October 23, 2008

Faculty Search Committee
Department of Physics
California State University, Fullerton
Fullerton, CA 92834-6850

Dear Professors,

I would like to be considered for the Experimental Physicist Tenure-Track position in the Physics Department at California State University, Fullerton. Currently I am a Postdoctoral Research Associate at Syracuse University. Prior to that I was a Postdoctoral Fellow and a Graduate Research Assistant at the Albert Einstein Institute in Hannover, Germany. I completed my Ph.D. at the Leibniz Universität Hannover in 2006. I have attached my curriculum vitae, a list of publications, research plan, and teaching statement. I have also asked my references to send you letters of recommendation.

My primary research interest is gravitational wave detection. I work closely with the Laser Interferometer Gravitational Wave Observatory (LIGO) and have been active in the LIGO Scientific Collaboration (LSC) since 2000. I played a crucial role in the commissioning and characterization of the German-British GEO 600 gravitational-wave detector. Currently, my commissioning and laboratory research are directed toward ensuring that LIGO provides data of the highest quality so that we can learn the most from astrophysical observations. I am active in the LSC Burst data analysis group, searching for unmodeled transient gravitational waves in the LIGO, GEO 600 and VIRGO data. Within this group I have contributed significantly to the development of vetoes for false gravitational wave signals using data from auxiliary sensors in or near the detectors. I will be leading the Burst group's online data quality and veto effort during the approaching first data run of Enhanced LIGO. I will continue to expand upon these areas of research.

I am enthusiastic about the opportunity to teach and mentor students. While at Hannover I taught three semesters of an advanced laboratory for undergraduates and found the experience very rewarding. As an undergraduate at Syracuse University I was a teaching assistant for two large introductory physics courses. I have experience speaking to large audiences and would enjoy teaching introductory courses. I also look forward to teaching more advanced subjects such as modern optics.

Thank you for your consideration.

Sincerely,

Joshua R. Smith

Joshua Ryan Smith

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SYRACUSE UNIVERSITY
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EDUCATION

2002–2006
Ph.D. Physics (*Doktor der Naturwissenschaften*)
Leibniz Universität Hannover
Formulation of Instrument Noise Analysis Techniques and Their Use in the Commissioning of the Gravitational Wave Observatory GEO 600
Supervisor: Prof. Karsten Danzmann

1998–2002
B.Sc. Physics
Syracuse University
Thermal Noise Associated with Silicate Bonding
Supervisor: Prof. Peter Saulson

EMPLOYMENT

2007–
Postdoctoral Research Associate
Department of Physics
Syracuse University

2006–2007
Postdoctoral Fellow
Integrated Large Infrastructures for Astroparticle Science
Virgo / Albert-Einstein-Institute Hannover

2002–2006
Graduate Research Assistant
Max Planck Institute for Gravitational Physics
Albert-Einstein-Institute Hannover

1999–2002
Undergraduate Research Assistant
Department of Physics
Syracuse University

2001	Summer Undergraduate Research Assistant Max Planck Institute for Gravitational Physics Albert-Einstein-Institute Hannover
2000	Summer Undergraduate Research Fellow LIGO Livingston Observatory California Institute of Technology

TEACHING

2007–	Co-supervision of five undergraduate and two graduate laboratory projects Syracuse University
2003–2005	Instructor for Advanced Undergraduate Laboratory Leibniz Universität Hannover
1999–2000	Undergraduate Teaching Assistant for two introductory physics courses Syracuse University

TALKS

August 2008	"Roadmap to Enhanced and Advanced LIGO", 2008 Numerical Relativity and Data Analysis Meeting, Syracuse, NY
March 2008	"Overview of current veto strategies", LSC-Virgo Meeting, Caltech, Pasadena, CA
March 2008	"First Results from the Syracuse University Scatter Imaging Lab", Workshop on Optical Coatings in Precision Measurements, Caltech, Pasadena, CA
November 2005	"The Status of GEO 600", LSC Meeting, MIT, Cambridge, MA
March 2005	"Noise Analysis for the GEO600 Interferometric GW Detector", German Physical Society Meeting, Berlin, Germany
December 2003	"Detector characterization of the dual-recycled GEO600", 8th Annual Gravitational Wave Data Analysis Workshop, Milwaukee, WI

