

Astro2010 Progress Report

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(http://sites.nationalacademies.org/bpa/BPA_049810)

Overview

The three pillars of the survey

Astro2010: Science Frontiers

Astro2010: State of the Profession / Infrastructure

Astro2010: Activities / Program Prioritization

Some features of Astro2010

Unprecedented community buy in to process

Include unstarted projects from AANM

Improved cost, readiness, risk assessment

Increased international and private collaboration

Changing economic political background

Executive Committee, NRC Staff

- Roger Blandford Chair, Astro 2010
- Martha Haynes Chair, Science
- John Huchra
- Marcia Rieke
- Lynne Hillenbrand

- NRC: Staff Michael Moloney.

- BPA/SSB Liaison

**Responsibility for managing process,
communicating with community**

7 bulletins

Committee on Astro2010

Roger Blandford, Chair, Stanford University

Lynne Hillenbrand, Executive Officer, California Institute of Technology

Subcommittee on Science

Martha P. Haynes, Vice Chair – Science Frontiers, Cornell University

Lars Bildsten, University of California, Santa Barbara

John E. Carlstrom, The University of Chicago

Fiona A. Harrison, California Institute of Technology

Timothy M. Heckman, Johns Hopkins University

Jonathan I. Lunine, University of Arizona

Juri Toomre, University of Colorado at Boulder

Scott D. Tremaine, Institute for Advanced Study

BPA, SSB Liaisons
DOE, NASA, NSF

Subcommittee on State of the Profession

John P. Huchra, Vice Chair – State of the Profession, Harvard-University

Debra M. Elmegreen, Vassar College

Joshua Frieman, Fermi National Accelerator Laboratory

Robert C. Kennicutt, Jr., University of Cambridge

Dan McCammon, University of Wisconsin-Madison

Neil de Grasse Tyson, American Museum of Natural History

Subcommittee on Programs

Marcia J. Rieke, Vice Chair – Program Prioritization, University of Arizona

Steven J. Battel, Battel Engineering

Claire E. Max, University of California, Santa Cruz

Steven M. Ritz, NASA Goddard Space Flight Center

Michael S. Turner, The University of Chicago

Paul Adrian Vanden Bout, National Radio Astronomy Observatory

A. Thomas Young, Lockheed Martin Corporation [Retired]

Science Frontier Panels

- Planetary Systems and Star Formation (PSF) - Lee Hartmann
- Stars and Stellar Evolution (SSE) - Roger Chevalier
- The Galactic Neighborhood (GAN) - Mike Shull
- Galaxies across Cosmic Time (GCT) - Meg Urry
- Cosmology and Fundamental Physics (CFP) - David Spergel
- Load-balanced
- Attention to gaps and overlaps
- Independent NRC Committees
- Will write independent, reports with NRC review
- Most compelling science program
- Charged to identify four key questions and one discovery area
- Input from 324 White Papers, 18 Town Halls, emails
- Significant choices and omissions are emerging
- Input to subcommittee, PPP
- Feedback from committee, PPP

Infrastructure Study Groups

- **Computation, Simulation, & Data Handling (CDH)** – Bob Hanisch & Lars Hernquist
- **Demographics (DEM)** – James Ulvestad
- **Facilities, Funding and Programs (FFP)** – Craig Wheeler
- **International and Private Partnerships (IPP)** – Bob Dickman
- **Education & Public Outreach (EPO)** – Lucy Fortson & Chris Impey
- **Astronomy & Public Policy (APP)** – Daniel Lester
- **Primarily fact-finding**
- **Consultants not NRC committee**
- **Facts-> Inferences[-> Recommendations]**
- **Input from 69 position papers, 18 town halls**
- **Input to subcommittee, PPP, SFP**
- **Feedback from committee, SFP, PPP**

Programmatic Prioritization Panels

- **Radio, Millimeter and Submillimeter from the Ground (RMS) - Neal Evans**
- **Optical and Infrared Astronomy from the Ground (OIR) - Pat Osmer**
- **Electromagnetic Observations from Space (EOS) - Alan Dressler**
- **Particle Astrophysics and Gravitation (PAG) - Jackie Hewitt**
- **Load-unbalanced!**
- **Independent NRC Committees**
- **Will write independent, reports with NRC review**
- **Science a prime discriminant along with readiness and understanding cost using independent contractor**
- **Significant choices and omissions**
- **Input from 108 RFIs, 60 Technology WP, 10 theory, lab astro, computation WP, 18 town halls, emails, SFPs, ISGs**
- **Input to main Astro2010 committee and its subcommittees**
- **Feedback to SFPs, ISGs**
- **Feedback from committee, SFPs**

Astro2010 Charge

- space- and ground-based astronomy and astrophysics
- priorities for the most important scientific and technical activities
- new and previously identified concepts
- *concise report*
- *agencies...Congressional committees...scientific community*
- experimental and theoretical aspects of observations of the cosmos
- *common ground between fundamental physics and cosmology*
- *experimental data, physics-based theoretical models, and numerical simulation*
- *portfolio...small, medium-sized, and large projects*
- private, state, federal, and international
- priority order within different categories
- *guiding principle...will be maximizing future scientific progress*
- Include...unrealized projects...not be assumed that they will go forward
- *review the technical readiness of the components*
- *estimate of...costs with help from a contractor*
- *a range of budget scenarios...establish criteria... rebalance...upon failure*
- *organization of research programs...within...federal agency structure.*

Progress so far

- **Science Frontier Panels (SFP)**
 - Interim questions and discovery areas
 - Some writing already
- **Infrastructure Study Groups (ISG)**
 - Data collection – some gaps to be filled
 - Some draft reports
- **Program Prioritization Panels (PPP)**
 - Reading RFI responses & WP
 - Undertaking detailed study of activities, requesting more information
 - Preparing for external technical readiness, costing studies

We are still on schedule!

