class quizzes were given.

2. Mather
   - I trained (with the assistance of my postdoc) my two graduate students in introductory experimental techniques in molecular biology, microfluidics, and microscopy, with the overall goal to use these techniques for research topics in biophysics and synthetic biology. I also trained my two graduate students in stochastic simulation and scientific computing.
   - With my guidance, one of my graduate students (Phil) established himself as one of the only students on campus who is capable of fabricating custom microfluidic devices. He also constructed and engineered a custom experimental setup to control these microfluidic devices. He is currently running his own experiments on synthetic circuits in *E. coli*, with the hope of understanding the stochastic degradation processes within cells. He has been approved to give a talk at the upcoming 2014 APS March Meeting.
   - My other graduate student (Curtis) has been developing his own user-friendly program for the simulation of stochastic chemical reaction networks, with the goal that this program would routinely be used for research purposes and also for the annual q-bio Summer School in San Diego. I gave him this project both to teach him the intricacies of stochastic simulation and to develop a tool that brings recognition to my lab and Virginia Tech more broadly. He has also been instrumental in the development of computer programs used in experimental situations, such as writing code to control stepper motors, which in turn control the fluid pressure that drives our microfluidic devices.

H. Examples of research experiences and experiential learning opportunities for undergraduates:

1. Arav
   - Supervised and advised 2 undergraduate students in paid undergraduate research positions
2. **Heflin**
   - See development of NANO 3015 above.

3. **Heremans**
   - **Modern Experimental Physics “Senior Lab”, PHYS 4315 (CRN 95518 and 95519)**
     - I taught this class for the first time in Fall 2012, and started to introduce gradual change from previous years’ implementation. Last year I refurbished setups, performed overdue maintenance on equipment, tidied up the lab space, shelved abandoned equipment to create room for independent UG projects, rewrote the syllabus, updated some lab handouts, and wrote 2 new documents to help students with reporting requirements (core curriculum area 1 requirement: spoken, visual, and written communication in major).
     - For 2013 I continued the process with a necessary entire rewriting of the NMR experiment lab guide. The new 27-page document is self-contained, and describes the theoretical background, the experimental implementation, and illustrations and photographs of what the working experiment should look like. From the student oral presentations it appears that the students’ understanding of the NMR experiment has much benefited from the new write-up.
     - For 2013 I built a new experiment from the ground up: the Hall effect in semiconductors as function of temperature. I used an existing electromagnet and semiconductor samples, separate commercial power supplies, source meters, and benchtop DMMs, and fabricated dedicated conditioning electronics boxes using shop supplies. The new experiment was thoroughly tested before the academic year. I also wrote a new 9-page lab guide for the new experiment, in the same spirit as the new NMR lab guide. From the student oral presentations I can deduce that the students benefited from the new experiment. Some groups even went beyond the lab guide and performed additional experiments and analysis, which I will likely incorporate in future versions.
     - Using shop supplies and newly acquired items I continued to refurbish existing equipment (connector boxes, cables, O-rings, ...). When possible students were involved in the repairs, as such fixes are interesting and part of experimental life.
     - The students responded well to the efforts to invigorate Senior Lab and showed a gratifying enthusiasm. They also appreciated the continuous help from the TA (a quite central person for a lab course) and from the instructor. Several students had very insightful suggestions. They e.g. correctly realized that the
experiments dealt with not only physics content but also experimental techniques, which could be applied to different physics aims, and they suggested experimental techniques they would like to learn about. Those suggestions were excellent and should be given consideration in future years.

4. Heremans
   - Undergraduate research mentor of James Gantt Ward. Gantt Ward performed research in Spring 2013 on deposition and electronic properties (including superconductivity) of Pb films for integration on spin-orbit coupled semiconductor wires.
   - Senior personnel of NSF-REU Chemistry “SURP”.

5. Khodaparast
   - Doug Wilson spent several semesters in my group and currently is pursuing a graduate program at Florida State in the area of materials science.
   - Last summer supported by the NSF, Alex Winemiller participated in research activities in my group. Amnah Eltahir summer research in my group was supported by MAOP. Both Alex and Amnah were part of my group during the regular semesters. Rochelle Silverman joined my group in Fall of 2013.
   - A Scineering program student, Bishwamoy Sinha Roy, who spent one semester in my group, presented a poster in April 19th 2013 as part an undergraduate research day.
   - One undergraduate student in the nano-program (R. Abrahmson) as part the required lab rotation in the program, spent a month in my lab.
   - Continue collaboration with Prof. Jill Sible’s NSF STEP (CURIE) program to promote student retention in the physical and quantitative science majors. I attracted an undergraduate student (Alex Winemiller) as part of the interaction with this program.

6. Link
   - In Research sections in Spring 2013 I had two undergraduates in Phys4994: Mario Solano with 1 credit hour and Kevin Kin with 2 credit hours
7. **Mather**
   - Four undergraduates (Spring 2013). I introduced these students to experimental, theoretical, and computational techniques in biophysics and synthetic biology. I met with most of these students weekly during and just prior to my weekly lab meetings. As their primary point of contact, I assigned particular students to either one of my graduate students or my postdoc.

8. **Minic**
   - Jacob Carroll has been doing some nice research with us on the Banach quantum theory, and idea we (Lay Nam Chang, Zach Lewis and Tatsu Takeuchi) came up with two years ago. Jacob has finally given us enough data to proceed with this project. He was discovered by Zack Lewis in his math methods class and then Jacob did an independent study with Tatsu and now the 5 of us are going to write a nice paper on this pretty original idea that once again covers classical, quantum and superquantum theory in one go.

9. **Nguyen**
   - John Rahmani, junior honors, in Spring and Fall 2013, research project: measuring the dielectric conductivity, dielectric response of salt solutions.
   - Erica Grant, freshman, in Spring and Fall 2013, research project: measuring the dielectric response of biological solutions with the VDI Frequency Extenders.
   - Adelman, Max P., Sophomore, in Spring 2013, research project: Building optical setup for terahertz-frequency system.

10. **Park**
    - Michael Warnock - supervised his undergraduate research, co-author of one submitted paper; wrote recommendation letters for his graduate school applications.

