

CURRICULUM VITA

Shane L. Larson

CONTACT INFORMATION

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APPOINTMENTS

1. Associate Director, CIERA (Center for Interdisciplinary Research & Exploration in Astrophysics)
Research Associate Professor of Physics, Northwestern University: 09/2017-present.
2. Joint Appointment: 09/2013 - 09/2017
Research Associate Professor of Physics, Northwestern University
Astronomer, Department of Astronomy, Adler Planetarium
3. Associate Professor of Physics (with Tenure), Utah State University: 04/2013 - 09/2013.
4. Assistant Professor of Physics, Utah State University: 06/2008 - 04/2013.
5. Assistant Professor of Physics, Weber State University: 08/2006 - 06/2008.

PROFESSIONAL PREPARATION

1. Senior Postdoctoral Scholar, Center for Gravitational Wave Physics & Institute for Gravitational Physics and Geometry, Penn State (Sponsor: *L. S. Finn*): 07/2004 - 07/2006.
2. Postdoctoral Scholar, California Institute of Technology (Sponsor: *T. A. Prince*): 07/2001 - 06/2004.
3. NASA EPSCoR Postdoctoral Research Associate, Jet Propulsion Laboratory/Montana State University (Sponsor: *R. W. Hellings*): 07/1999 - 06/2001.
4. Ph.D. *Physics*, Montana State University (1999)
5. M.S. *Physics*, Montana State University (1994)
6. B.S. *Physics (with High Scholarship)*, Oregon State University (1991)

LEADERSHIP INTERESTS

Faculty development (particularly in mentoring), long term evolution of faculty roles in the academy, cross-disciplinary scholarship and learning (especially between STEM and traditionally non-STEM fields), career pathways to and from the academy, academia as a societal resource and partner.

SCHOLARLY INTERESTS

Gravitational wave astronomy, relativistic astrophysics, general relativity, cosmology. Multi-messenger astrophysics, ultra-compact binaries, evolution of massive black holes. Science for the public, science advocacy in society, mentoring young scientists.

- ▶ **Position:** Associate Director
- ▶ **Scope:** CIERA is a university-wide, multi-college research center that operates under the Vice-President for Research. We currently have an annual University operating budget of approximately \$2 million, and are a cost center for more than \$30 million in external grants during FY2017.
- ▶ **Personnel:** CIERA's operational faculty consist of 12 faculty in core astronomy and astrophysics, with an additional 20 active interdisciplinary faculty in departments around the University. We have 22 postdoctoral scholars, and 35 graduate students. Under the leadership of the Director and Associate Director, the Center operates with 6 permanent staff, including a Director of Operations, a Director of Communications, a Director of Engagement Programs, one Administrative Assistant, and two Grants and Finance Managers.
- ▶ **Board:** We currently have a 9 member Board of Visitors; this is a philanthropic board with a giving commitment. Additionally we have an Internal Scientific Advisory Board comprised of University Faculty and members of other Centers. We are currently building an external Scientific Advisory Board to provide broad advice on CIERA's research activities and their interface with the broader international astrophysics community.
- ▶ **Development:** CIERA is currently in a strong development phase, with a 5-year target of \$5 million growth in our philanthropic portfolio. I work closely with University Advancement and Alumni Relations, meeting with prospective donors, participating in alumni events and alumni travel, briefing the Board of Trustees about CIERA's role in the broader Northwestern campaign activities, and producing media materials to promote CIERA and our mission.
- ▶ **Strategic Plan:** The expansion of our development program and advisory structures coincides with the beginning of a Strategic Planning process that will map out our goals and aspirations for CIERA's second decade. We are currently engaged in surveying faculty and stakeholders, and consulting with Northwestern's Vice-President for Research and other University-wide programs to insure consistency, alignment, and synergy with broader institutional priorities.
- ▶ **Initiatives & Special Projects:** In the past two years I have led several outward facing projects for CIERA. The most prominent of these were:
 - Redevelopment of the Center's main website, done in collaboration with Northwestern's Global Marketing Office to insure consistency with University strategies but still showcasing our unique work.
 - Created visualizations and public relations materials to support the majore LIGO gravitational wave announcements since early 2016. Worked closely with the University's marketing, public relations, and visualization teams, resulting in a wide variety of national and international media spots.
 - Guided development of open access data visualization tool for gravitational wave events, used and adopted by the broader scientific community for science activities as well as public engagement.

