

LSC Education and Public Outreach Group: Executive Summary of 2018-19 White Paper

1.1 Introduction

This document presents an Executive Summary of EPO priorities and objectives for 2018-19. Broader context for these priorities will be provided in the full EPO White Paper. LSC Groups are encouraged to consult this Executive Summary when formulating their 2018-19 MoU plans. Groups are also welcome to contact the EPO Chair or relevant member(s) of the EPO Committee (see 1.4 for names and contact details) to discuss their plans.

Note that activities considered to be part of the Core EPO program are denoted as “Core” below.

1.2 EPO Mission and Goals

A core mission of the LSC is to harness the excitement and enthusiasm generated by gravitational wave research to inspire and educate students and the general public in astronomy and fundamental science; the LSC believes that the opportunity to discover the beauty of the cosmos should not be limited by age, culture or abode.

The LSC EPO working group, established in 2008, aims to lead the LSC efforts to carry out this mission. By combining and synthesising a range of ideas and approaches across participating institutions, and promoting collaboration and sharing of best practise, the LSC EPO working group seeks to create outreach programs which are far more effective than they would be if LSC member institutions worked independently.

The EPO group’s program of activities and priorities is shaped by the following general goals:

- To communicate LSC results in an accessible way to the world - to other physicists, students, and the general public.
- To develop educational resources that will inspire and train the next generation of scientists and build overall scientific literacy.
- To advocate for future development and growth in our field, in partnership with LSC/Lab leadership and the broader GW and EM astronomy communities.

1.3 EPO Priorities for 2018-19

1.3.1 Priorities of the LIGO Laboratory

LIGO Livingston Observatory: Needs and Future Plans

The Science Education Center (SEC) at the LIGO Livingston Observatory has transitioned to a regional collaboration headed by the Baton Rouge Area Foundation (BRAAF). BRAAF provides an institutional umbrella under which the collaboration can continue to grow and mature.

Future plans include growth in the scope and depth of the SEC's programming with an eye towards innovation as the SEC staff continues to expand the reach of the facility, reaches out to the general public more effectively and leverages the facility's potential as a unique tool for enhancing the public's science literacy and the level of interest in LIGO's pioneering research.

One aspect of this mission includes the LIGO/SUBR (Southern University of Baton Rouge) docent program. This program involves SUBR STEEM (Science, Technology, Engineering, Education, Mathematics) students who are trained in interacting with the school children and the general public around LIGO-based themes. This program is intended to provide effective role modeling for visitors, while at the same time instill a passion for science outreach in the undergraduates.

Another aspect of this mission involves prioritizing local partnerships that will yield more teacher professional development opportunities targeted at local teachers. Teachers then spend time at LIGO's Science Education Center, where physical science concepts are explored as they relate to the overall LIGO project.

In the future the SEC will need to retain the ability to involve LIGO in new and innovative outreach work as such opportunities arise, while at the same time serving its core audiences.

- For 2018-19, the SEC will focus on growing our capability and capacity for conducting virtual tours and field trips, and connecting the outside world to what is happening during the upgrades via regular social media releases. **[Core]**

LIGO Hanford Observatory: Needs and Future Plans

Space limitations at the LIGO Hanford Observatory place a cap on the number of interactive exhibits that the site can host. Growth of the exhibit collection will require new space to house additional exhibits. After many years of effort the Washington State Legislature has included a small allocation in the current capital budget to fund the architectural design for a SEC similar to the facility in Livingston. Continued efforts will focus on obtaining the additional funding necessary to build, furnish and run the facility.

LIGO Lab outreach personnel continue to update and rework the existing space to ensure the LHO field trip experience continues to be exciting for visitors even with the limitations on the exhibit space. The Advanced LIGO discoveries along with the Nobel Prize have created a swell

of interest in LHO field trips and public visitors; every effort should be made to maintain the outreach momentum that the discovery has created.