11. **Pitt**
    - Jonathan Baker and Bevin Huang both did honors research projects on Qweak data analysis in Spring 2013. Bevin Huang continued work on Qweak in summer and fall 2013 for pay.
12. Pleimling
- Ahmed Roman, senior, in Spring and Fall 2013, research project Competition and coexistence of N interacting species
- James Mayberry, senior, in Spring and Fall 2013, research project Metamagnets in thin film geometry
- Keith Tauscher, senior, in Spring and Fall 2013, research project Nonequilibrium relaxation of metamagnets
- Mark Brown, junior, in Spring and Fall 2013, research project Two-dimensional systems with anomalous slow dynamics
- Hilton Galyean, junior, in Spring and Fall 2013, research project Coarsening and anomalous slow dynamics
- Bart Brown, junior, in Summer and Fall 2013, research project Two-times function in population dynamics
- Brendan Miles, junior, in Fall 2013, research project Multiple species with inhomogeneous predation rates

13. Simonetti
- PHYS 1155-1156 Astronomy Lab, Spring-Fall 2013
  - 6 lab sections in Spring (1156); 6 lab sections in Fall (1155)
  - Lab fees were used to purchase and distribute Galileoscope 2-inch refracting telescope kits to all students in Fall 2013 (these instruments were then constructed in a lab session, and used in lab); the students keep their constructed telescopes
- PHYS 3154 Observational Astrophysics, Spring 2013
  - Student groups split their observing time on the Optical Telescope and Radio Telescope. Just as for last year, the Radio Telescope was essential to continuing the observing projects when weather prevented Optical observing. The 2.3m Radio Telescope is on the roof of Robeson Hall, operated from a room on the third floor of Robeson.
  - Each group has one multi-hour observing session per two-week interval, which occurs outside class, at night (can be during the day, if radio), with either me or the TA present.
  - In lieu of “lab write-ups” students produce papers with all the attributes of research papers (writing style, formatting, references, etc.). They receive extensive critiques of their papers.
  - Students gives oral presentations on one project from the semester. Prior to the presentations I give extensive instructions and a presentation on how to give a scientific/technical talk.
14. **Soghomonian**
   - Doug Sampson, Spring 2013, research. Doug was exposed to various measurement and characterization techniques in the lab.
   - Marc Pomeroy, Spring 2013. Marc wrapped up his portion of the work on the measurement of electrochemical properties of vanadium oxide nanosheets for electrochemical energy storage applications. The work was presented by Marc at the American Physical Society meeting in Baltimore MD (2013).
   - Doug Sampson, as an REU student, I spent ~30 hours per week, for ~9 weeks, in the lab with Doug, training him and doing measurements together. Also, Doug presented his research at the VT Summer Research Symposium (July 31, 2013 at the Inn at Virginia Tech).
   - Julia Zukowski, Fall 2013, Honors research. Julia learned synthesis and characterization techniques, as well as general laboratory procedures.
   - Doug Sampson, Fall 2013, research. Doug researched how to synthesize Mo nanowires, so a comparison may be made with the V nanowires that we already study in the lab.

I. **Examples of international experiences for undergraduate students**

J. **Examples of international experiences for graduate students**

1. **Heremans & Soghomonian:**
   - “Interactions between InAs surface electrons and magnetic surface species”, J. J. Heremans, Yao Zhang, R. L. Kallaher, and V. Soghomonian, 16th International Conference on Narrow Gap Systems (NGS16), Hangzhou, China, August 2-5, 2013.

2. **Khodaparast:**
   - Conference in Strasbourg, France. My students presented talks at the APS meeting.
3. Pleimling & Tauber:
   • Presentations at Scientific/Professional Conferences:
   • Assi H., Dobramysli U., Pleimling M., and Täuber U. C., Monte Carlo and Langevin dynamics simulations for the steady-state and relaxation properties of magnetic flux lines in type-II superconductors, STATPHYS 25 (Seoul, Korea July 22-27, 2013)

K. Any additional examples that address goals in Virginia Tech’s “Plan for a New Horizon”

1. Ways in which computational science and skills for managing and analyzing complex data sets are integrated across a wide range of disciplines

2. Use of technology in classrooms and examples of distance-learning opportunities

   a) Arav:
      • PHYS 1055 and 1056 Introduction to Astronomy, Spring and Fall 2013.
      • A “Virginia Tech signature experience.”
        o This is a course for non-majors, and has a strong voluntary demand from the general student body. State of the art teaching approach and technology were used, including: Fully integrated clicker use both in the beginning of the lecture and in its midst. Extensive reliance on a high profile educational website supplied by the book’s publisher, which greatly enriches the learning experience, and encouraging the students to broaden their education beyond the course material by encouraging a range of extra credit assignments.
3. Incentives for teaching and learning through distance education

4. Creation of flexible classroom spaces that fully support e-learning components

5. Quality and availability of academic advising from orientation through graduation

a) Anderson (graduate level advising)
   - I have begun advising a 1st year graduate student (He Feng). I am working with her on independent reading on background mathematics and an introduction to String Theory. I have set up readings/problems for her and we meet weekly to discuss her progress.
   - I have written a number of letters of recommendation and provided job-search guidance for finishing graduate students at VT and several other universities.

b) Cheng (graduate level advising)
   - Mr. Chengyuan Wen joined my research group during the fall term. He spent most of his time with course work and background reading, and passed his oral Ph.D. qualifying exam in November. He started to work on a research project in December. I regularly meet with my students, typically three times a week, in addition to irregular meetings.

c) Farrah (in addition to graduate level advising)
   - Mentoring 7 undergraduate students
   - Took part in a ‘Dine with Faculty’ event by accompanying a group of UGs to lunch, talking to them in an informal setting.

d) Heremans (in addition to graduate level advising)
   - Undergraduate advising
     - Continuous active career mentoring, graduate school application mentoring and resume counseling for many undergraduates (not only those pursuing research in the lab).
     - Helping several undergraduates compose applications to REUs and internship programs (NIST, DOE, Johns Hopkins APL).
     - Letters of recommendation for several VT students for summer internships and graduate schools.
e) **Khodaparast**
   - See information listed under research and experiential learning for undergraduates section

f) **Mariani (in addition to graduate student advising)**
   - Mario Solano Gonzalez spent the summer 2013 at Fermilab working on understanding reconstruction efficiency in Liquid Argon using hand scan data and he completed this work in the fall semester.
   - Ronald Pelkey and Daniel Fenstermaker worked on the muon angular reconstruction for the detector that I have developed in the past and that is now being deployed at Kurf to measure cosmic ray integrated flux.
   - Amanda Hoebel and Lance Chao worked in developing a likelihood method to distinguish between cosmic muon and radiation.

h) **Nguyen:**
   - See information listed under research and experiential learning for undergraduates section

i) **Pitt**
   - See information listed under research and experiential learning for undergraduates section

j) **Pleimling**
   - See information listed under research and experiential learning for undergraduates section
   - Right now I have six graduate students working with me (as expected, two finished in 2013, but at the same time two others joined my group). This is a very good number as it allows me to progress in my research on various interesting topics, while still being sure that I can advise the students in the best possible way. I could maybe add one additional graduate student, but a much larger number would make intensive advising and mentoring rather difficult.
I am also advising numerous undergraduate students doing research projects with me (at the time of writing, I advise seven undergraduates). This is a large time commitment, as I have regular meetings with all of the students. Still, I find this very rewarding as undergraduate students are very motivated. I think it is very important that research active faculty are willing to incorporate undergraduates into their research projects and I plan to continue doing so in the future.

