



AAAC and Mid-DECADAL ASTRO SURVEY

Angela V. Olinto (U. Chicago)
Chair of AAAC
member Mid-Decadal

Astronomy and Astrophysics Advisory Committee (AAAC)

The US astronomy and astrophysics research enterprise is preeminent in productivity and in visibility to the public, both in the nation and worldwide. The diverse approach to astronomical and astrophysical research supported by NASA, NSF, and DOE is key to this scientific success and remains a central aspect of the future success of US astronomy and astrophysics.

In 2001 the NAS Committee on the Organization and Management of Research in Astron. and Astroph. (COMRAA) recommended the establishment of an advisory committee to advise NASA and NSF on the increasingly important interfaces between them in supporting astronomy and astrophysics. Support for this by the Executive Branch and Congress led to the establishment of the Astronomy and Astrophysics Advisory Committee (AAAC) under the National Science Foundation (NSF) Authorization Act of 2002. (Also FACA committee like HEPAP)

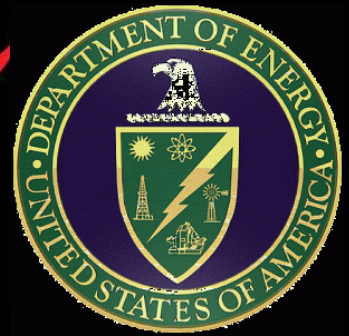


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In 2004 DoE was added to the AAAC:

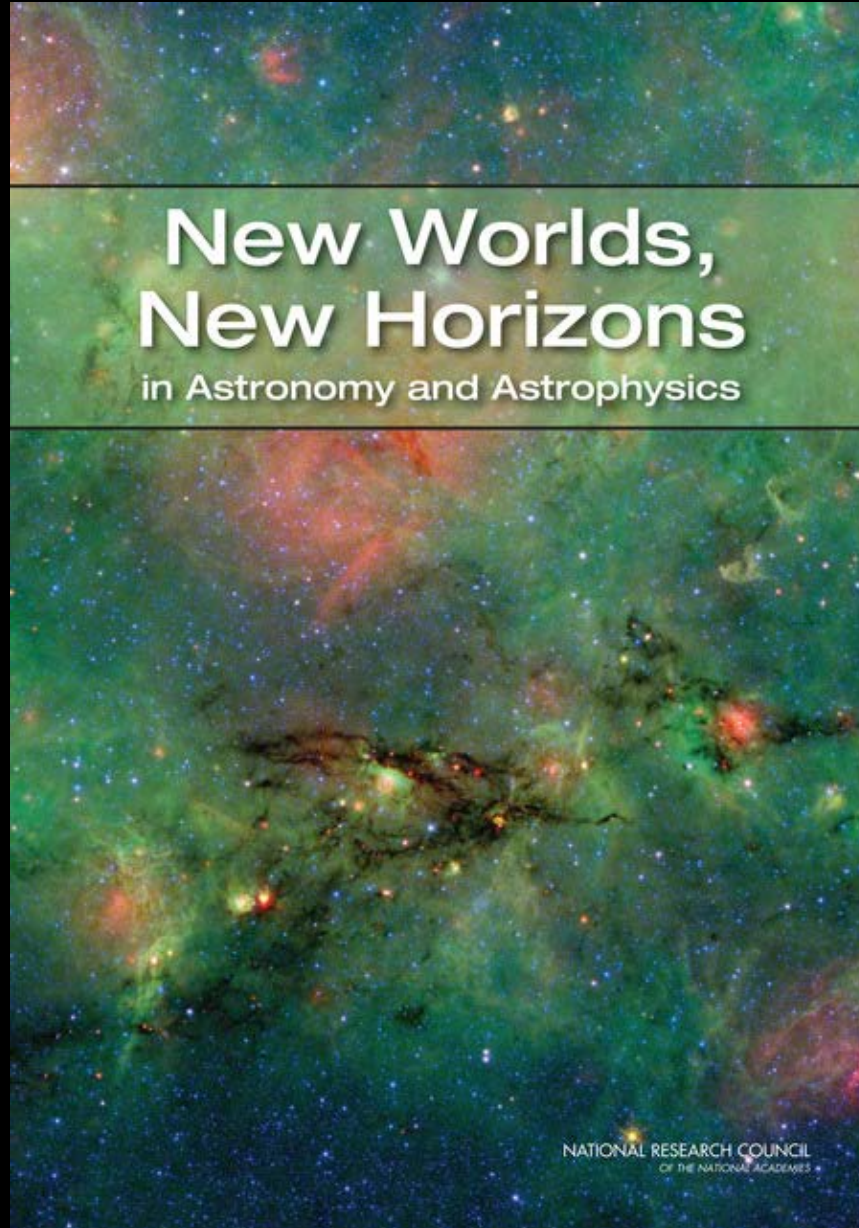


Astronomy and Astrophysics Advisory Committee (AAAC)

The AAAC was established under the **National Science Foundation Authorization Act of 2002** Public Law 107-368 and amended by SEC. 5 of P.L. 108-423 (the **Department of Energy High-End Computing Revitalization Act of 2004**), to:

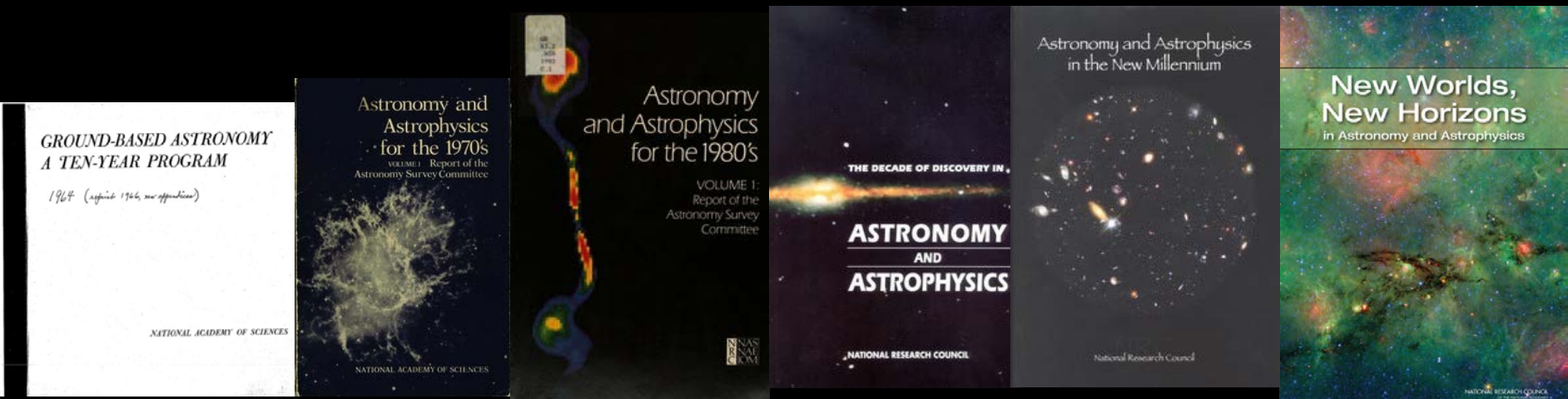
- (1) **assess, and make recommendations** regarding, the **coordination** of astronomy and astrophysics programs of the Foundation, the National Aeronautics and Space Administration, and the Department of Energy;
- (2) **assess, and make recommendations** regarding, the **status of the activities** of the Foundation, the National Aeronautics and Space Administration, and the Department of Energy as **they relate to the recommendations** contained in the **National Research Council's 2001 report entitled Astronomy and Astrophysics in the New Millennium**, and the recommendations contained **in subsequent National Research Council reports of a similar nature**; and
- (3) not later than March 15 of each year, transmit a report to the **Director, the Administrator of the National Aeronautics and Space Administration, the Secretary of Energy, and the Committee on Science of the House of Representatives, the Committee on Commerce, Science, and Transportation of the Senate, and the Committee on Health, Education, Labor, and Pensions of the Senate** on the Advisory Committee's findings and recommendations under paragraphs (1) and (2).