- For 2018-19, LHO will also focus on growing our capability and capacity for conducting virtual tours and field trips, and connecting the outside world to what is happening during the upgrades via regular social media releases. We will continue our efforts to secure funding for a future LHO Science Outreach Center. LHO will also organise, in July 2018, an International Physics and Astronomy Educator Program and we will explore routes to augment and extend this program in the future, in collaboration with colleagues in other fields of physics and other professional bodies as appropriate. **[Core]**

1.3.2 Priorities in Formal Education

The current priority areas for Formal Education are as follows:

- To develop new classroom units for high schools, wherever possible aligned with Next Generation Science Standards (NGSS) and other appropriate international school standards, classroom tested and evaluated **[Core]**;
- To update and revise existing classroom activities, such as the Penn State and I2U2 materials to align with NGSS **[Core]**;
- To work with APS to develop Physics Quest experiment and Spectra comic book about LIGO for middle-school students **[Core]**;
- To develop high-school teacher training materials that can be tested and evaluated prior to use **[Core]**;
- To conduct professional development with high-school teachers at local, regional, national and/or international venues **[Core]**;
- To expand use of existing classroom materials beyond the areas local to the LIGO Observatories **[Core]**;
- To encourage LSC sites that hold REU grants to consider writing RET supplement proposals or explore other means by which summer teacher internships could be expanded across the LSC;
- To work with APS and other professional organisations to identify routes for publicising and distributing our LVC science summaries;
- To develop a GW master class experience for high school students either in class or during out of class time - possibly working in collaboration with the International Particle Physics Outreach Group (www.ippog.org) following a successful pilot exercise at the Ontario Science Centre and fruitful discussions at the IPPOG meeting in Cascina, both in April 2018.

1.3.3 Priorities in Higher Education

The current priority areas for Higher Education are as follows:

- To develop new LIGO-related classroom activities for introductory Astronomy courses that are classroom tested and evaluated **[Core]**;
- To develop a Lab on LIGO Data Analysis appropriate for undergraduate laboratory classes beyond First Year level - building upon the success of the LIGO Open Data workshop held in Pasadena in March 2018, and working closely with the LOSC team as appropriate **[Core]**;
- To develop additional experimental lab activities related to LIGO science for use in introductory or advanced undergraduate physics courses **[Core]**;
- To update and revise existing college student activities, such as those originally created by Penn State;
- To offer college faculty training workshops;
- To provide additional college student internship activities in LSC groups, especially for students traditionally under-represented in STEM;
- To contribute to the development of a LIGO-related resource page for use by college faculty;
- To collect ideas for, and summaries of, previous undergraduate research projects.

1.3.4 Priorities in Informal Education and Public Outreach

Ongoing priority areas in Informal Education and Public Outreach as the Detection Era unfolds and as O3 begins are as follows:

- **Web media**, in conjunction with the Web Committee, particularly supporting the maintenance and possible renovation/re-organisation of the ligo.org website **[Core]**;
- **Social media**, particularly supporting our @LIGO, Facebook and Instagram output, including: social media support for O3 alerts and dissemination of educational ‘primers’ to assist with managing public expectations for O3 science; assisting with answering question@ligo.org queries; supporting the embryonic “Humans of LIGO” initiative; monitoring the accuracy and consistency of Wikipedia and other non-LSC pages **[Core]**;
- **Printed material and multi-lingual material**, particularly the timely and efficient production and dissemination of science summaries and other resources associated with detection papers and other upcoming collaboration papers, and their translation into multiple languages. (Our approach to these tasks will require significant streamlining for O3) **[Core]**;
- Promoting development of audio, video, VR, web/phone apps, video games, planetarium shows, and other **innovative approaches that communicate LIGO science [Core]**;
- **Citizen science**, particularly supporting further development of Gravity Spy and maintaining and promoting the LIGO Open Science Center – including (through e.g. moderation and proactive and reactive support for software development) a possible LOSC User Group **[Core]**;