k) **Scarola (graduate student advising)**
- I meet with all members of my group on a weekly basis. The meetings are used to monitor research progress, teach background information, and foster professional development.
- I helped group members prepare for their qualifying and preliminary exams. All of these students passed their exams.

l) **Sharpe (graduate student advising)**
- I ran weekly group meetings with my graduate students during the spring semester. In spring 2013, the group meetings revolved around toric varieties. In fall 2013, Lara Anderson and James Gray took over the group meeting organization.
- In summer 2013 I ran unofficial independent studies on special functions (8 students), differential geometry (2 students), and topology (1 student). Two of these independent studies just finished their first year and wish to work with me. The others are taking these classes to improve their backgrounds in preparation for QFT in the fall.

m) **Simonetti**
- In Spring 2013 I oversaw 6 Undergraduate Learning Assistants (LAs), covering the 6 lab sections. Their Overall SPOT Scores were: 5.50, 5.75, 5.44, 5.33, 5.67, 6.00
- In Fall 2013 I oversaw 6 Undergraduate Learning Assistants (more on the LA Program, below). Each had 1 lab section. Their Overall SPOT Scores were: 5.43, 5.60, 5.33, 5.50, 5.30, 5.56
- Met with TAs weekly to discuss how to teach and run a lab section, the new lab assignment for the week (actually 2 per week, one for outside, one for inside), and organizational details (grading, student issues, etc.)
- **PHYS 4994 Undergraduate Research, Spring 2013**
• Rachel Elliott concluded her work on the Radio Jove system. I plan to set the system up for use in PHYS 1155-1156 and PHYS 3154, in the future.
• Supervised the work of David Harter as docent for the Astronomy Open House program at Prices Fork Observatory. This program takes place every Friday night, to handle the number of students from PHYS 1055-1056 Introduction to Astronomy and PHYS 1155-1156 Astronomy Laboratory.

n) Soghomonian
• Presentation at Scientific/Professional Conference: “Solid-state electrochemical studies of vanadium centers” Doug Sampson, Qifan Yuan, and V. Soghomonian, VT Summer Research Symposium, July 31, 2013 Virginia Tech, Blacksburg. NOTE: D. Sampson is an undergraduate student.

o) Takeuchi
• Ahmed Roman, Undergraduate advisee: Ahmed has been working with Zack Lewis and myself on studying the consequences of the minimal length uncertainty relation.
• Jacob Carroll, Undergraduate advisee: Jacob has been working with Zack Lewis and myself on the problem of constructing a quantum mechanical theory on Banach spaces.
• Chen Sun, Ph.D. advisee: Chen and I have been working on understanding the potential of the proposed OscSNS experiment at Oak Ridge in constraining non-standard neutrino interactions. We are also working on calculating the semi-leptonic decay branching fractions of the D-meson.

6. Examples of STEM-related activities fostering entrepreneurship, science and technology policy, and ethics

a) Heremans
• Collaboratively laying foundation for “Quince”, “Quantum Information Center” at VT. One of the aspects of interest to Quince is our ongoing experimental investigations.
b) Huber

- The teaching buyout in the spring semester allowed me to considerable enhance my interdisciplinary research portfolio in neutrino safeguards, which is at the intersection of nuclear engineering, nuclear physics and international policy. The paper on neutrino safeguards (40+ pages) was one of the most difficult research projects I ever undertook and required me to expand my techniques significantly. I traveled to Chicago and Boston to interview key players in the North Korean nuclear crisis and conducted phone interviews with a number of experts. At the same time I strengthened the ties to the nuclear engineering program at VT and Georgia Tech. A second paper on Iran is in preparation.

III. The Virginia Tech Experience

A. Faculty service (Editorships, NSF/NIH program managers or panel members, leadership positions in professional societies)

1. Anderson

- I am a review editor for Frontiers in Physics.
- I have served on the US National Committee of Selection for the Rhodes Scholarship for the past five years. In November 2013, I served on the Rhodes District II committee, reviewing applications and interviewing finalists over two days (Nov. 2013).

2. Arav

- Served as a panel member for HST proposals peer review, STScI, Baltimore MD
- Served as a panel member for NASA Astrophysics Theory Proposals peer review
3. Cheng

- *Manuscript review* for professional scientific journals (7 total; I only count reviews of different manuscripts, not of resubmissions, since August 2013):
  - RSC Advances (4)
  - Soft Matter (1)
  - Langmuir (1);

4. Farrah

- Telescope reviews: China Telescope Access Program, JCMT

5. Heflin

- Techulon, Inc. Scientific Advisory Board Member
- Editorial Board Member of International Journal of Nanoscience
- Referee for Applied Physics Letters, Optics Express, and Applied Materials and Interfaces.

6. Heremans

- Agencies:
  - Reviewer for Agence Nationale de la Recherche (France)
  - Reviewer for Belgian Fonds National de la Recherche Scientifique
  - Reviewer for Deutsche Forschungsgemeinschaft
  - Reviewer for Cottrell Scholars (RC)
  - Reviewer for NSF
  - Reviewer for DOE
  - Reviewer for several Journals, among which:
    - Reviewer for Physical Review B
    - Reviewer for Physical Review Letters
    - Reviewer for Applied Physics Letters
    - Reviewer for Journal of Applied Physics
    - Reviewer for Journal of Physics-Condensed Matter
    - Reviewer for Solid State Communications
    - Reviewer for Semiconductor Science and Technology
    - Reviewer for Physica E
    - Reviewer for Materials Science and Engineering
    - Reviewer for Sensors and Actuators
- Letters for various national and international P&Ts and awards
- Co-organizer (1 of 3) for the 2013 American Physical Society March Meeting Focus Session Series “Spin dependent phenomena in semiconductors” for the 2013 March Meeting (GMAG/DMP/FIAP). This is the 2nd year in a row I have been invited to do this, for what is
a rather large Focus Session. Being asked twice in a row is unusual. (Baltimore, MD, March 18-March 22, 2013).

- Aiding in locating and organizing the 16th International Conference on Narrow Gap Systems, Hangzhou, China, August 2-6, 2013, and on program committee.