- ▶ **Positions:** NASA LISA Study Team, LISA Consortium Board, U.S. Chair of the LISA Astrophysics Working Group
- ▶ **Scope:** LISA is a gravitational wave observatory that is being developed by the European Space Agency (ESA) and NASA, to be launched in the 2030 timeframe. The LISA Consortium is an international scientific collaboration consisting of more than 1000 individual scientists in Europe and the United States. It is the primary scientific community responsible for the science and data analysis associated with the LISA mission.
- ▶ **Consortium Roles:** The Consortium is led by a Board whose representatives are appointed by ESA, the member states of ESA, and NASA. I am one of the four U.S. representatives on the Consortium Board. The general scientific membership of the Consortium is organized into five working groups; the largest of these is the Astrophysics Working Group with more than 350 members. I am one of the 4 chairs of this working group, and the U.S. astrophysics lead.
- ▶ **NASA Roles:** In 2017, I was selected by NASA to be one of 15 members of their LISA Study Team, which is responsible for coordinating U.S. activities in LISA. Prior to that, I was a member of the L3 Study Team (2015-2017) that was responsible for outlining what NASA's roles and responsibilities in the LISA Mission could be. The membership in these study teams is decided through competitive selection, with application reviews done by the administration at NASA Headquarters.
- ▶ **Initiatives:** I have been responsible for guiding a variety of efforts within the LISA community, which involves managing input from a diversity of stakeholders, balancing competing and sometimes conflicting priorities from those stakeholders, and synthesizing a cogent and well balanced response that benefits both Consortium wide and individual interests. Managing the messaging of those responses within the Consortium membership also requires considerable management of personalities and expectations.
 - I am part of the small Consortium committee developing our *Publications & Presentations* (P&P) policies. These policies are the guidelines for how the Consortium and Consortium members collaborate on science activities. It includes policies on: how data and data results are handled; how ideas are shared and worked on within the Collaboration; authorship on Collaboration-wide papers as well as “short author” papers. This is in its earliest phases of development, and is one of the most important early administrative activities for the collaboration as it has important implications for our members, particularly students, early career faculty, and scientists seeking extramural funding through grants and foundations.
 - As the Astrophysics lead on NASA's L3 Study Team (L3ST) I led the development of a report entitled “*A U.S. Roadmap for the LISA Science Case: Challenges, & Opportunities*” that laid out capabilities and goals in the U.S. science community for participating in the international LISA mission, and outlined the required resources in terms of funding and workpower needed. This report was used by NASA Headquarters to inform the development of their LISA Preparatory Science Program, now part of the annual ROSES (“Research Opportunities in Space and Earth Sciences”) funding call.

- ▶ **Positions:** I have been a member of the LIGO-Virgo Scientific Collaboration (LVC) since 2012, first as the leader of the USU Gravitational-wave group, and now as a member of the Northwestern LIGO Group. I work broadly across the Collaboration, mostly in roles that involve outward facing activities, promoting our science with administration, other scientists, and the public.
- ▶ **Scope:** The LIGO-Virgo Scientific Collaboration is an international collaboration of more than a thousand scientists worldwide. It involved the LIGO Collaboration in the United States, the Virgo Collaboration in Europe, and will soon also encompass the Kagra Collaboration in Japan. The Collaboration is built around the world network of kilometer scale interferometric gravitational wave observatories.
- ▶ **Roles & Responsibilities:** I have a role in the LVC as a member of several *Paper Writing Teams*. Collaboration papers are prepared by a small team who plan and prepare the draft. It is internally reviewed (a pseudo-refereeing process) and the PWTs revise the paper in response. The paper is then released to the entire collaboration, and the PWT manages a much larger suite of comments and criticisms. I am asked to be on Paper Writing Teams to help navigate competing opinions and personalities, as well as for my writing skills. The most prominent PWT responsibilities I have had are:
 - The first Binary Neutron Star merger observed by LIGO was one of the most significant events in the history of astronomy – the first multi-messenger detection with gravitational waves. I was on the Paper Writing Teams for three of the eight papers the LVC announced the discovery with (including the primary discovery paper in *Physical Review Letters*).
 - Currently, I lead the Paper Writing Team for a paper responding to criticisms that have been leveled against the first LIGO discovery and have gained considerable attention in the international press. This paper is, as you might imagine, extremely sensitive and contentious, and is the focus of many deep and divided opinions within the Collaboration. As the leader of the PWT, I help the team navigate to an agreeable and even response that faithfully represents the Collaboration’s scientific processes and projects our confidence in our analysis.