- Developing a bank of “**approved**” **graphics, multimedia** and other resources, on all aspects of gravitational-wave science, suitable for LVC colleagues to use in public lectures **[Core]**;
- Support LSC presence at **major science festivals, exhibitions and other high-profile public events** that attract large audiences **[Core]**;
- Encouraging and supporting the presentation of **public lectures** to general audiences by LSC colleagues;
- Updating, refreshing and (depending on funding availability) replacing elements of the **LIGO traveling exhibit(s)**, and creating more flexible resources for LSC use at science festivals and other F2F events - including exhibits presented in partnership with colleagues in other GW research communities.

1.3.5 Priorities in Professional Outreach

- Work with the LSC Spokesperson Team to develop plans for a establishing a US Government Relations Group **[Core]**;
- Work with the LSC Spokesperson Team to formulate a clearer policy for who is authorized to advocate on behalf of the LSC and GW community **[Core]**;
- Create a one-page handout that can be customized to reflect the accomplishments achieved by the LSC members who reside in a specific congressional member’s district **[Core]**;
- Promote outreach to scientists at professional conferences and meetings. Particularly important examples, as the Detection Era unfolds, include ensuring an LSC presence at upcoming professional meetings - both in meeting programs and where possible via e.g. exhibition booths at large AAS and IAU meetings and symposia. Other possibilities include the HEAD/AAS meetings and the March and April APS meetings. A key element to support this outreach is developing flexible and easily portable resources (e.g. flyers, demonstrations, multimedia) that can be used at exhibitions. Ideally these resources could also be used for informal education outreach **[Core]**;
- Collect US government relations training materials from APS, AAS, AAAS, and Lewis-Burke.
- Organize at least one government relations training telecon for the LSC.
- Start and maintain a centralized list/database of government contacts and LSC member visits
- Longer-term: develop handouts tailored to different focuses based on the government official’s stance (e.g. education/community focused, technology leader focused, etc.)
- Increase LSC involvement in governance for professional societies and divisions such as AAS, HEAD/AAS and APS/DAP.

1.4 EPO Committee

The EPO Committee is defined in the Bylaws of the LSC as:

” ...7.13 Education and Public Outreach Committee

7.13.1 The Education and Public Outreach (EPO) Committee is responsible for overseeing and documenting the Collaboration’s activities in education and public outreach. The EPO committee is also responsible for formulating the Collaboration’s strategic plans to harness the excitement and enthusiasm generated by gravitational wave research in order to inspire and educate students and the general public in astronomy and fundamental science, and thus to help improve science literacy and education among the citizenry.

7.13.2 The EPO Committee consists of a chair appointed by the LSC Spokesperson, and at least four additional members from the LSC (including members from LIGO Observatories) with a spread of interests and expertise in formal and informal education, media relations, and in public and professional outreach.

7.13.3 The chair of the EPO Committee is appointed by the LSC Spokesperson for a term of two years. Other members of the EPO committee are appointed by the EPO chair for the term of her/his tenure in consultation with the LSC Spokesperson.

7.13.4 The EPO Committee is also responsible for preparing and maintaining a White Paper relevant to the Collaboration’s plans and activities for education and public outreach, with an up-to-date version to be available before the beginning of the annual LSC MOU review cycle.”

As of May 2018, the EPO Committee comprises:

- Martin Hendry (EPO Chair: martin.hendry@ligo.org)
- Amber Stuver (Informal Education & Public Outreach Lead: amber.stuver@ligo.org)
- Lynn Cominsky (Formal & Higher Education Lead: lynnc@universe.sonoma.edu)
- Amber Henry (EPO Lead for LIGO Hanford: amber.henry@ligo-wa.caltech.edu)
- William Katzman (EPO Lead for LIGO Livingston: wkatzman@ligo-la.caltech.edu)
- Marc Favata (WebComm Chair: marc.favata@ligo.org)