7. **Huber**

- Referee for the following journals:
  - JHEP
  - Physics Letters B
  - Phys. Rev. D
  - Phys. Rev. C
- Chairman of the Physics and Performance Evaluation Group of the International Design Study for a Neutrino Factory (IDS-NF)
- *ex-officio* member of the Steering Group of IDS-NF
- member of the Muon Accelerator Staging Study of the U.S. Muon Accelerator Program, supported their DOE review by a presentation (yet another trip to Fermilab), weekly phone meetings
- Member of the scientific advisory board for the following conferences: NuFact 2013, NuFact 2014, ICFA townhall meeting at Fermilab
- Member of the organizing committee for the International Neutrino Physics Summer School 2013, Beijing
- Co-convener for the three flavor oscillation sub-working group of the neutrino working group of the intensity frontier group within the SNOMASS process. SNOMASS is the equivalent of the decadal community reviews astronomers and nuclear physicists have. The event itself was in the summer of 2013. The amount of time spent in phone meetings and drafting reports is staggering. (and turned out worse than predicted in my previous FAR). Altogether there were 3 workshops I attended.
- Editor of the neutrino section of the Project X physics study
- Editor of the physics section of the reference design report of IDS-NF
- Member of Daya Bay
- Member of the U.S. working group on short-baseline reactor experiments, now called PROSPECT
- DOE visit to Germantown and NIST to explore funding options for PROSPECT
- DOE visit to Germantown to highlight the need for better support of neutrino theory
• Co-Convener for the neutrino session at APS Division of particles and fields meeting in Santa Cruz

8. Khodaparast
• Program committee member of the CLEO/QELS Fundamental Science Subcommittee on "Optical Interactions with Condensed Matter and Ultrafast Phenomena”, the tasks include selecting the invited speakers and reviewing the abstracts and papers. **Reviewed 100** two-page abstracts, that serve as the conference paper, and attended the organizing meeting from March 22-24, 2013. I will continue to serve on the committee in 2014.
• Program committee member of the SPIE-OPTICS, Spintronics subcommittee, the tasks include selecting invited speakers and reviewing the abstracts and the proceedings. I will continue to serve in 2014.
• Member of the 16th International conference of Narrow-Gap Semiconductors in China, reviewed abstracts and the program.
• Chaired sessions in the 16th International Conference of Narrow-Gap in China and the Ultrafast Magnetism in France
• Invited to serve on the National Research Council panel in March 2014. The review of the proposals will start in Feb. 2014.

9. Link
• Served on the Institutional Board of the Daya Bay Collaboration and was appointed chair in December 2013.
• Served as chair of the the Talks Committee of the Daya Bay Collaboration
• Co-convened the “Anomalies and New Physics” subtopic of the Intensity Frontier Neutrino Subgroup for the 2013 Snowmass Community Planning Processes. This was a significant undertaking involving weekly phone meetings, the organization of sessions at three separate meetings (SLAC, March 6-7; Argonne National Lab, April 25-27, and Minneapolis, July 29-August 6), and writing a section of the working group report.
• Served on the Institutional Board of the LBNE Scientific Collaboration
• Reviewed proposals for DOE, NSF, the Institute Laue-Langevin (ILL), and The French National Research Agency (ANR)
• Refereed papers for PRL, PRD and Advances in High Energy Physics
10. **Mariani**
   - Served on the Executive Committee of the Double Chooz Collaboration
   - Served as DAQ expert for the Double Chooz Collaboration
   - Served as analysis coordinator for the Double Chooz Collaboration
   - Served as convener of the Oscillation analysis working group for the Double Chooz Collaboration
   - Served as convener of the Online working group for the MicroBooNE Collaboration
   - Served as part of the Institutional Board and Executive Committee for the MicroBooNE experiment
   - Served as Virginia Tech representative for the Hyper-K Collaboration
   - Co-Chair for the NUSTEC school on Neutrino cross section and Interaction models that will be at Fermilab in August 2014

11. **Mather**
   - Manuscript review for professional scientific journals:
     - Physical Review Letters (1)
     - The Journal of Physical Chemistry (1)
     - American Journal of Physics (2)
     - Co-organizer of the *International Conference on Computational Cell Biology* (ICCCB). The conference was rather successful, drawing over 100 researchers, many from outside the U.S., to Blacksburg to discuss interdisciplinary research and education. Invited speakers were all internationally renowned experts in their field. By securing internal and external funding, we were able to provide support for a number of undergraduate and graduate students to attend. I am now part of an effort to use the success of the ICCCB to become the 2015 location of the annual q-bio summer conference, for which we are now one of three candidate institutes invited to submit a full proposal.
     - Served on an NSF proposal review panel in early Fall 2013.
     - Completed an *ad hoc* proposal review for the NWO Physical Sciences Divisional Board.
     - Completed an *ad hoc* proposal review for the Jeffress Trust.
     - Accepted and initiated *ad hoc* reviews for both NSF and NIH.
     - On the editorial board of *In Silico Biology*.
     - Member of the American Physical Society (APS) and the Society for Industrial and Applied Mathematics (SIAM).
12. **Minic**
   - I serve on the examination committee for the prestigious Masters program at Perimeter Institute for Theoretical Physics. (This program is called Perimeter Scholars International, or PSI, [http://perimeterscholars.org/](http://perimeterscholars.org/)).
   - I was part of the international advisory committee for the annual conferences on quantum gravity. The 2013 conference is being held in July 2013 at Perimeter Institute, Waterloo, Canada.
   - I served as a reviewer of grant proposals for the NSF, and the NSF analogs in Chile, Austria, Czech Republic and South Africa. I advised the Julian Schwinger foundation, via its secretary Prof. Ng from Chapel Hill, NC.

13. **Mun**
   - Editorial Board
   - Journal of American Telemedicine
   - Journal of Computer Assisted Radiology and Surgery
   - Journal of Frontiers of Medicine

14. **Nguyen**
   - Manuscript review for professional scientific journals:
   - Nature Communications (1)
   - Optics Express (1)
   - IEEE – Transactions on Terahertz Science and Technology (1)
   - Research proposal reviews:
   - NASA (through South Carolina’s Institutions of Higher Education).
   - U.S. Department of Energy, Office of Basic Energy Sciences (BES): two
   - research grant proposals.
   - Member of the American Physical Society, American Chemical Society
15. Park
- Chair of AKPA (Association of Korean Physicists in America) Publicity & Editorial Committee
- Served on AKPA Award Committee.
- Reviewed NSF (5) and DOE proposals (1).
- Wrote a reference letter for US permanent residence on behalf of Prof. Soumik Banerjee (Washington State Univ.)

16. Petty
- NASA ADP Panel (declined for teaching obligations)
- Reference letters: Sean Lake, Marina Kiseleva, Mehnaaz Asad
- Invited, and hosted a department colloquium speaker Duilia de Mello from Catholic University of American and NASA/GSFC
- Received funding from the AAS to visit representatives in Washington, DC as part of the Communicating with Washington program to help bridge the gap between scientists/academia and congress.