July 2003	”Quality factor measurements of monolithically-suspended mirrors in the GEO600 gravitational wave detector”, 5th Eduardo Amaldi Conference on Gravitational Waves, Tirrenia, Italy

MEMBERSHIP AND AWARDS

2008–	Member LSC Council
2007–	Member APS Topical Group on Gravitation
2007–	Member LSC Burst Group
2004–2007	Appointed Member ILIAS-GWA WP1 (Working Group for European GW Antenna Commissioning and Characterization)
2002	SU Award for Academic Excellence
2001	SU Clements Internship Award
2000–2001	Founder and President of SU Society of Physics Students
1998–2002	SU Chancellor’s Scholar

References

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PUBLICATIONS

Refereed Publications

- "Measurement and simulation of laser power noise in GEO600", J.R. Smith, J. Degallaix, A. Freise, H. Grote, M. Hewitson, S. Hild, H. Lück, K.A. Strain and B. Willke, *Class. Quantum Grav.* **25** 035003-035015 (2008).
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- "Implications for the Origin of GRB 070201 from LIGO Observations", B. Abbott et al., *The Astrophysical Journal* **681:2**, 1419-1430 (2008).
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- "A joint search for gravitational wave bursts with AURIGA and LIGO", B. Abbott et al., *Class. Quantum Grav.* **25** 095004 (2008).
`http://stacks.iop.org/0264-9381/25/095004`

- "Search for gravitational waves associated with 39 gamma-ray bursts using data from the second, third, and fourth LIGO runs", B. Abbott et al., *Phys. Rev. D* **77**, 062004 (2008).
`http://link.aps.org/abstract/PRD/v77/e062004`

- "All-sky search for periodic gravitational waves in LIGO S4 data", B. Abbott et al., *Phys. Rev. D* **77**, 022001 (2008).
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- "Demonstration and comparison of tuned and detuned signal recycling in a large-scale gravitational wave detector", S. Hild, H. Grote, M. Hewitson, H. Lück, J.R. Smith, K.A. Strain, B. Willke and K. Danzmann, *Class. Quantum Grav.* **24** 1513-1523 (2007).
`http://stacks.iop.org/0264-9381/24/1513`
- A *Class. Quantum Grav.* Editor's Choice Article.

- "Charge measurement and mitigation for the main test masses of the GEO 600 gravitational wave observatory", M. Hewitson, K. Danzmann, H. Grote, S. Hild, J. Hough, H. Lück, S. Rowan, J.R. Smith, K.A. Strain and B. Willke, *Class. Quantum Grav.* **24** 6379-6391 (2007).
`http://stacks.iop.org/0264-9381/24/6379`

- "Photon-pressure-induced test mass deformation in gravitational-wave detectors", S. Hild, M. Brinkmann, K. Danzmann, H. Grote, M. Hewitson, J. Hough, H. Lück, I. Martin, K. Mossavi, N. Rainer, S. Reid, J.R. Smith, K. Strain, M. Weinert, P. Willems, B. Willke and W. Winkler, *Class. Quantum Grav.* **24** 5681-5688 (2007).
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- "A statistical veto method employing a back-coupling consistency check", S. Hild, P. Ajith, M. Hewitson, H. Grote, J.R. Smith, *Class. Quantum Grav.* **24** 3783-3798 (2007).
  `http://stacks.iop.org/0264-9381/24/3783`
- "Searches for periodic gravitational waves from unknown isolated sources and Scorpius X-1: Results from the second LIGO science run", B. Abbott et al., *Phys. Rev. D* **76**, 082001 (2007).
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- "Search for gravitational wave radiation associated with the pulsating tail of the SGR 1806-20 hyperflare of 27 December 2004 using LIGO", B. Abbott et al., *Phys. Rev. D* **76**, 062003 (2007).
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- "Search for gravitational-wave bursts in LIGO data from the fourth science run", B. Abbott et al., *Class. Quantum Grav.* **24** 5343-5369 (2007).
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- "Upper limits on gravitational wave emission from 78 radio pulsars", B. Abbott et al., *Phys. Rev. D* **76**, 042001 (2007).
  `http://link.aps.org/abstract/PRD/v76/e042001`
- "Upper limit map of a background of gravitational waves", B. Abbott et al., *Phys. Rev. D* **76**, 082003 (2007).
  `http://link.aps.org/abstract/PRD/v76/e082003`
- "First cross-correlation analysis of interferometric and resonant-bar gravitational-wave data for stochastic backgrounds", B. Abbott et al., *Phys. Rev. D* **76**, 022001 (2007).
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- "A photon pressure calibrator for the GEO600 gravitational wave detector", K. Mossavi, M. Hewitson, S. Hild, F. Seifert, U. Weiland, J.R. Smith, H. Lück, H. Grote, B. Willke, K. Danzmann, *Phys. Lett. A* **353** 1-3, (2006).
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- "Robust vetoes for gravitational-wave burst triggers using known instrumental couplings", P. Ajith, M. Hewitson, J.R. Smith, K.A. Strain, *Class. Quantum Grav.* **23** 5825-5837, (2006).