2010 Decadal Survey



Previous Decadal Surveys

- 1964: Ground-based Astronomy: A Ten Year Program (Whitford)
- 1972: Astronomy and Astrophysics for the 1970s (Greenstein)
- 1982: Astronomy and Astrophysics for the 1980s (Field)
- 1991: The Decade of Discovery in Astronomy and Astrophysics (Bahcall)
- 2001: Astronomy and Astrophysics in the New Millennium (McKee-Taylor)
- 2010: New Worlds, New Horizons in Astronomy and Astrophysics (Blandford)



2010 Decadal Survey: New Worlds New Horizons

Community Input: 324 Science White Papers; Town Halls

Optimizing the recommended Program: based on science, existing facilities, budget outlooks, maximizing scientific return, considering international and private partnerships; Cost, Risk, and Technical Evaluation

NASA:

L: WFIRST, Explorers Augmentation, LISA, IXO

M: New Worlds Technology and Inflation Probe Technology Development Programs

NSF:

L: LSST, Mid-Scale Augmentation, GSMT, ACTA;

M: CCAT, AAG

DOE:

WFIRST (w/NASA)

LSST (w/ NSF)

ACTA (w/ NSF)

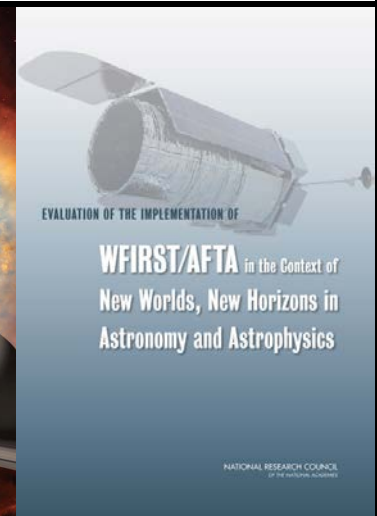
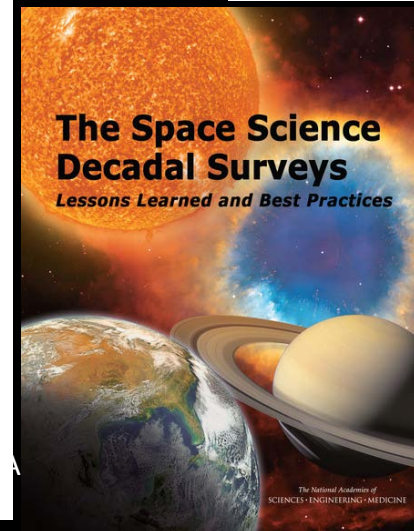
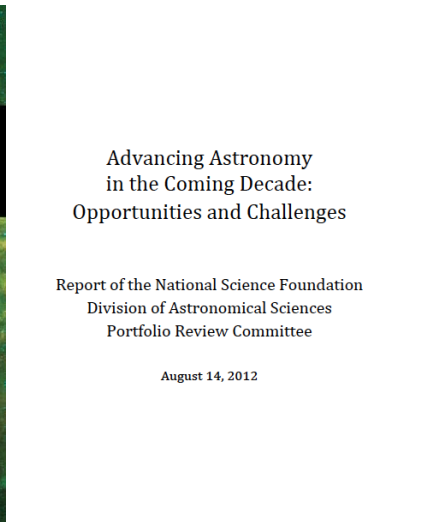
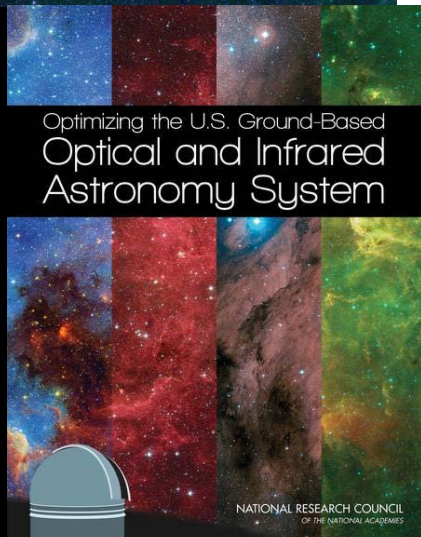
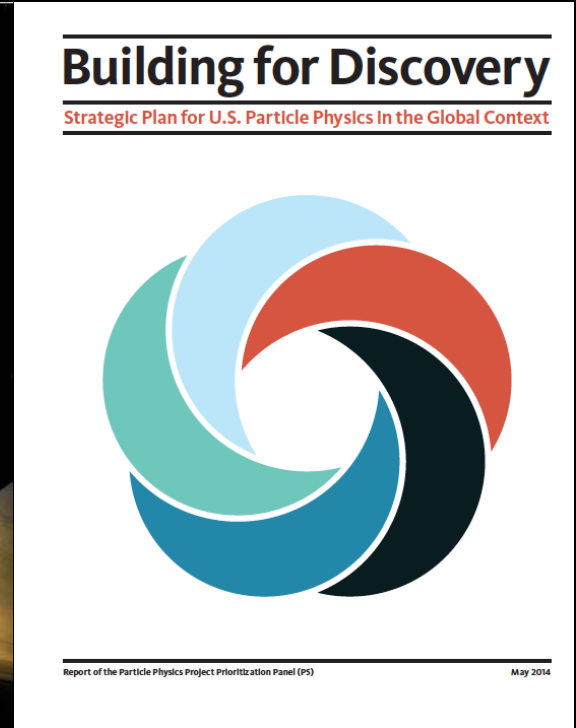
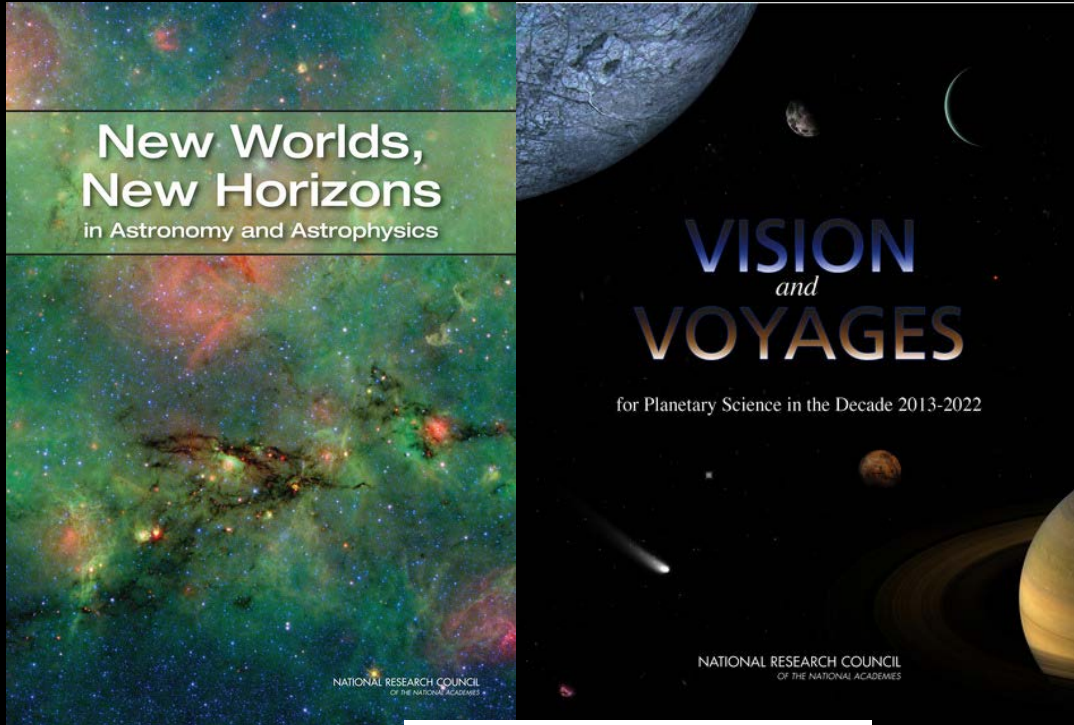
S: Theory and Computation Networks (w/ NASA, NSF)