17. Piilonen
- Fellow, American Physical Society (elected in November 2013)
- Member, American Association for the Advancement of Science
- Member, American Association of Physics Teachers
- Member, Sigma Xi scientific honour society
- Reviewer for DOE high energy physics program
- Reviewer for NSF high energy physics program
- Co-Spokesperson, Belle Collaboration; elected two-year term started April 2012
- Member, Belle Publication Council (final refereeing body for all papers)
- Belle Authorship Manager (for all physics-journal publications)
- Member, Belle II Institutional Board (one of Belle II’s two management bodies)
- Belle II Election Manager (for spokesperson and for IB chair)
- Member, Center for Neutrino Physics
18. Pitt
- Qweak experiment Institutional Council, member and chair beginning August 2012 - present
- JLAB 12 GeV MOLLER experiment Executive Board, member (and chair and deputy spokesperson beginning in February 2014)
- Wrote recommendation letters for three professional colleagues for various job/award opportunities
- Prepared successful nomination package for APS fellowship for my colleague Bruce Vogelaar

19. Pleimling
- Dr. Hans Behringer (University Mainz/Germany), letter of reference for a Research Fellow position in the Department of Physics at the University of Warwick
- Shahir Mowlaei, letter of reference for the summer school Soft Solids and Complex Fluids (University of Massachusetts at Amherst)
- Dr. Hans Behringer (University Mainz/Germany), letter of recommendation for a position in the Graduate School “Quantitative Biosciences” of the Ludwig-Maximilians-Universität München
- Michael Anderson, letter of recommendation for a Rising Junior Leadership Award sponsored by the German Club Alumni Foundation
- Dr. Vlad Elgart (Stanford), reference for a permanent position at the Biotechnology High Performance Computing Software Applications Institute
- Dr. Vlad Elgart (Stanford), letter of reference for a postdoctoral research position at the Memorial Sloan-Kettering Cancer Center
- Matteo Marcuzzi (SISSA, Trieste/Italy), letter of recommendation for a postdoctoral research position in the Quantum Optics group at the Universitat Innsbruck
- Matteo Marcuzzi (SISSA, Trieste/Italy), letter of recommendation for a postdoctoral fellowship at the South African National Institute for Theoretical Physics
- Dr. Vlad Elgart (Stanford), letter of reference for a postdoctoral research position at Yale University
- Matteo Marcuzzi (SISSA, Trieste/Italy), letter of recommendation for a postdoctoral research position at the Laboratoire de Physique Théorique et Modèles Statistiques in Orsay/France
- Dr. Vlad Elgart (Stanford), letter of reference for a postdoctoral research position at MIT
- Dr. Vlad Elgart (Stanford), letter of reference for a postdoctoral research position at Princeton University
- Dr. Vlad Elgart (Stanford), letter of reference for a postdoctoral research position in the Department of Systems Biology at Harvard University
- Matteo Marcuzzi (SISSA, Trieste/Italy), letter of recommendation for a postdoctoral research position at the University of Nottingham
- Linjun Li, letter of recommendation for a postdoctoral research position at Cornell University
- Trevor Richards, letter of reference for a data reduction position at the Virginia Tech Transportation Institute
- Mark Brown, letter of recommendation for a VT Education Abroad Scholarship
- Linjun Li, letter of recommendation for a postdoctoral research position at the Santa Fe Institute
- Dr. Ulrich Dobramysl, letter of reference for a Junior Fellowship at the Magdalen College of the University of Oxford
- Eric Kenney, letter of reference for the the Japan Exchange and Teaching Program
- Linjun Li, letter of reference for a Junior Research Association position in Theoretical Physics in the Department of Physics of the Ecole Normale Superieure
- Linjun Li, letter of reference for a postdoctoral fellowship at the Institute for Condensed Matter Theory of the University of Illinois at Urbana-Champaign
- Ahmed Roman, letter of reference for a NSF Graduate Research Fellowship
- Dr. Ulrich Dobramysl, letter of reference for a Junior Research Fellowship at Christ Church (University of Oxford)
- Manuscript review for professional scientific journals:
  - Journal of Electromagnetic Waves and Applications (1)
  - Journal of Physics: Condensed Matter (1)
  - Journal of Physics D: Applied Physics (2)
  - Journal of Statistical Physics (1)
  - Physical Review Letters (2)
  - Physical Review B (7)
  - Physical Review E (3)
  - Physica A (3)
  - Physics Letters A (2)
  - EPL (3)
- Referee for the European Commission in the framework of the Marie Curie Fellowships.
  - Incoming International Fellowships
  - Outgoing International Fellowships
  - Intra-European Fellowships
- Reviewer of research proposals for the Division of Materials Research of the National Science Foundation (Condensed Matter and Materials Theory)
• Reviewer of Research in Undergraduate Institutions (RUI) proposals for the Division of Materials Research of the National Science Foundation (Condensed Matter and Materials Theory)
• Reviewer of Materials World Network: Cooperative Activity in Materials
• Research between US Investigators and their Counterparts Abroad proposals for the Division of Materials Research of the National Science Foundation (Condensed Matter and Materials Theory)
• Reviewer for the Nederlandse Organisatie voor Wetenschappelijk Onderzoek (Dutch Research Foundation)
• Vice-Chair of the 2013 Physics panel for the Marie Curie Individual Fellowships of the European Commission. As Vice-Chair I was responsible for organizing the review and ranking of 1000 proposals by 176 evaluators.
• Member of the American Physical Society.
• Elected Member of Virginia Tech's Chapter of the Research Society Sigma Xi.
• Member-at-Large of the Executive Committee of the Southeastern Section of the American Physical Society (2011-2014)
• Co-organizer (together with my colleague Uwe C. Täuber) of three Focus Sessions on Population and Evolutionary Dynamics that took place at the 2013 March Meeting of the American Physical Society (Baltimore, MD, March 18-22, 2013).
• Co-organizer (together with Malte Henkel, Nancy/France, Gunter Schütz Jülich/Germany, and David Mukamel, Rehovot/Israel) of the International Symposium Small Systems far from Equilibrium: Order, Correlations, and Fluctuations that took place in Dresden/Germany October 14-18, 2013.
• I took part in the March Meeting 2014 Sorters Meeting (College Park, MD, December 5, 2013) and helped organizing the Topical Group of Statistical and Nonlinear Physics sessions that will be part of the 2014 March Meeting of the American Physical Society.
• Co-organizer (together with my colleague Uwe C. Täuber) of two Focus Sessions on Strong Correlations in Systems Far from Equilibrium that will take place at the 2014 March Meeting of the American Physical Society (Denver, CO, March 3-7, 2014). I list this event here as the preparations (writing a proposal, inviting speakers) were done in 2013.