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- "Status of the GEO600 detector", H. Lück et al., *Class. Quantum Grav.* **23** S71-S78, (2006).
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- "Search for gravitational waves from binary black hole inspirals in LIGO data", B. Abbott et al., *Phys. Rev. D* **73**, 062001 (2006).
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- "Search for Gravitational Waves Associated with the Gamma Ray Burst GRB030329 Using the LIGO Detectors", B. Abbott et al., *Phys. Rev. D* **72** 042002, (2005). http://link.aps.org/abstract/PRD/v72/e042002
- "First All-sky Upper Limits from LIGO on the Strength of Periodic Gravitational Waves Using the Hough Transform", The LIGO Scientific Collaborration, *Phys. Rev. D* **72** 102004, (2005). http://link.aps.org/abstract/PRD/v72/e102004
- "Limits on Gravitational-Wave Emission from Selected Pulsars Using LIGO Data", B. Abbott et al., *Phys. Rev. Lett.* **94** 181103, (2005). http://link.aps.org/abstract/PRL/v94/e181103
- "Search for Gravitational Waves from Galactic and Extra-galactic Binary Neutron Stars", B. Abbott et al., *Phys. Rev. D* **72** 082001, (2005). http://link.aps.org/abstract/PRD/v72/e082001
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- "Damping and tuning of the fiber violin modes in monolithic silica suspensions", S. Goßler, G. Cagnoli, D.R.M. Crooks, H. Lück, S. Rowan, J.R. Smith, K.A. Strain, J. Hough and K. Danzmann *Class. Quantum Grav.* **21** S923-S933, (2004).
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- "The status of GEO 600", K.A. Strain et al., *Proceedings of the SPIE 5500* 25-36, (2004).
- "Detector Description and Performance for the First Coincidence Observations Between LIGO and GEO", B. Abbott et al., *Nucl. Instrum. Methods in Physics Research A* **517** 154-179, (2004).
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- "Analysis of first LIGO science data for stochastic gravitational waves", B. Abbott et al., *Phys. Rev. D* **69** 122004, (2004).
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- "Mechanical loss associated with silicate bonding of fused silica", J.R. Smith, G.M. Harry, J.C. Betzwieser, A.M. Gretarsson, D.A. Guild, S.E. Kittelberger,

M.J. Mortonson, S.D. Penn and P.R. Saulson, *Class. Quantum Grav.* **20** 5039-5047, (2003).
`http://www.iop.org/EJ/abstract/0264-9381/20/23/007/`
Nominated for inclusion in the *Class. Quantum Grav.* Research Highlights of 2003/2004, see
`http://www.iop.org/EJ/journal/-page=extra.High0304/CQG`

- "A report on the status of the GEO 600 gravitational wave detector", M. Hewitson et al., *Class. Quantum Grav.* **20** S581-S591, (2003).
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- "Detector characterization in GEO 600", A.M. Sintes et al., *Class. Quantum Grav.* **20** S581-S591, (2003).
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- "High quality factor measured in fused silica", S.D. Penn, G.M. Harry, A.M. Gretarsson, S.E. Kittelberger, P.R. Saulson, J.J. Schiller, J.R. Smith, S.O. Swords, *Rev. Sci. Instrum.* **72** 3670-3673, (2001).
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RESEARCH PLAN

Direct observation of gravitational waves will be one of the most important scientific events of this century. Most of our current astrophysical knowledge has been obtained through electromagnetic radiation. Gravitational waves will open a new and fundamentally different window on the Universe. The Laser Interferometric Gravitational Wave Observatory (LIGO) is an ambitious NSF-funded project to observe gravitational waves from astrophysical sources such as supernovae, coalescing binary systems of neutron stars and/or black holes, spinning neutron stars, and the Big Bang. Together with its international partners, the German-British GEO 600 and Italian-French VIRGO detectors, LIGO recently completed observations of unprecedented length and sensitivity. Among the astrophysical results extracted from these are an upper limit on gravitational-wave radiation from the Crab pulsar which beats the indirect upper limit inferred from spin-down[1] and evidence that the gamma-ray burst GRB 070201 did not originate from a compact binary coalescence in the Andromeda galaxy[2]. Searches of the data for the first gravitational-wave detections are ongoing.

