

THE NATIONAL ACADEMIES

Advisers to the Nation on Science, Engineering, and Medicine

Call to the Astronomy & Astrophysics Community for Science White Papers

Submit in PDF via the web form that will be linked to

<http://nas.edu/astro2020.html>

Submissions must be made between 12:01am EST, Monday 7 January 2019 and
11:59pm Friday 18 January 2019

In preparation for the 2020 decadal survey in astronomy and astrophysics, the U.S. National Academies of Sciences, Engineering, and Medicine's Committee on Astronomy and Astrophysics (CAA) invites the community to submit white papers focusing on how our understanding of the scientific frontiers in astronomy may be advanced in 2020-2030 and beyond.

Science white papers provided crucial community input to the Astro2010 Decadal Survey. They played a major role in informing the Survey about what the community viewed as important science areas and provided guidance to the committee on areas that needed to be examined deeply. In particular, the work of the Science Frontier Panels was greatly facilitated by the information provided in the white papers.¹ For the upcoming Survey, the science white papers will be available at the outset, and the community will have more time to prepare them. We currently anticipate that the Survey will start in early 2019. In addition, we anticipate that there will be one or more additional call(s) for white papers on other essential topics, such as issues relating to the state of the profession and to missions, projects, and technology development, once the survey begins.

White papers should identify a primary thematic science area (and, if relevant, a secondary area) from the list below, and should specifically and succinctly identify new science opportunities and compelling science themes, place those in the broader international scientific context, and describe the key advances in observation, experiment, and/or theory necessary to realize those scientific opportunities within the decade 2020-2030.

Thematic areas:

1. *Planetary Systems* including solar system bodies (other than the Sun), debris disks, and extrasolar planets; exobiology and the search for life beyond the solar system.
2. *Star and Planet formation*, formation of stars and clusters, protostellar and protoplanetary disks, planet-disk interactions, molecular clouds and the cold interstellar medium, dust, and astrochemistry.
3. *Stars and Stellar Evolution*, including the Sun, stellar astrophysics, the structure and evolution of single and multiple stars, and brown dwarfs.

¹See page xvii in the Preface to *New Worlds, New Horizons*

4. *Formation and evolution of compact objects*, including stellar-mass black holes, neutron stars, white dwarfs, supernovae, mergers of compact objects, gamma-ray bursts, accretion, production of heavy elements and other extreme physics on stellar scales.
5. *Resolved stellar populations and their environments*, including the structure and properties of the Milky Way and nearby galaxies, their stellar populations and evolution, as well as interstellar media and star clusters.
6. *Galaxy Evolution*, including the formation, evolution, dynamics, and properties of supermassive black holes, galaxies, and galaxy clusters, active galactic nuclei and QSOs, mergers, star formation rates, gas accretion, and the circumgalactic and intergalactic media.
7. *Cosmology and Fundamental Physics*, including the early universe, the cosmic microwave background, reionization and galaxy formation up to the virialization of protogalaxies, large scale structure, the intergalactic medium, determination of cosmological parameters, dark matter and dark energy, astroparticle physics, tests of gravity, and astronomically determined physical constants.
8. *Multi-Messenger Astronomy and Astrophysics*, including the sources of gravitational waves, astrophysical and cosmogenic neutrinos, cosmic rays and gamma rays, and the coordinated multi-messenger and multi-wavelength follow-ups.

White papers should:

1. Identify scientific opportunities and compelling scientific themes for the coming decade, particularly those that have arisen from recent advances and accomplishments in astronomy and astrophysics;
2. Describe the scientific context of the importance of these opportunities, including connections to other parts of astronomy and astrophysics and, where appropriate, to the advancement of our broader scientific understanding;
3. While focusing on science, not specific missions or projects, describe and quantify the key advances in observation, measurement, theory, and/or computation necessary to realize the scientific opportunities within the decade 2020-2030 and beyond.

Focus on the Science

Authors should focus their white papers on the detailed presentation of fundamental and important science opportunities, rather than on broad or general studies. White papers will be of most use if they identify directly specific critical questions and opportunities as well as the potential measurements and/or theoretical advances that will address them.

Collaborative efforts are encouraged. A group of authors might wish to submit more than one white paper, each focused on a different science question in the same thematic area. Also, a major research activity may wish to submit a number of different white papers in different thematic areas, outlining quite different science opportunities. These inputs are certainly welcome. Note that contributing to a science white paper, even as lead author, does not necessarily preclude one from subsequently serving on the Survey Committee or one of its panels.

Formatting and Length Requirements

The CAA hopes for and anticipates a large volume of input from the community. As such, it asks that submitters abide by the following formatting guidelines:

- White papers may not be more than 5 pages in length, including all figures, tables, and appendices. References and the author list do not count against the page limit and can include web links to other documents.
- A cover page should be included (beyond the 5-page limit) that should include the title of the white paper, the thematic science area(s), and a list of authors plus contact information for the lead author.
- Use a 12-pt font, single spaced, with 1-inch margins on all sides of the document.
- Only Adobe Acrobat (.pdf) format will be accepted.

A white paper template will be available at the URL at the top of this announcement. We plan to post an FAQ section on that site as well.

Submission Instructions

A white paper must be submitted in pdf via web form at the URL at the top of this announcement.

Please note that all submitted white papers will be made public.

Submissions must be made between 12:01 a.m. EST, Monday, 7 January 2019 and 11:59 p.m. Friday, 18 January 2019. Please check the web pages for any change in this submission window.

All submitted white papers will be made public

Additional information on the Astro2020 Survey

Additional information on the survey's statement of task, structure, and timeline as they become available can be found at

<http://nas.edu/astro2020.html>

Thank You

The CAA thanks the community in advance for innovative and thoughtful studies of the compelling science that astronomy and astrophysics could address in the next decade and beyond.