2020 Decadal Survey Perspectives

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RA2020

20 Aug 2018

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Process

- National Academy of Sciences (NAS): "The 2020-2030 Astronomy and Astrophysics Decadal Survey ***(Astro2020) is a partnership between the National Academies and the astronomical community*** **to survey the field of astronomy and astrophysics and provide priorities for the most important scientific and technical activities of the decade 2020-2030**. It serves as a guide for scientists, policy makers, and agencies alike invested in the astronomical sciences. **The survey is driven by input from the scientific community and *led by a survey committee*.**"

- "The astronomy and astrophysics decadal survey is a large and influential study run jointly between the Board of Physics and Astronomy and the Space Studies Board of the National Academies. The institutional **goal** of a decadal survey is **to consider the past and current research of the field and provide *consensus recommendations* for the direction of the field over the next decade**. These recommendations are made by a survey committee who are directed by the statement of task and informed by community input."

http://sites.nationalacademies.org/SSB/CurrentProjects/SSB_185159

➢ **NASA uses the Decadal Survey to set funding priorities.**

Process (continued)

- "The Statement of Task is being negotiated by the Academies and the potential sponsors of the survey. Once the project is funded the Task will be posted here." http://sites.nationalacademies.org/SSB/CurrentProjects/SSB_185159
- Negotiating sponsors: **NASA, NSF,** and **DoE**

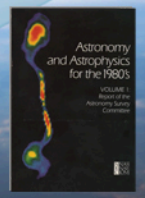
- The Committee on Astronomy and Astrophysics (CAA) helps the National Academies and Agencies think about issues relevant to generating the task statement, "stimulate and gather community input prior to the Survey, and pave the way into the Survey".
  - including lessons from previous Surveys and the mid-decadal report input
  - CoChairs: Marcia Rieke (U of AZ) and Steve Ritz (UCSC)
  - "Participation in white papers will not necessarily disqualify authors from service on Survey panels."

  https://www.nsf.gov/attachments/242692/public/RiekeMarcia_RitzSteve_NRCCAAUpdate2_150PM.pdf
  http://sites.nationalacademies.org/BPA/BPA_048755

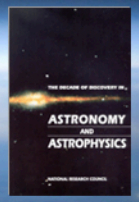
ASTROPHYSICS

Decadal Survey Missions

1972
Decadal Survey
Hubble



1982
Decadal Survey
Chandra



1991
Decadal Survey
Spitzer, SOFIA

2001
Decadal Survey
Webb

2010
Decadal Survey
WFIRST

Timeline

- As of the Academies website 16 Aug 2018:
  -- 2018 January AAS Town Hall
  – 2018 March Astro 2020 proposal submitted to Agencies
  – Summer: Science White Paper call issued
  – 2018 ≤ December Chair selected
  – 2019 January AAS Town Hall and other community outreach activities
  It will take ~2 years to complete the survey process and release the report.
- NB: identical to presentation by CAA CoChairs (personal assessment) to AAAC in Jan 2018

(AAAC = The Astronomy and Astrophysics Advisory Committee federal advisory committee)

- "Members of the **survey committee will be appointed *after* funding** from the sponsors is received. The appointment of the membership of the subpanels will occur after that."
- Survey **Structure**: **determined by** the **Survey Committee *after*** it's **appointed**

- National Academy's statement on community input:
  "**Community input is essential to the decadal survey process.** The call for science white papers has been issued and instructions for preparing and submitting the white papers are below. The window for submission of science white papers will be between 12:01am EST, Monday, 7 January 2019 and 11:59pm Friday, 18 January 2019."

Community Science White Papers

- Call for community science white papers issued by CAA July 2018 http://sites.nationalacademies.org/SSB/CurrentProjects/SSB_185159
- Submission window: 7 - 18 January 2019
- Instructions: http://sites.nationalacademies.org/cs/groups/ssbsite/documents/webpage/ssb_187932.pdf

Highlights:

- Past white papers informed the Decadal Survey committee about what the community views as important science topics and provided guidance about areas needing deeper examination.
- The ***CAA encourages collaboration*** on science white papers.
- Contributing to and "even leading a white paper does not necessarily preclude one's selection to the Survey Committee or one of its panels".
- CAA anticipates an **additional call(s) for** white papers on ***state of the profession*** **and on missions, projects, and technology development**

Community Science White Papers

Content: Focus on science and context:

- "White papers ... 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."
- White papers should:
  - Identify scientific opportunities and compelling scientific themes for the coming decade, particularly from recent advances
  - Describe the scientific context of the importance of these opportunities, including connections to other parts of astronomy and astrophysics and science more broadly
  - 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.

Style: (not described in call; from discussion with various communities' members)

- Anticipate that shorter, science-focused white papers aimed at being more persuasive, w references to published works will be most effective.

Community Science White Papers

- "White papers should identify a **primary thematic science area** (and, if relevant, a secondary area)..."
- **Thematic areas:**

1. **Planetary Systems**
2. **Star and Planet formation**, including molecular clouds and the cold interstellar medium, dust, and astrochemistry
3. **Stars and Stellar Evolution**, including the structure and evolution of single and multiple stars, and brown dwarfs.
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**
7. **Cosmology and Fundamental Physics**, including dark matter and dark energy, astroparticle physics, tests of gravity, and astronomically determined physical constants.
8. **Multimessenger Astronomy and Astrophysics**, including the sources of gravitational waves, astrophysical and cosmogenic neutrinos, cosmic rays and gamma rays, and the coordinated multi-messenger and multiwavelength follow-ups.