Large Synoptic Survey Telescope (LSST)



2010 Decadal Survey & reports of a similar nature



2010 Decadal Survey & reports of a similar nature



Building for Discovery

Strategic Plan for U.S. Particle Physics In the Global Context



Area(s) of Unusual
Discovery Potential

Gravitational Wave
Astronomy

May 2014

Panel	Science Questions
Cosmology and Fundamental Physics	CFP 1 How did the universe begin?
	CFP 2 Why is the universe accelerating?
	CFP 3 What is dark matter?
	CFP 4 What are the properties of neutrinos?

- Use the Higgs boson as a new tool for discovery
- Pursue the physics associated with neutrino mass
- Identify the new physics of dark matter
- Understand cosmic acceleration: dark energy and inflation
- Explore the unknown: new particles, interactions, and physical principles.

Astronomy and Astrophysics Advisory Committee (AAAC)

Current Members 2015-2016:

Dr. James Buckley (Washington University)

Dr. Craig Hogan (Fermilab/University of Chicago)

Dr. David Hogg (New York University)

Dr. Klaus Honscheid (Ohio State University)

Dr. Buell Jannuzi (Steward Observatory)

Dr. Lisa Kaltenegger (Cornell University)

Dr. Rachel Mandelbaum (Carnegie-Mellon University)

Dr. Angela Olinto (University of Chicago), Chair

Dr. William Smith (ScienceWorks International), Vice-Chair

Dr. Angela Speck (University of Missouri)

Dr. Suzanne Staggs (Princeton University)

Dr. Jean Turner (University of California, Los Angeles)

Dr. Martin White (University of California, Berkeley)

Astronomy and Astrophysics Advisory Committee (AAAC)

Yearly reports starting March 15, 2004, available at:

<http://www.nsf.gov/mps/ast/aaac.jsp>

Past Subcommittees & Reports:

Principles for Access to Large Federally Funded Astrophysics Projects and Facilities - 2014

ExoPlanet Task Force (ExoPTF) - 2008

*Dark Matter Scientific Assessment Group (DMSAG) - 2007

*Dark Energy Task Force (DETF) - 2006

*Task Force on CMB Research (TFCR) – 2005

Giant Segmented Mirror Telescope (GSMT) Science Working Group – 2005

*Joint activities with HEPAP

AAAC 2015 report

March 2015 report: 21 findings and 5 recommendations

Interagency Coordination and Cooperation:

1. FINDING: Thanks to a history of shared scientific goals and coordinated U.S. investment in Astronomy and Astrophysics, the U.S. program has achieved **many advances and breakthroughs over the past year**.
2. FINDING: Dealing with complex constraints, **U.S. agencies work well together** to support the priorities of the scientific community, both in collaboration on large managed projects and in coordination of diverse research programs.
3. FINDING: **Interagency cooperation and collaboration has increased in the last decade**, to the benefit of the science community.

Some very successful examples:

NSF + DOE: SDSS, DES, Auger, VERITAS,...

Large Synoptic Survey Telescope (LSST)

start Dark Energy Spectroscopic Instrument (DESI) at Mayall

NASA + DOE: Fermi Gamma-ray Space Telescope

NASA + NSF: HST, space telescopes + Ground based telescopes

start NOAO **WIYN 3.5 m**: NASA-NSF Exoplanet Observational Research (NN-EXPLORE)

AAAC 2015 report

Status and Implementation of Decadal Surveys I

4. FINDING: The **highest priorities of NWNH: WFIRST and LSST are moving forward.**

5. FINDING: **NSF/AST and DOE/HEP** have done an excellent job in coordinating their efforts to make sure that **LSST continues to make progress.** Some delays in LSST and associated cost increases have resulted from the federal budget standoffs, but the agencies have provided good management to minimize the impact on the project.