Timeline

- **June 8 Program Panels meet in Pasadena**
 - Activity and other presentations in public sessions
- **Summer**
 - Complete SFP reports
 - Interim program panel priorities
 - Draft committee report chapters
- **Oct 5,6,7 -Survey committee meeting**
 - Preliminary merging of program priorities
 - Review of panel reports
- **Dec/Jan - Survey committee meeting**
 - Finalizing recommendations
- **Jan-Mar - Report writing submission**
- **April-July - NRC Review**
- **Aug- Release and Promulgation**

EXTRA SLIDES

Subcommittee on Science

- **Vice-Chair: Martha Haynes**
 - Bildsten, Carlstrom, Harrison, Heckman, Lunine, Toomre, Tremaine
- **Recommend:**
 - An integrated scientific program of observational, experimental, and theoretical research using panel reports
- **Draft science portion of survey report**
 - Merge SFP input
- **Five Science Frontiers Panels (SFP)**
 - NRC committees
 - Write panel reports
 - Four central questions
 - One area of unusual discovery potential

Science Frontier Panels

Planetary Systems and Star Formation (PSF) - Lee Hartmann

- Solar system bodies (other than the Sun) and extrasolar planets, debris disks, exobiology, formation of individual stars, protostellar and protoplanetary disks, molecular clouds and the cold ISM, dust, and astrochemistry.

Stars and Stellar Evolution (SSE) - Roger Chevalier

- The Sun as a star, stellar astrophysics, structure and evolution of single and multiple stars, compact objects, supernovae, gamma-ray bursts and solar neutrinos. Extreme physics on stellar scales.

The Galactic Neighborhood (GAN) - Mike Shull

- Structure and properties of nearby galaxies including the Milky Way and their stellar populations, interstellar media, star clusters. Evolution of stellar populations.

Galaxies across Cosmic Time (GCT) - Meg Urry

- Formation and evolution of galaxies and galaxy clusters, active galactic nuclei and QSOs, mergers, star formation rate, gas accretion, global properties of galaxies and galaxy clusters, supermassive black holes.

Cosmology and Fundamental Physics (CFP) - David Spergel

- Early universe, microwave background, reionization and galaxy formation up to virialization of protogalaxies. Large scale structure, intergalactic medium, determination of cosmological parameters, dark matter, dark energy. High energy physics using astronomical messengers, tests of gravity, physical constants as determined astronomically.

Subcommittee on State of Profession

- **Vice-Chair: John Huchra**
 - Elmegreen, Friemann, Kennicutt, McCammon, Tyson
- **Recommend:**
 - State of field - How to maintain and improve it
 - Infrastructure and policy issues
- **Draft relevant portions of survey report**
 - Oversee ISG studies
- **Six Infrastructure Study Groups (ISG)**
 - Consultants to the survey
 - Primarily fact-finding and verification
 - Produce graphical and tabular data
 - Chairs continue to consult with committee

Infrastructure Study Groups

Computation, Simulation, & Data Handling (CDH) – Robert Hanisch & Lars Hernquist

- Computational resources and support for analysis and archiving of astronomical data; resources and support available for astrophysical and cosmological simulation; major challenges and changes in computing environments and software; expected availability of computing capability over the next decade.

Demographics (DEM) – James Ulvestad

- Numbers of astronomers and astrophysicists working in different environments and subfields; diversity, geography and student populations; breakdown of resource allocation by field, discipline and cost category where possible; subscription rates for programs; publication rates.

Facilities, Funding and Programs (FFP) – J. Craig Wheeler

- List major operational public and private facilities, their capabilities, ages, and proposal pressure; budgets for all agency programs; infrastructure issues such as support for laboratory astrophysics and technology development and theory.

International and Private Partnerships (IPP) – Eugene Levy & Robert Dickman

- Lessons learned; scope and current status of relevant major projects in development; summarize lessons learned to promote successful collaborations.

Education & Public Outreach (EPO) – Lucy Fortson & Chris Impey

- Public communication programs; astronomy in K-12 and college education; professional education for astronomers, journalists and science policy experts.

Astronomy & Public Policy (APP) – Daniel Lester

- Benefits to the nation that accrue from federal investment; contributions made to important research of societal importance; current structure of committees and reporting lines that are used to provide advice to the federal government.