20. **Scarola**

• Refereed 6 articles for Physical Review Letters, Physical Review B, and Physical Review A
• Reviewed 1 MURI grant for the Army Research office and 1 grant for DOE
21. Sharpe
   • Refereed two grant proposals (1 NSA, spring 2013; 1 NSERC, fall 2013)
   • Reviewer for Mathematical Reviews / MathSciNet
   • Member of International Advisory Committee for *Third international conference on mathematical methods in physics* (Londrina, Brazil, October 21026, 2013).
   • Member of International Advisory Committee for *String-Math 2013* (Alberta Canada, June 9-13, 2014)
   • Wrote letters of recommendation for 6 people total
   • Conference organization

22. Simonetti
   • Proposal reviewer for the National Science Foundation.

23. Soghomonian
   • Review of publications:
     • Crystal Engineering Communications
     • Physical Chemistry Chemical Physics
   • Review of proposals:
     • National Science Foundation

24. Takeuchi
   • I have joined the editorial board of the journal Frontiers in Mathematical Physics as a review editor.

25. Tao
   • Reviewing user proposals for the Oak Ridge National Laboratory.
   • Sorting abstracts for the APS March Meeting.

26. Tauber
   • Editorial Board member of the electronic journal *Physics Research International* (formerly *Research Letters in Physics*), since September 2007. In 2013, I organized the review process for one manuscript.
   • *Advisory Panel* member, *Journal of Physics A: Mathematical and Theoretical*, since December 2007, renewed for another three-year term in December 2010. In the past year, I was asked to provide initial editorial recommendations for two manuscripts prior to further official
review, and to assist in the final acceptance decision during the adjudication process for three manuscripts.

- Co-organized, with Michel Pleimling, the joint Group of Statistical and Nonlinear Physics (GSNP) and Division of Biological Physics (DBIO) Focus Session *Stochastic and Evolutionary Population Dynamics* for the 2013 American Physical Society March Meeting at Baltimore, MD, and the joint Group of Statistical and Nonlinear Physics (GSNP) and Division of Condensed Matter Physics (DCMP) Invited Symposium *Non-equilibrium Relaxation and Aging in Materials*.

- Proposed, with Michel Pleimling, a Group of Statistical and Nonlinear Physics (GSNP) Focus Session *Strong Correlations in Systems Far From Equilibrium* for the 2014 APS March Meeting at Denver, CO, which was accepted; and a Division of Biological Physics (DBIO) Invited Session *Evolutionary Dynamics: Stochastic and Spatially Extended Modeling*, which was declined/postponed to 2015.

- Manuscript review for professional scientific journals (31 total; I only count reviews of different manuscripts, not of resubmissions):
  - *Proceedings of the U.S. National Academy of Sciences (PNAS)* (1);
  - *Physical Review Letters* (4);
  - *The Physical Review B* (1);
  - *The Physical Review E* (4);
  - *The Physical Review X* (2);
  - *Europhysics Letters (EPL)* (2);
  - *The European Physical Journal E* (1);
  - *Journal of Physics A: Mathematical and Theoretical* (6): 1 regular review, 3 adjudications, 2 initial recommendations prior to review;
  - *Physics Letters A* (1);
  - *Journal of Statistical Mechanics: Theory and Experiment (JSTAT)* (1);
  - *Communications in Computational Physics* (1);
  - *American Journal of Physics* (1);
  - *Journal of Chemical Physics* (1);
  - *Applied Mathematical Modeling* (1);
  - *Mathematical Biosciences* (1);
  - *PLoS One* (1);
  - *Journal of Ecology and the Natural Environment* (1);
  - *Scientia Iranica* (1).

- Published 8 paper reviews for the American Mathematical Society (AMS) journal *Mathematical Reviews*.

- Proposal reviews (3 total):
  - *U.S. National Science Foundation, Division of Materials Research NSF-DMR*

- Theory: One INSPIRE Track 1 proposal;
27. Vogelaar
   - NSF, DOE ad-hoc reviews

B. Examples of economic development (e.g., industrial partnerships, patents):

1. Heflin:
   - The company Virginia nanoTech that I co-founded continues to work on commercialization of the biosensor platform consisting of a long-period grating optical fiber with nanoscale polyelectrolyte coatings that was developed and patented in my research group. The specific goal of the project is to develop an inexpensive and rapid (<1 hour) test for identification of infection by methicillin-resistant *Staphylococcus aureus* (MRSA). More than 10,000 people per year in the U.S. die from MRSA infections and >100,000 per year are hospitalized due to them. The current method for identification of MRSA infection is a bacterial culture done at a specialized lab and requires 2-3 days, so a rapid identification technique could save lives and reduce the duration of or eliminate a large number of hospitalizations.

C. Study Abroad programs
D. PK-12 STEM programs

1. Mariani
   • Developed and build a new muon prototype detector. A high school student, Ryan Devens, helped in the design and assembly of this detector. Ryan is actively participating in the research that I am doing. He will be presenting the project we are working on at the Science Fair, called the Project Forum, the largest science fair in Virginia. I started working with Ryan last summer to introduce him to the concept of particle interactions in matter.

2. Mather
   • A project tied to K-12 outreach has been approved in my recent NSF award, where I propose to contribute to Kids’ Tech University in a way that connects to my own research. My first contribution is scheduled for March 2014.

E. Examples of Community and Student Engagement

1. Arav
   • Gave a campus wide Webinar "Visitors from Afar: Meteors, Comets, and Asteroids” 11/12/13
   • A Senior Fellow to the Residential College at West Ambler Johnston

2. Heremans
   • Outreach and pipeline; collaboration with Southwest Virginia Higher Education Center (Abingdon, VA).
   • REU: Faculty participant in NSF-REU program in Chemistry, hosting REU students

3. Khodaparast
   • Regular visits and lectures at the Roanoke Valley Governors School
   • Adviser for the CURIE program lead by Jill Sible
4. **Mather**
   - My outreach activities from my NSF grant begin this year. My participation in Kids’ Tech University (KTU) will directly benefit children in Virginia and surrounding states, including underprivileged regions of these states. My participation in another component of outreach, Virtual KTU, will directly benefit two undergraduate students (not necessarily from Virginia Tech), and indirectly benefit children, parents, and teachers who access the online materials generated from this program.

5. **Petty**
   - Made contact with scientists at CfA-Harvard to find a summer internship mentor for Chelsea Cook, so that she can do astrophysics research, not integrative technology
   - As a result of the NASA press release on the results of my paper, a student in the 8th grade contacted me via email to ask about the results. I responded with an explanation and links to public outreach sites with more information.