Community Science White Papers

Formatting:

Request due to anticipated large volume of papers:

- 5 pages, including all figures, tables, and appendices and not references and author list
- Additional cover page, including the title, the thematic science area(s), and author list
- 12-pt font, single spaced, with 1-inch margins on all sides of the document
- Only pdf format accepted

Template will be provided.

Community Science White Papers

Other efforts => *opportunities for coordination, collaboration, etc*:

- The PhysPAG's **Gamma-ray SIG**:
  - facilitating the gamma-ray communities' white papers via
    - ~ monthly telecons and in-person meetings in May 2018, Oct 2018, …
    - to discuss the community's possible strategies and to start writing white papers
  - Currently discussing 5 white papers:
    - What is/are the origin/s and evolution of stellar mass and supermassive black holes? https://docs.google.com/document/d/1a4lFhwCo9HkXbZmxGN7OIRFUqHA0CywjxOWBgvlSZLs/edit?usp=sharing
    - How are elements created? https://docs.google.com/document/d/1Y6-ghlWKt66v-yonKOf4IHTp4OQYFd-gH0zKxRjeuL8/edit?usp=sharing
    - Dark Matter https://docs.google.com/document/d/1tnjzpLyKYVXHpETnsSY_3qtfZ_4g5iU-mcrHyrkk3ec/edit
    - What is the origin and composition of relativistic jets? How are particles accelerated to high energies (or what is the origin of cosmic rays)? https://docs.google.com/document/d/16Y--YsSnOwvPNoujEoK6RglfMze1ZHkEus10M5hDNs0/edit?usp=sharing
    - Multimessenger astrophysics => in coordination with MMA SAG (co-chair John Tomsick)
  - White papers will cross-reference each other, w MMA white paper as overview
  - Looking for input on Decadal strategy and white paper participants and leads
  - ***Happy to coordinate/collaborate with folks at this conference and/or merge efforts on an element creation white paper!***

https://pcos.gsfc.nasa.gov/sigs/grsig/

Community Science White Papers

Other efforts => *opportunities for coordination, collaboration, etc*:

- The PhysPAG **Multmessenger Astrophysics (MMA) Science Analysis Group (SAG)**:
  - ***Open to ENTIRE community***
  - Messengers include
    - photons of all wavelengths,
    - gravitational waves,
    - cosmic rays,
    - neutrinos,
    - etc.
  - Teams organized by topic:
    - AGN, SMBH binaries, EMRIs
      Leads: Sarah Burke-Spolaor, Bindu Rani
    - NS+NS, NS+BH, WD-WD binaries, GRBs.
      Leads: Eric Burns, Colleen Wilson-Hodge
    - Stellar mass BH-BH binaries
      Leads: Saavik Ford, Peter Shawhan
    - FRBs, SNe Ia, SN remnants
      Lead: Geoff Clayton
  - Bi/weekly topical team meetings, monthly MMA SAG meetings
  - *MMA SAG welcomes your participation* in writing white papers!

https://pcos.gsfc.nasa.gov/sags/mmasag.php

Community Science White Papers

Other efforts => *opportunities for coordination, collaboration, etc*:

- **Space-based Gravitational Wave Community**
  - organized around LISA (ESA-led mission w US contribution)
  - NASA LISA Study Team
    - Established a set of key science white papers, volunteer writers, and met* in Feb for a white paper writing workshop. (*including w remote participants)
    - On-going collaborative writing using online tools
    - Meeting in Oct to continue writing/editing
  - GW SIG: coordinating community and NLST efforts https://pcos.gsfc.nasa.gov/sigs/gwsig.php and white papers list therein

- **Space-based X-ray Community**
  - Lynx large mission concept study
    - Instrument papers in special edition of SPIE Journal of Astronomical Telescopes, Instruments, and Systems
    - Plan to publish science white papers
  - ~3 X-ray/soft gamma-ray Probe studies: STROBE-X, TAP, AXIS
  - X-ray SIG: assisting community in organizing white papers https://pcos.gsfc.nasa.gov/sigs/xrsig.php

CAA Report on NASA Decadal Activities

- NASA Astrophysics requested that the CAA review NASA's Astro2020 Decadal Survey preparation activities in order to improve the value of NASA's preparations. https://science.nasa.gov/astrophysics/2020-decadal-survey-planning/
- Report 6 Aug 2018: https://www.nap.edu/catalog/25212/report-series-committee-on-astronomy-and-astrophysics-mission-concept-studies?utm_source=NAP_embed_book_widget&utm_medium=widget&utm_campaign=Widget_v4&utm_content=25212

Findings:

- CAA commends NASA for sustained and well-considered preparation efforts, namely the 4 large mission studies and the Probe studies.

that could improve value to Astro2020:

1. Clearly show key mission requirements, derived from science drivers and their impact on the design, eg science traceability matrix.
2. Mission concept studies could include possible descope & upgrade options with related impact on science and cost. Implicit: prioritize mission capabilities.
3. Risk evaluation and enumeration is essential, and to clearly communicate.
4. Similar levels of detail will help ensure a clear basis for comparison of mission concepts.
5. To the extent possible given resources, optimize the mission design and presentation.
6. Mission concepts that did not get NASA support may still submit to decadal; anticipate continued open submission policy.
7. Affordability and budget guidance help align studies to Decadal Survey needs.

Doesn’t the Decadal just care about the big stuff?

- Recent decades and mid-decadal have particularly focused on **balance**, eg emphasis on suborbital program and R&A, and **strategic investments**, eg Strategic Astrophysics Technology program
- Derived from compelling science case(s) laid out in white papers to the Decadal (and inputs to the mid-Decadal)

https://www.youtube.com/watch?v=eaXmIPHrHmY
https://www.youtube.com/watch?v=lmCBWGDXLf0

End