Subcommittee on Programs

- **Vice-Chair: Marcia Rieke**

- Battel, Max, Ritz, Turner, Vanden Bout, Young

- **Recommend:**

- **Synthesize panel reports into a prioritized, cost-constrained and balanced program for next decade**

- With input from independent contractors for major contenders on construction and full running costs, schedule, risk.

- **Research technology development program to enhance existing capabilities and enable missions starting in the following decade**

- **Draft program part of report**

- Committee feedback

- **Four Programmatic Prioritization Panels (PPP)**

- NRC committees
- Relevance to SFP priorities + ISG capabilities
- Write panel reports
- Prioritize with the programmatic area assigned

Programmatic Prioritization Panels

Radio, Millimeter and Submillimeter from the Ground (RMS) - Neal Evans

- Observatories and telescopes that observe primarily in these wavebands

Optical and Infrared Astronomy from the Ground (OIR) - Pat Osmer

- Observatories and telescopes that observe primarily in these wavebands

Electromagnetic Observations from Space (EOS) - Alan Dressler

- All space-based astronomical projects observing the electromagnetic spectrum.

Particle Astrophysics and Gravitation (PAG) - Jackie Hewitt

- All projects exploring areas at the interface of physics and astronomy such as gravitational radiation, TeV gamma-ray astronomy, and free-flying space missions testing fundamental gravitational physics.

Calls for Input

(1) The Astro2010 Survey Committee, through its Subcommittees, has issued a series of calls for information. More detail on the input received in response to these calls is available on the Astro2010 web site.

www.nationalacademies.org/astro2010

Inputs received:

- Notice of Interest from Activities (170+ inputs are posted)
- Science White Papers (320+ papers are posted)
- State Of The Profession Position Papers (69 papers are posted)
- White Papers on Technology Development, Theory, Computation and Laboratory Astrophysics : (~70 white papers are posted)
- Request for Information from Activities: (~108 responses)

(2) Community input is welcome at any time by emailing

astro2010@nas.edu

Community Town Halls

(3) The Astro2010 Survey Committee has called on the astronomy and astrophysics community to organize town hall meetings to provide coordinated regional input into the survey.

- Organized locally by department chairs, centers, observatories...
- Include your neighbors
- Invite committee, panel and study group members
- Please discuss with NRC staff who will provide assistance in publicizing and coordinating committee attendance.
- Submit a written summary (will be made publicly available)
- More detail on the Astro2010 web site - including a suggested format and suggested questions and topics for discussion.
www.nationalacademies.org/astro2010
- Written summaries from a number of the town halls are now on the web.

Science White Papers

- Addressed how understanding of astronomical frontiers may be advanced
- Were addressed to one or more panels
- Multiple submissions were allowed
- Asked to identify critical questions and specific opportunities
- Theory, experiment, and observation
- Scope of science panels is inclusive, connections to other areas of science are important
- Over 320 papers submitted and are now available at <http://www.nationalacademies.org/astro2010>

State of the Profession Position Papers

- The State of the Profession Subcommittee invited position papers to be submitted to inform the work of the Infrastructure Study Groups as well as the broader work of the Astro2010 Committee.
- Papers focused on broad general themes related to the state of the profession, such as:
 - data and information on the need for broad support for theory, for laboratory astrophysics, computation;
 - generic technology development;
 - training of observers and instrument builders,
 - relevance of public outreach and astronomy education
 - support both general and specific areas in astronomy and astrophysics,
 - national facilities and any other topic covered in the six broad areas being studied by the infrastructure study groups.
- 69 papers submitted and are now available at
<http://www.nationalacademies.org/astro2010>

Technology Development White Papers

- The Subcommittee on Programs invited interested parties from the broad community to submit white papers focusing on how developing technologies in the upcoming decade will enable advances in astronomy in the future.
- White papers were submitted to one of the four discipline PPPs or to the Subcommittee on Programs for technologies relevant to more than one area or to very broad areas.
- White paper authors were asked to address specifically and succinctly how the suggested technology studies in the decade 2010-2020 will facilitate future astronomical discoveries.
- ~ 60papers submitted and are now available at
<http://www.nationalacademies.org/astro2010>

Theory, Computation, and Laboratory Astrophysics White Papers

- The Subcommittee on Programs solicited white papers identifying areas or research problems in theoretical, computational, or laboratory astrophysics that would benefit from targeted investments, including investments on scales larger than normally possible through existing grants programs.
- White papers were submitted to one of the four discipline PPPs or in the case of ideas that may benefit several areas, to the Subcommittee on Programs
- ~ 10papers submitted and are now available at <http://www.nationalacademies.org/astro2010>

Program Prioritization Plans

- May 10 - Science + State of Profession meetings
- May 11 – “Jamboree” meeting
- May 12,13 – Program panel meetings
 - Finalize calls for written and oral inputs
- June 8-11 - Program panel meetings
 - Oral presentations from “activities”
 - Two-way discussions with science panels and infrastructure groups
- June 22? -RFI to selected activities
- July 21? -RFI responses due
- Aug 14? -Contractor technical evaluations
- Aug-Sept -Program panel meetings
 - Draft prioritization
- Dec? –Draft reports