

Canadian Astronomy Long Range Plan 2020: Terms of Reference

Context

Astronomy and astrophysics play a significant role in our society, informing us about the nature of the Universe and our place within it. The development and funding of astronomical research in the 21st century is both a collaborative and competitive process. By identifying scientific, and hence funding, priorities in the 2010 Long Range Plan (hereafter LRP2010), the Canadian astronomical community successfully facilitated the creation of the current generation of world class astronomical research and facilities. However, in the ten years since the previous plan, unanticipated avenues of research have opened up and a new generation of facilities are on the drawing board. These new developments need to be assessed and incorporated into an updated long range plan, LRP2020, which looks forward to the 2030 time frame.

The development of LRP2020 will be a collaborative process initiated by the Canadian Astronomical Society / Société canadienne d'astronomie (CASCA) with the support of all Canadian national agencies and organisations that fund or administer astronomical research. As with LRP2010, the initial review of the field and subsequent formulation of LRP2020 will be undertaken by a primary Author Panel (hereafter “the panel”), led by two co-Chairs. Primary input is expected to come from the astronomical community through a combination of white-paper submissions, online discussion, and open webinars, town halls and other meetings.

The scope, structure, panel membership, and community input processes for LRP2020 are described within this document.

Statement of Task

The panel will review the field of astronomy and astrophysics, along with the associated education, training, and outreach. Both current and future scientific goals and the various needs of the different Canadian communities in astronomy and astrophysics will be considered. From this review, the author panel will then produce a list of recommended priorities for the next decade, to be outlined within LRP2020. These priorities will only include those considered to be essential to the success of the Canadian astronomical community. The resulting plan will serve as a single unified vision for the highest priority projects in astronomy in Canada over the coming decade.

Scope

Formulation of LRP2020 is in outline a two-step process, namely a review followed by a prioritisation exercise. It is anticipated that LRP2020 will address the following issues:

1) ***Assessment of the state of astronomy and astrophysics in Canada in the context of available astronomical facilities and the direct support of ongoing research programs.*** The review will consider all aspects of astronomy and astrophysics, with the primary task of the review being the consideration of the infrastructure that enables new discoveries. This review process will

necessarily be in the context of LRP2010 and will address both the successes and failures of previous planning processes.

2) *Assessment of additional infrastructure and processes critical to the success of the Canadian astronomical community.* While the primary evaluation task of LRP2020 is anticipated to encompass astronomical facilities, additional infrastructure must also be considered. This includes, but is not limited to, facilities relevant to laboratory astrophysics, instrument design and development, processing of, storage of and access to astronomical data, computer infrastructure used in the analysis and modelling of astronomical phenomena, and, importantly, the education and training of highly qualified personnel. The success of our field is also dependent on ensuring equitable access and representation, requiring consideration of equity, diversity and inclusion (EDI). Considerations of these various aspects of the subject will then inform decisions on whether the appropriate infrastructure exists or needs to be developed to support future priorities.

3) *Identification of potential new research directions or areas of opportunity, and articulation of the types of facilities and support needed to pursue them.* This assessment will be science driven (first) and program driven (second) rather than facility oriented. This review is anticipated to primarily fill any gaps that have opened in the coverage provided by LRP2010. The possibilities for new facilities will be assessed separately.

4) *Assessment of proposed new National and International facilities or programs, including space missions, and their relevance to the Canadian astronomical community.* Several new facilities are on the drawing-board that were unanticipated in either LRP2010 or in the 2015 Mid-Term Review (MTR). Updating the Long Range Plan requires that we review these facilities/missions and assess their potential impact and possible benefits to the Canadian astronomical community. Understanding the possibilities for Canadian participation in major new international projects is anticipated to be a key component of this assessment. Given that Canadian researchers are also increasingly collaborating with international partners and many future facilities are likely to be built by international consortia, whether any distinction is drawn between National and International opportunities is at the discretion of the panel.

5) *Formulation of a prioritised list of facilities and programs that are essential to the success of the Canadian astronomical community.* Building upon the previous assessments, the list of priorities will only include those considered essential to the success of the community. This will inevitably entail comparative and qualitative assessments, since during the review process different sub-disciplines or facilities will be compared with one another. The panel may also choose to make recommendations for reorganisation of research programs if current structures are deemed inappropriate for future endeavours. The decision on priorities will lie solely in the hands of the panel and is ultimately the most important aspect of LRP2020, setting the foundation for the highest priority projects in Canada over the coming decade.