- ▶ **Position:** In my previous role as an astronomer at the Adler Planetarium, my responsibilities were to use my expertise as a professional, academic astronomer to help address institutional priorities and missions. The academic department is small, but operates in a fashion very similar to a University department, with faculty carrying out research and serving in service and administrative roles for the institution as needed.
- ▶ **Scope:** The Adler Planetarium is the oldest planetarium in the Western Hemisphere, and one of the major cultural institutions focused on astronomy and space science in the United States. Boasting more than half a million visitors on-site every year, the Adler's staff works both in and outside the walls of the museum to bring an appreciation for the role of modern science in every corner of society using astronomy as a gateway for broad access.
- ▶ **Roles & Responsibilities:** In general I was responsive to whatever requests were made for my expertise, but there are several areas where I played an regular and ongoing role in institutional activities.
 - **Development & Advancement** Philanthropic development is a substantial part of the economic viability of a public museum like Adler. I regularly worked with the Adler's Advancement team by interacting with prospective donors, providing programming at development events, and visiting corporate partners to foster donor relations.
 - **Public Relations & Marketing** I worked closely with our Public Relations and Marketing team, helping develop the messaging and content that built the Adler brand. The most visible example of this was the "*Space is Freaking Awesome*" campaign; I provided content expertise that helped shape the science facts used in the campaign, keeping them accurate while simultaneously making them short, fun, and understandable.
 - **Media Interface** As one of the main astronomy cultural institutions in the United States, the Adler was regularly queried by broadcast, print, and online media to provide explanations and interpretation about major events in astronomy and space science. Our media team connected members of the astronomy department with these inquiries; I regularly appeared on TV and radio, and spoke with reporters, journalists, and freelancers in this capacity.
 - **Staff Development** Adler staff are intelligent and thoughtful ambassadors for astronomy and space science. They work at the institution because they have a personal love for the Cosmos, and because they enjoy the intellectual engagement of sharing knowledge with our visitors. They are not generally content experts in astronomy. I regularly worked with all our staff, both formally and informally, to help them understand astronomy concepts and to develop their own way of explaining the latest discoveries in astronomy and space science. I helped develop training and programming that was presented to bring them up to speed on exhibits and science content, allowing them to help guide and educate visitors.

- ▶ **Positions:** I have held a number of other leadership positions within the scientific community. These positions all encompass leadership across a wide diversity of scientists, representing many different disciplines and many different institutions.
 - **Astronomy & Astrophysics Advisory Committee (2016-2019)** The Astronomy & Astrophysics Advisory Committee (AAAC) is a 12 member federal advisory committee (this is a national FACA committee) that provides guidance to NASA, the National Science Foundation, and the Department of Energy about overlapping astronomy and astrophysics activities sponsored by the agencies. Membership on this committee is by recommendation and appointment by the federal agencies; my membership was recommended by NASA. Each year the AAAC solicits information from the agencies and the astronomy community about research priorities and the health of the scientific enterprise. When needed, we also constitute task force studies to map out the appropriate strategies to expand and fund technology and research capability in specific research areas. The output of this activity is a report that is delivered to the agencies and the Congress in the spring of each year.
 - **Chair, 4 Corners Section of the American Physical Society (2012-2015)** The American Physical Society (APS) is the largest professional physics organization in the world, boasting more than 50,000 members. In North American it is organized into ten regional sections. The section Chairs are elected positions, with an overall 4 year commitment. The Chairs represent the section interests to the central leadership, organize sectional meetings, promote membership in the section, and facilitate development for scholarship and funding programs sponsored by the section.
 - **Science Unwrapped (2009-2013)** In 2009 I co-founded and directed a public outreach program at Utah State University called *Science Unwrapped*. It is a monthly lecture series that features an accessible public speaker, coupled with direct engagement activities after the lecture between the attendees and working students and scientists from the University's units. It is still running today, and has been one of the most successful outreach programs ever run by the University; during the 4 years I directed the program we had 11,500 visitors (in a rural area with a population of roughly 100,000). It was most widely recognized and respected for drawing interdisciplinary connections between every college and unit on campus, including the sciences, engineering, and the humanities. The most challenging aspect of leading this program was working with the members of the university community to understand and embrace the deep connections between all disciplines. In 2013 I was awarded a *Public Engagement Award* from Utah State University for the creation of this program.