6. **Scarola**
   - **ALPS**: The ALPS collaboration (Algorithms and Libraries for Physics Simulations: alps.comp-phys.org) is a large international groups of physicists and computer scientists seeking to collect numerical algorithms used to study condensed matter phenomena into one comprehensive framework freely available to researchers and students. The programs in the ALPS project are freely distributed to the community via the website. The software will give students and researchers in disadvantaged areas immediate access to cutting edge research and learning tools.
   - **Web-based outreach**: Networking through the web is a straightforward and effective way to connect prospective students and alumni to departmental news, events, and announcements. By connecting our departmental updates to social networking sites we can reach a large audience (friends of students, faculty, etc.) locally and in many different areas of the world. The web presence I maintain increases our exposure to the local community.
7. Simonetti
- PHYS 4974 Independent Study, Physics Outreach, Spring, Fall 2013
  - The Fall 2013 class had the largest enrollment I have ever seen, 24 students. I think this was because we explicitly discussed the benefits of Outreach in the Freshman Seminar course: learning physics, and testing your interest in and aptitude for teaching.
  - This is the Physics Outreach course.
  - Grant: “Fertilizing ROSES through the STEM: Interdisciplinary Modules as Pre-service Research Experiences for Secondary STEM Educators (IMPRESS-Ed),” PI: Michael Kavic, CoPIs: Margaret Benoit, Nathan Maggee, Paul Wiita. NASA-Opportunities in Education and Public Outreach for Earth and Space Sciences $161,896.00.
  - Outreach Funding: $7500 (5/1999 – present) from the Mary Moody Northen Endowment. This money funds an outreach program aimed at guests at the Mountain Lake Hotel, groups from schools in the local counties, private groups, and others. Programs take place at the hotel or Martin Observatory.
  - Coordinator of Public Open Houses at the Prices Fork Observatory
  - I maintain a website devoted to answering Frequently Asked Questions about Astronomy and Physics (http://www.phys.vt.edu/~jhs/faq). Each year I also separately answer numerous email questions from public individuals who have come across the FAQ Website (on specific phenomena, on specific physics --- black holes, quasars, pulsars, special relativity, interviews for classes, advise on telescopes, etc.). This website is included in the PSIgate Physical Sciences Information Gateway, a free online catalogue of high quality Internet resources in the physical sciences, compiled by the PSIgate team at the University of Manchester. This is a very popular website among the department webpages.

8. Takeuchi
- Maintained and updated the Japanese translations of the Educational Software created by mathematician and MacArthur Fellow Jeff Weeks. Please see the following website: http://www.geometrygames.org/.
9. **Tao**
   - Participation in the “A day in the life of a physics major” project.
   - Gave research introductions about scanning probe microscopy to the first year graduate students.
   - Lab tour for the students from the University of Science and Technology of China.
   - Lab tour for the students who took the Nano course that was taught by Michael Hochella and others.
   - Lab tour for the Nanotechnology Society.
   - Lab tour for the SPS students.
   - Participation in the Nanoscience Research Rotations, organized by Randy Heflin.

**F. International collaborations and programs (include description along with region and country):**

1. **Mariani:**
   - I have started collaborating with an Italian group of nuclear theorists: Omar Benhar and Davide Meloni on integrating new nuclear models in the GENIE neutrino interaction generator and try to understand the effect of nuclear models on the determination of neutrino oscillation parameters. Prof. Huber is part of this effort and our two groups at VT are actively involved in such studies. Prof. Benhar’s sabbatical was used to integrate and validate the spectral function nuclear model into GENIE. Prof. Ulrich Mosel has become part of this effort after his visit to Virginia Tech last fall. With Prof. Mosel we are starting systematic studies and comparison between GENIE and GiBUU. GiBUU is another neutrino interaction generator that was developed by Prof. Mosel group in Germany in the last 5 years. The work that we have been doing with Prof. Benhar focuses on understanding neutrino interactions in heavy nuclei, like Argon. Argon will be the nuclear target for the next generation long baseline experiment in the US, LBNE. The work is in good progress and Prof. Benhar and I have been also thinking of what kind of measurements can be done on Argon using electron scattering at Jefferson Lab. We have been in contact with P. Rossi, deputy associate director for nuclear physics at Jefferson Lab. We would like to take a few weeks of electron scattering data on an Argon target. The JLAB’s directorate expressed vivid interest in this idea and we have been invited to submit a letter of intent at the July PAC.
2. **Minic**
   - I am on the organizing committee of the Miami winter conferences. The committee involves many distinguished senior physicists. This year our public lecture was by Prof. Lars Brink, chair of the Nobel Committee for Physics and member of the Royal Swedish Academy of Sciences. Next year the plan is to bring another regular participant of our Miami meetings, Prof. Francois Englert, the winner of the Nobel Prize in physics for 2013 (this was the reason Prof. Englert was not able to attend our meeting this year).
   - Together with Prof. Don Marolf (UCSB), Prof. Silverstein (Stanford) and Prof. Leigh (Urbana) I am co-organizing the 60th birthday celebrations of one of the greatest living theoretical physicists, and my former mentor, Prof. Joseph Polchinski (KITP, Santa Barbara). The celebration will take place at the Kavli Institute for Theoretical Physics in Santa Barbara in February 2014.

3. **Nguyen**
   - Prof. Olle Inganäs in Biomolecular and organic electronics, Dept. of Physics, Chemistry and Biology IFM, Linköping University, 581 83 Linköping, Sweden. This is a new collaboration in the terahertz spectroscopy for the picosecond dynamic of conducting polymers.
   - Prof. Ben Murdin, Advanced Technology Institute and Department of Physics, University of Surrey, Guildford GU2 7XH. Currently, we have collaborated on research projects of the dynamics of electrons in nano-semiconductor structures.

4. **Park**
   - Oscillations in differential conductance as a function of external magnetic field at the charge degeneracy point in single-molecule junctions of single-molecule magnet Fe4: This is collaboration with experimental group at Delft, Netherlands.
   - Understanding topologically protected surface states in topological insulator Bi2Se3 with magnetic adatoms and impurities: This is collaboration with Antwerpen, Belgium and with Samsung, Korea.
   - Topological insulator Bi2Se3 in contact to ferromagnetic semiconductor: This is collaboration with Prof. Han group at KAIST in Korea.
5. Pleimling

- I continue my collaboration with Prof. Malte Henkel (Nancy, France) on various aspects of the physics of systems far from equilibrium, especially aging systems.
- Together with Dr. Andrea Gambassi (Trieste, Italy) and his student Matteo Marcuzzi I study non-equilibrium dynamics in systems with surfaces. A first short paper on this subject has been published at the end of 2012.
- I have started a new collaboration with Prof. Jae Dong Noh from Seoul/Korea on aging in nonequilibrium growth processes. A first paper resulting from this collaboration (co-author Prof. Malte Henkel) has been published in 2012.
- Together with Dr. Claude Godrèche (Saclay, France) I study the nonequilibrium properties of a novel class of driven systems. A first paper on this subject has just been submitted.
- In a new collaboration with Prof. Hildegard Meyer-Ortmanns from the Jacobs University Bremen in Germany I study population dynamics of many-species systems.