The LIGO interferometers are now being enhanced with higher power lasers and improved isolation and readout systems to extend their astrophysical range. The resulting Enhanced LIGO will provide a six-fold increase in the volume of the Universe observable by gravitational waves. Enhanced LIGO will begin observations in Summer 2009.

In conjunction with these upgrades, the National Science Board recently approved $205M to fund Advanced LIGO, reaffirming the NSFs commitment to the future of gravitational-wave astronomy. Construction of Advanced LIGO has already begun and the transition from Enhanced LIGO observation to Advanced LIGO commissioning will occur within the next few years. By providing an additional thousand fold increase in observable volume, Advanced LIGO will propel the field into a regime where signals are routinely detected. LIGO has positioned itself at the forefront of gravitational-wave astronomy and is set to usher in a new era of astrophysics.

Gravitational-wave detection is my primary research interest. I have been active in research through the LIGO Scientific Collaboration (LSC) since 2000. I was a key member of the team that commissioned the GEO 600 gravitational-wave detector. Currently I am working to ensure that the extremely challenging goals of both Enhanced and Advanced LIGO are met, namely that the detectors provide extended high quality observations at their sensitivity goals and that our analysis of the data will extract the maximum astrophysical information. My current research projects are as follows.

- I am contributing to the commissioning and characterization effort for Enhanced LIGO. My work is aimed at understanding and eliminating sources of noise that limit the astrophysical reach and the quality of the detector output signals.
- I am the Veto and Data Quality Coordinator for the online search for un-modeled transient gravitational-wave bursts with Enhanced LIGO. Along these lines I have developed a method for vetoing false gravitational-wave candidates based on their relationship with transient noise found in auxiliary environmental and instrumental channels.
- Optical losses at the main mirrors of LIGO degrade the range of the detectors. in order to better understand the optical losses of current LIGO mirrors and reduce them for Advanced LIGO, I have designed and built an experiment to measure and image light scattered by the surfaces of high quality optics.
- Finally, I am the developer of *ligoDV*, a graphical data viewing tool that allows users to access data from the LIGO detectors, perform mathematical operations (FFT, filtering, coherence, etc.) and plot the results. LigoDV is already used in the LIGO control rooms and by many off-site collaboration members. It will be a part of the standard suite of data tools for Enhanced and Advanced LIGO.

In the sections below I describe a plan for continuing and expanding upon these areas of research.

Commissioning and Characterization of LIGO Observatories

Despite careful design, an enormous amount of scientific ingenuity was required to bring the worldwide network of interferometric gravitational-wave detectors to their current levels of robustness and sensitivity. The more ambitious goals for Enhanced and Advanced LIGO provide even greater challenges. The commissioning and characterization work that lies ahead will directly determine the impact that LIGO observations will have on physics and astronomy.

While the GEO 600 detector is currently not competitive in astrophysical reach to the kilometer scale detectors, it has pioneered the technologies that will be crucial to the success of the advanced generation of detectors. Advanced LIGO will adopt several key technologies from GEO 600 including multistage pendulums with monolithic glass lower stages, electrostatic actuators and signal recycling. Signal recycling involves the use of an additional mirror at the interferometer output to form an optical cavity that resonantly enhances gravitational-wave signals[3]. It also enables *tuning* the detector response by changing the Fourier frequency of maximum signal enhancement[4, 5]. I played a key role in the commissioning and noise analysis of the signal recycled GEO 600. I plan to build upon my experience and familiarity with advanced techniques to contribute significantly to the development and characterization of Enhanced and Advanced LIGO.