6. FINDING: **NASA effort to reformulate the WFIRST-AFTA concept is well underway.** The NASA plan offers the potential for realizing an even more powerful experiment for **Dark Energy** and Extrasolar planet science in a cost-neutral way.

7. FINDING: The **NSF MSIP program is funded at a level well below that envisioned in NWNH,** but is becoming the only mechanism available for funding the high priority activities advocated in NWNH. By combining support for strategic objectives with an unsolicited open call for proposals, the program may become so oversubscribed that it can no longer effectively serve the community.

NWNH recom \$40M/yr – current \$14M to FY16 \$18.72M (decreasing AAG)

Zwicky Transient Facility, **Advanced ACTPol**, the Event Horizon Telescope, HERA (Hydrogen Epoch of Reionization Array)

AAAC 2015 report

Status and Implementation of Decadal Surveys II

8. FINDING: Despite budgetary constraints that did not allow progress on recommendations for a U.S. partnership in a large optical/infrared telescope (**GSMT**) and a major new X-ray telescope (**IXO**), the **NSF** is working on a U.S. Participation Plan for the **TMT** and **NASA** is anticipating future U.S. participation in the **ESA ATHENA** project providing future resources for the U.S. ground-based and X-ray communities.

9. FINDING: **NSF/AST and DOE/HEP** continue to support a **strong dark energy program** with **DES** and a new MIE start for **DESI** in FY2014. Along with **LSST** and **WFIRST/AFTA**, this broad-based program across all three agencies is an **excellent response to NWNH and P5 priorities in dark energy and cosmic acceleration**.

10. FINDING: **DOE/HEP Cosmic Frontier and NSF/PHY Particle Astrophysics** have selected three **G2 direct detection dark matter** detectors to move forward, **however funding is not at the level recommended**. Both agencies will continue to make the case for funding these at the level needed to carry them out successfully.

11. FINDING: The **international CTA consortium** is moving forward to build the CTA observatory without **U.S. financial participation**. Despite **positive recommendations in NWNH and the P5 report**, **DOE has declined to support participation of U.S. scientists in CTA**. For NSF, the only available funding mechanisms to support CTA construction are the highly-competed **NSF/AST MSIP program and NSF/PHY Midscale Instrumentation Fund**.

AAAC 2015 report

Status and Implementation of Decadal Surveys III

12. FINDING: *Gravitational wave science remains one of the most exciting frontiers of physics and astrophysics, and its future development will benefit greatly from cooperation among the three agencies.*

13. FINDING: **CMB science** clearly **crosses the boundaries of agencies**. As recommended by P5, **a larger role of DOE with NSF** is important to realize the great scientific potential of this enterprise

1. RECOMMENDATION: **We encourage DOE and NSF to continue working toward a plan for the next generation (stage-IV) ground-based CMB observatory**

2. RECOMMENDATION: *The agencies should continue to pursue international partnerships in order to further accomplish the goals of NWNH. The Principles for Access¹ should guide the process*

Status of the Portfolio Review

14. FINDING: *The NSF Division of Astronomical Sciences has done a commendable job of finding creative solutions to achieve the divestment recommended by the Portfolio Review without shutting down facilities. These actions serve to reduce their operating budgets and thus to enable key scientific priorities in NWNH.*

15. FINDING: *Divestments recommended by the Portfolio Review are proceeding, but at a slower pace due to complexities of the divestment process.*

16. FINDING: *The loss of open access facilities from the NSF portfolio does not come without a cost to the U.S. user communities, in terms of loss of open nights and access to a variety of instruments and science. This loss is especially critical for the researchers at institutions without their own telescope access or who use ground-based facilities that provide unique science capabilities.*