6) *Budgetary recommendations for said facilities and programs and, where possible, suggestions of solutions to current funding challenges.* It is recognised that estimating construction and operating costs for future facilities is challenging and that LRP2020 does not have the resources to perform detailed cost estimates or technical risk assessments. Where available

from other sources, these estimates should be incorporated into the LRP2020 process; where unavailable, the author panel will make best-effort estimates.

The review will also take into account that funding within the Canadian community comes from multiple agencies, and ranges in size from small individual grants to large community-driven projects. The suggested funding strategy will incorporate some measure of the relative risk associated with a given facility or program. In cases where funding is considered to be difficult, for whatever reason including such issues as inter-agency cooperation, the panel will make suggestions for possible resolutions.

The final outcome of the review process will be the production of an updated Long Range Plan for astronomy and astrophysics in Canada for the next decade. LRP2020 will be formulated in priority order within different categories to be decided upon by the author panel.

Approach

Projects that were approved by LRP2010 and its MTR that are partly funded or underway need not be reassessed in detail. However, the impact of these facilities or programs and their relevance to astronomy and astrophysics through to 2030 must be incorporated within LRP2020. Throughout the process of determining research priorities, the panel will necessarily have to make judgements on the feasibility, technical readiness and risks involved in supporting a particular facility or program. The panel is expected to maintain independence in this process (see Conflicts of Interest), and will consult with independent authorities when necessary. It is critical to the overall success of LRP2020 that the assessment of science capability and budgetary demands is seen as a fair and rigorous process. The increasing overlap between fundamental physics and various areas of astronomy, in particular cosmology, makes it difficult to consider these areas as distinct subjects. In situations where notable overlaps with other subject areas arise, the review will pay close attention to any goals that have been set in similar fields while still maintaining independence of process.

Selection of Co-Chairs Of The Author Panel

The selection of the Co-Chairs is a critical issue since the LRP2020 process must be viewed to be open and without bias. CoChairs that are viewed favourably by the entire community will thus bring goodwill toward the planning process. As a consequence of the sensitive nature of the choice of the Co-Chairs, the selection process will involve the Board of Directors of CASCA and the agencies participating in LRP2020. The co-Chairs will jointly determine their individual responsibilities and those of the author panel.

Selection of Main Author Panel

Once the Co-Chairs of the main author panel have been appointed, the selection of the remaining panel members will begin. Up to six additional panel members will be appointed, one of whom is affiliated with a non-Canadian institution. Since the panel will be required at certain points to make comparative assessments of the relative merits of different subject fields and programs, it is necessary that the panel have significant breadth in expertise. The panel members will be selected by the CASCA President and Panel Co-Chairs, in consultation with agency designates and the CASCA Board.

Structure of Review

LRP2020 and its MTR relied upon CASCA standing committees to provide reports to the author panel. The author panel will decide on any (sub-)committee structure to be used in LRP2020.

Deliverables

The author panel will deliver the final version LRP2020 (in English) and associated recommendations to the President of CASCA. The LRP will then be simultaneously released, in both official languages, to all relevant parties including NSERC, NRC, CFI, CSA and relevant Ministries of the Government of Canada.

Schedule

The review process will begin upon appointment of the Co-Chairs of the author panel. Community input to the panel will take place in the first half of 2019, including a dedicated Slack workspace, and a town hall discussion at the CASCA 2019 AGM. Additional input will follow the AGM, including possible submission of white papers in Fall 2019, and then panel deliberations in late 2019 and early 2020. Town halls to present draft priorities and receive final feedback will take place before CASCA 2020. The final report will be completed in time for the public launch of LRP2020 in late 2020.

Conflicts Of Interest

The members of the author panel and any LRP2020 committees and sub-committees will ensure that all relevant work conducted under the auspices of LRP2020 is pursued in a manner free from conflicts of interest. For the purposes of this review, a conflict of interest is defined to be a situation where any member or their family is able to benefit scientifically or financially from involvement in the review process, or if a prioritised process is perceived to benefit the individual's place of work or research program. If a conflict of interest arises, it must be declared so that the Co-Chairs may take appropriate action. It may be necessary to exclude a panel, committee or sub-committee member from participation in debate about a particular project priority. Members are also requested to provide early notification of the possibility of conflicts occurring. As members of the professional community, author panel members are recognised as having specific expertise, interests and facility biases. They are expected to maintain their independence during the LRP2020 process, putting the best interests of the community ahead of their personal interests or those of their own sub-communities.

Confidentiality

The review is expected to be an accountable and open process. Submissions to the project will be made public; however proprietary information may be indicated as such and kept confidential. However, prior to mutually agreed upon release dates, all author panel members are to agree that they will not disclose or give to any person any information or documents relating to LRP2020.