A primary goal of my research will be understanding and eliminating mechanisms by which noise sources couple to the observatory output signals. To accomplish this I will expand on some of my current areas of research, such as optical and control systems modelling of laser interferometers, data quality investigations focused on the coupling of noise transients, the development of software that improves remote data access, and laboratory research toward solving commissioning problems. This will be accomplished primarily through off-site research and to a lesser extent through visits to the observatories during teaching breaks. Startup funds to support travel to the observatory sites would be very helpful for this work.

Advanced Optics Research

Research in advanced optical techniques will play a crucial role in the success of LIGO and other gravitational-wave detectors to come. It also serves to educate students in the experimental techniques needed to design, commission and characterize these detectors. I have gained a lot of experience with complex optical systems, such as power- and signal-recycled interferometers, through my research on GEO 600 and Enhanced LIGO. I have also designed and constructed several successful tabletop laboratory experiments. I plan to build upon this experience to develop, with student help, an advanced optics lab. Its core will be a tabletop Michelson-type laser interferometer, like those used in gravitational wave detectors. The focus of the lab will be to study advanced interferometer topologies involving, e.g., signal recycling, all-reflective interferometry with grating optics,etc. The experiments will rely heavily on optical and control systems modelling and design. This lab should be very engaging and educational for undergraduate and graduate students.

During the commissioning of the current international network of gravitational-wave detectors it was often the case that off-site labs, owing to their relative flexibility, were required to develop solutions to problems encountered at the observatories. An advanced optics lab at CSF could play this role, being powerful and flexible enough to address research issues that become important as LIGO progresses. Existing laboratory equipment and space as well as startup funding would be very helpful for this project which will require, e.g., an optical bench, laser, oscilloscope, small optics and analog electronics.

Searches for Gravitational-Wave Bursts

Of the gravitational-wave sources that LIGO seeks to detect, among the most challenging are un-modeled transients, or bursts. The search for these signals is being carried out by the Burst data analysis group. We are now implementing a procedure for an online analysis with low enough latency to allow electromagnetic follow-up of burst detections, thereby laying the foundations of multi-messenger gravitational wave astronomy. This could lead to, e.g., measurement of both the gravitational waves and the light curve of a supernova or combined gravitational wave and electromagnetic observations that would reveal the nature of the progenitors of short hard gamma-ray bursts.

The most difficult task faced by the burst group is to separate true gravitational-wave signals from the background of non-Gaussian noise transients in the detectors. Although a significant amount of effort goes into scrutinizing the data for causes of non-Gaussianity (e.g., external environmental disturbances or malfunctioning of the detector control systems) and reducing these transients through commissioning, noise transients are invariably present in the data. This problem is mitigated by requiring a close match of the waveforms observed in multiple detectors, i.e., by performing coherent analysis. However the sensitivity of coherent burst searches is still limited by non-Gaussianity. To make detections, it is crucial that the number of noise transients in the analysis data set be reduced to a minimum.

Vetoes are one way to accomplish this. They remove false gravitational-wave candidates shown to be related to disturbances from external noise sources and control signals for non-gravitational wave degrees of freedom of the detectors. My work in this area has led to my being Veto and Data Quality Coordinator for the Enhanced LIGO online burst search.

Currently, these vetoes are developed using statistical methods to show correlations between transients in the gravitational-wave outputs and auxiliary channels. There is much to gain by folding in more information about the physical coupling of noise sources to the detector output. I will continue to develop statistical vetoes and expand my research to include the implementation of so-called phenomenological vetoes[6] that will have improved utility and robustness. My experience with both detector physics and data analysis puts me in an excellent position to accomplish this. The output from these methods will play an important role in improving data quality by quickly informing on-site scientists of problematic transient noise sources so that they can be addressed promptly.

I expect this research to benefit greatly from the input of students, both in the development and application of veto methods, and in interpreting and acting on the results (e.g., devising strategies to reduce pernicious coupling of external transient noise sources). Startup funds would be very helpful for capitalizing on student involvement. A computing lab with two desktop computers would provide the tools and atmosphere for students and I to work together.

LIGO Data Viewer

The LSC has lacked an easy way to access, view and manipulate data, particularly from outside the observatories. I am the developer of *ligoDV*, a Matlab-based graphical user interface for downloading, performing mathematical operations on, and displaying plots of LIGO data. This software is the product of years of detector signal processing experience. It can be easily installed on most computers and can access data from any internet connection. By improving the ease with which LIGO data can be remotely accessed and viewed *LigoDV* has the potential to greatly increase the amount of scientific scrutiny of the data. This research will lead to student projects in high end industrial type software development for a large-scale science project. These student projects could also take place in the proposed computing lab, however startup funds would be useful for purchasing Matlab licenses for student developers.