Below is an abbreviated summary of my historical achievements as an academic over the past ~20 years. Full accounting of the list can be found in my complete curriculum vita. *Comprehensive list of any information available on request.*

1. Honors & Awards Highlights

- ▶ Elected *Fellow* of the American Physical Society (2015)
- ▶ *Collaboration Award*, Chicago Innovation Awards, Aquarius Team (2018)
- ▶ *College of Science Public Engagement Award*, Utah State University (2013)
- ▶ *Sigma Pi Sigma/SPS Professor of the Year*, Utah State University (2012)
- ▶ *Exemplary Collaboration Award*, HARBOR Team, Weber State University (2009)

2. Publications

- ▶ 99 refereed scientific publications to date
- ▶ 15+ reports and discipline papers published through NASA studies and Decadal Survey process

3. External Grant Funding

- ▶ PI for \$1,522,685.00 over career
- ▶ Co-I for \$2,932,260.00 over career
- ▶ Total Funded Grants: \$4,454,945.00 over career

4. Students

- ▶ Advisor to 4 Ph.D. students
- ▶ Advisor to 6 M.S. students
- ▶ Advisor to 50+ undergraduates
- ▶ Advisor to 10+ high school students
- ▶ Advisor on \$87,550.00 in student-led grant awards over career

5. **Teaching:** I have largely taught intro Physics and Astronomy classes over my career, with 132 credit hours (8800 student credit hours) taught.

6. Invited Talks

- ▶ 40+ invited talks
- ▶ 65+ invited colloquia and seminars

7. Public Engagement

- ▶ Delivered 200+ public lectures to 26,000+ attendees.
- ▶ 3 time TEDx speaker
- ▶ Kavli Foundation Full Dome Lecture (2018)
- ▶ 145 blog posts at writescience.wordpress.com; 4000+ followers, 170,000+ hits over 9 years
- ▶ Posted 20 *Instructables* at instructables.com/ with 305,000+ views

REFERENCES

Contact for all references available upon request. My current top level reference contacts are:

- ▶ *Dr. Robin T. Stebbins*, Ex Officio LISA Study Team, Former Branch Head, Gravitational Astrophysics, Goddard Spaceflight Center
email: robinstebbins@gmail.com
- ▶ *Dr. Raymond Coward*, Provost Emeritus, Utah State University
email: raymond.coward@aggiemail.usu.edu
- ▶ *John Estey*, Executive Chairman S&C Electric Company, Chicago IL; Trustee, Adler Planetarium
email: John.Estey@sandc.com
- ▶ *Amy Carbone, J.D.*, Trustee, Adler Planetarium
email: amy@carbone.tv

My complete reference list is as follows, contact information available on request:

▶ *Research References*

- *Dr. William A. Hiscock* (Thesis Advisor, deceased)
- *Dr. Raymond Coward*, Provost Emeritus, Utah State University
- *Dr. Karsten Danzmann*, Chair, LISA Consortium, Albert-Einstein Institute, Hanover, Germany
- *Dr. Jeff Livas*, Branch Head, Gravitational Astrophysics, Goddard Spaceflight Center
- *Dr. David Shoemaker*, Spokesperson, LIGO Scientific Collaboration, MIT
- *Dr. Jan Sojka*, Chair, Physics, Utah State University
- *Dr. Lee Samuel Finn*, Physics, Pennsylvania State (Emeritus) University
- *Dr. Pablo Laguna*, Chair, School of Physics, Georgia Tech
- *Dr. Thomas A. Prince*, Physics, Caltech
- *Dr. Massimo Tinto*, Jet Propulsion Laboratory
- *Dr. Ronald W. Hellings*, Physics, Montana State University

▶ *Teaching References*

- *Dr. Kimberly K. Obbink*, Burns Technology Center, Montana State University
- *Dr. Gerry Wheeler*, Director Emeritus, National Science Teachers Association
- *Dr. Larry Kirkpatrick*, President Emeritus, American Association of Physics Teachers
- *Dr. Gregory Francis*, Physics, Montana State University
- *Dr. David Peak*, Physics, Utah State University

▶ *Public Engagement References*

- *Dr. Michele Weldon*, Public Voices Fellowship, Northwestern University
- *Jane Beachy*, Program Manager (Art), Illinois Humanities Council
- *Dr. Martin Hendry*, LIGO EPO Chair, University of Glasgow, Scotland