6. Scarola

- Collaboration with ETH Zurich: I am part of a collaboration with Prof. Matthias Toyer (ETH) and his group members to perform ab initio studies of quantum Hall systems. I am guiding his graduate students to construct a new computational formalism to perform this research. We regularly meet at conferences and discuss progress over Skype.
- ALPS Collaboration: The ALPS collaboration (Algorithms and Libraries for Physics Simulations: alps.comp-phys.org) is a large international group of physicists and computer scientists seeking to collect numerical algorithms used to study condensed matter phenomena into one comprehensive framework freely available to researchers and students. We meet at regular workshops and meetings.

G. Any additional examples that address goals in Virginia Tech’s “Plan for a New Horizon”

1. Partnerships with businesses and government that “address critical and complex problems by co-locating researchers and practitioners in ‘living labs’ where users, in partnership with researchers, drive problem formulation and research design”
2. Examples leveraging the strengths of our business programs to provide a competitive advantage

3. Examples of strategic global investment, development of research programs on energy and critical technologies, informatics, infrastructure, policy and planning at VT’s international centers

IV. Diversity

A. One to two notable activities by students, faculty and/or staff activities promoting diversity:

1. Anderson
   • My role on the Rhodes Scholarship Committee of Selection has included personally mentoring a dozen potential applicants nationwide and providing ongoing support for women and minority recipients as they prepare for graduate work in the UK.
   • I gave an interview on my experience as a woman in physics/academia which was featured in the “Rhodes Profile Project” and widely distributed in the UK (http://rhodesproject.com/lara-anderson-profile/).

2. Farrah
   • Workshop on LGBTIQ issues in astronomy at the American Astronomical Society.

3. Heremans
   • Pipeline initiatives and recruitment: many collaborative grant submissions have led to concrete ties with five Virginia HBCUs and with other MSIs (e.g. collaboration and joint grant submissions with the University of Texas at San Antonio).
   • Diversity in Physics:
     • -Installed African-American physicist as Session Chair (probably one out of two total for 9K attendees) for “Focus Session: Spins in Semiconductors - GaMnAs” at the 2013 March Meeting of the American Physical Society, Baltimore, MD, March 18-March 22, 2013.
     • -Installed female physicist as Session Chair for “Focus Session: Spins in Semiconductors - Dynamic and Nuclear Effects”, at the 2013 March Meeting of the American Physical Society, Baltimore, MD, March 18-March 22, 2013.
4. **Khodaparast**
   - Close interactions with MAOP to attract minority students. Ms. Amanh Eltahir worked in my group in Summer of 2013 as part of this collaboration.
   - Ladies of Robeson adviser. Arranging the external speakers to meet with our undergraduate students to inform them of the possibilities to apply for the REU and graduate programs.
   - Collaborate with MAOP to attract summer minority students.
   - Probed into organizing the APS Women in Physics Conference at VT. Several discussions with the University of Tennessee in Knoxville where a similar conference was held, the office of the undergraduate research, the physics chair, and Dr. Sible resulted in an estimated budget to host the conference with ~100 attendees. After communications with several offices on campus, the expected institutional support was not received. Hosting this conference would be practical when ~35K can be raised internally.

5. **Mariani**
   - I have participated in the QuarkNet meeting at William and Mary University in August and give a 3 hours talk on neutrino physics and describing what neutrino experiments. I have learned about the teacher situation in the Virginia State and how developing such a program at Virginia Tech would help involving more teachers from our geographical region.
   - Motivating with my research interest Prof. Omar Benhar to spend his sabbatical year here at Virginia Tech. Prof. O. Benhar is a well-known nuclear and neutrino cross-sections theorist that is working in University of Rome Sapienza.
   - I or my postdocs have given tours of my lab to prospective students, I am trying actively to recruit graduate student with special focus on under-represented minority.
   - Trying to create a QuarkNET center at Virginia Tech. This project of outreach has been funded in my NSF Career.

6. **Minic**
   - I am still in active contact with the amazing group in theoretical physics at the Witwatersrand University, in Johannesburg, South Africa, via my friend and collaborator, Prof. Vishnu Jejjala.
7. Petty
- Black Holes: from the Deaths of Stars to Singularities
  - This course required more than the usual amount of preparation due to the diversity of students' backgrounds, and the presence of a blind student and a hearing impaired (legally deaf) student. I personally met with Christa at Assistive Technologies to understand my part in providing an equal experience for a sight-impaired student. One major struggle I had was when they stopped providing transcribed graphics for the student, due to their lack of preparation. This required me to spend an extra 2 hours a week with the student to try to explain the concepts in the missing figures from the texts.
- Member of the Committee on the Status of Women Astronomers through the AAS
- Attended two Advance VT Women in Leadership luncheons that involved discussing issues campus-wide concerning women in leadership at VT (September 23 and November 14)

8. Pleimling
- As one of the organizers of the International Symposium Small Systems far from Equilibrium: Order, Correlations, and Fluctuations that took place in Dresden/Germany October 14-18, 2013, I made sure that the selection of the participants (less than 40% of applications were accepted) yielded a diverse audience.

9. Scarola
- Through networking at conferences, meeting, and through online outreach I seek to recruit under represented members into our student body and as faculty candidates.
- University of Science and Technology of China (USTC) recruitment: I started a graduate student recruitment effort with USTC in China, a school akin to Caltech in its focus on math and science. USTC produces very talented physics students. Several students contacted me with interest in working in my group and attending VT in general.

10. Simonetti
- Work on accommodating blind female physics major Chelsea Cook, in my course (PHYS 3656 Intro Astrophysics), Fall 2012, and in preparation, prior to Fall. Numerous discussions and work with other instructors in the department in helping them to work with SSD, Assistive Technologies, and Chelsea Cook. Work with Diane Walker-Green in coordinating various efforts in this work.
11. **Soghomonian**
   - Initiated the possibility of establishing a pipeline for minority students from the University of Dallas (TX) to graduate programs at Virginia Tech. This initial contact was established at a workshop hosted by the National Science Foundation in 2012. I am hopeful that summer 2014 I may host a student from this institution for a summer internship.

B. **Diversity awards and honors (e.g., MAOP scholarships; McNair Scholars):**