Conclusion

Initial LIGO has been a great success and its data is being analyzed for the first direct detection of gravitational waves. The vastly improved detectors and techniques of the coming decade will herald a golden age for gravitational-wave astrophysics. My research is focused on ensuring that the LIGO detectors will observe gravitational waves, that our analyses can extract the maximum astrophysical information from them, and on training the next generation of gravitational-wave experimenters. This research will require and promote active research by both undergraduate and Master's students. Laboratory space and startup funds would be an important catalyst to the implementation of these plans.

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Teaching Experience and Interests

Teaching and advising students are two of the aspects of being a professor that I am most looking forward to. Throughout my career I have been greatly influenced by a number of outstanding teachers and mentors. I am eager to follow their examples by providing students with the tools and knowledge they need to be successful at physics and convincing them that this is a rich and dynamic field, which despite its challenging curriculum, is well worth pursuing.

Since returning to Syracuse as a postdoc I have co-supervised, with Professor Peter Saulson, five undergraduate and two graduate students in various gravitational-wave research projects. The success of these projects has led to excellent opportunities for the students involved. For example, undergraduate Gavin Hartnett's work on audio characterization of LIGO data was the research centerpiece of his successful application for a 2008 Barry M. Goldwater Scholarship. Another of our undergraduate researchers, Jess McIver, spent last summer at the University of Washington through an REU program investigating aspects of LISA, a future space-based gravitational-wave detector. Witnessing and contributing to the advancement of these young physicists has been very rewarding.

During graduate school at the University of Hannover I developed a laboratory experiment that was used in an advanced experimental physics class for undergraduates. Over a two year period I supervised and graded the performance of around ten groups of 2-3 students who each had four weeks to complete my lab. My interactions with the students were stimulating and successful not only for the education of the students, but also for my development as a teacher. This program was very successful at encouraging students to join the experimental gravitational-wave group for research projects.

I would enjoy teaching large introductory courses to both science and non-science majors. I have experience speaking in front of large audiences both at conferences and as an undergraduate TA for introductory-level physics courses at Syracuse. As an undergraduate TA I worked directly with students during recitations, reviewing concepts covered in lectures and guiding hands-on projects. I also ran several well-attended review sessions before exams during which I took questions from students and helped guide them toward the relevant information through discourse. This experience taught me many things, including that when teaching introductory courses one encounters a wide range of learning styles and as such it is important to have flexible teaching methods.

I also look forward to teaching upper level and graduate courses. I would particularly like to teach a class in modern optics, which besides covering the fundamentals of optics would delve into some of the subjects that I find most interesting, such as laser interferometry, nonlinear optics and quantum optics. I am also excited about applying my research experience to enhance my teaching of more standard courses such as classical mechanics and experimental physics.

Knowledgeable and skilled physicists are a key ingredient to the continued success of LIGO. As a faculty member I would advise and teach undergraduates and Master's students about LIGO and the broader field of gravitational-wave astrophysics through both courses and research programs. Besides the research that I am proposing, the field of gravitational-wave astronomy is rich with both undergraduate and graduate research opportunities. As an undergraduate I spent a summer at the LIGO Livingston LA Observatory as a fellow of the Caltech Summer Undergraduate Research Fellowship program (http://www.surf.caltech.edu/). This was a great way to learn about research in a large physics project and it helped cement my interest in the field. I would encourage my students to take advantage of this and other programs, and would gladly host students from other universities who were interested in working in my group for a summer.

Finally, I consider outreach an important part of my career and I will endeavor to cultivate the interest of students and the public about physics and the the knowledge that future research will uncover. As an undergraduate I founded and was president of a chapter of the Society of Physics Students (SPS) at Syracuse University. This quickly became a useful social arena for physics majors to not only have fun, but to participate in outreach and to communicate about classes, research opportunities and graduate schools. Over the years the SPS has grown into one of Syracuse's most successful campus student organizations. This growth has accompanied, in a symbiotic way, growth and strengthening of the undergraduate program at Syracuse. I am pleased to see that CSF has an active physics club and I would look forward to working with them.