3. RECOMMENDATION: *Vigorous activities toward **divestments recommended by the Portfolio Review should continue**, along with agency efforts to explore partnerships, interagency cooperation and private resources to maintain some access to these facilities or their capabilities for the U.S. Divestments are necessary to increase the available funding for both strategic and unsolicited midscale and individual investigator programs.*

Mid-Decadal Review

17. FINDING: The **agencies are commended for their collaboration in developing the mid-decadal survey process**. This is **the first mid-decadal review to include the NSF and DOE**. They are successfully navigating the uniqueness of each agency, while maintaining a high level of coordination.

Budget Summary and Impact

18. FINDING: The 2016 President's Budget request proposes an overall **6% increase in R&D investment**, while **astronomy and astrophysics (NAF/AST, NASA/APD, DOE/HEP CF) would be flat (-0.1%)** in nominal dollars before inflation, when large facility/mission construction is not included.

4. RECOMENDATION: We urge the agencies and Congress to recognize the **important role of basic research** to the future of our country, including the special contributions that astronomy and astrophysics can offer. Additional investments will lead to great advances and breakthroughs and the bold vision for U.S. astronomy and astrophysics endorsed in the NWNH report.

Proposal Pressures Study Group

19. FINDING. *Over the last decade, the number of individuals submitting proposals to NSF and NASA in the fields of astronomy and astrophysics is increasing faster than the funding profile, causing a corresponding **drop in selection rate**. A larger fraction of very good to excellent proposals are unsuccessful now than in the past. Such a low selection rate for very good proposals is **incompatible with the healthy individual investigator programs** recommended by NWNH, and may represent a significant loss of science.*

20. FINDING. *After accounting for changes in agency opportunities, NSF and NASA data show that the PIs submitting these proposals have remained a relatively stable demographic entity in terms of race, gender, number of years since PhD, and type of Institution.*

21. FINDING. *A **falling success rate impacts both researchers and agencies**. Researchers spend a larger fraction of time re-submitting proposals and serving on multiple review panels. Agencies must deal with an increased workload, staffing problems, and ensuring fair review panels with sufficient reviewers.*

5. RECOMMENDATION: *The agencies should continue to work with the astronomy and astrophysics community to clarify and quantify the underlying factors contributing to the **declining success rate seen at NASA and NSF**, and develop data-driven ideas for managing the problem.*

Recommendations

1. RECOMMENDATION: We encourage DOE and NSF to continue working toward a plan for the next generation **(stage-IV) ground-based CMB observatory**

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Distant
quasar

Measurement of Expansion Velocity

Absorption features

2 Mpc

AAAC 2016 report

Next AAAC meeting
28-29 January 2016

Goddard Space Flight Center

Reports NSF (AST/PHY), NASA, DOE
CMB Stage 4 Collaboration Update
NEO detections with LSST
Mid-decadal Survey Status Report
LSST/WFIRST/Euclid Synergies

Distant
quasar

Measurement of Expansion Velocity



RXC J2248.7-4431

2 Mpc

Astro2010 NWNH Midterm Assessment

Report to the Astronomy and Astrophysics Advisory Committee

Jacqueline N. Hewitt, Chair

Presented by Angela V. Olinto, member

11 December 2015

Statement of Task

In the context of funding circumstances that are substantially below those assumed in NWNH, the committee's review will include the following tasks:

1. **Describe the most significant scientific discoveries, technical advances, and relevant programmatic changes** in astronomy and astrophysics over the years since the publication of the decadal survey;
2. Assess how well the **Agencies' programs address the strategies, goals, and priorities** outlined in the 2010 decadal survey and other relevant NRC reports;
3. Assess **the progress toward realizing these strategies, goals, and priorities**; and
4. In the context of strategic advice provided for the Agencies' programs by Federal Advisory Committees, and in the context of mid-decade contingencies described in the decadal survey, **recommend any actions that could be taken to maximize the science return of the Agencies' programs.**

The review **should not revisit or alter the scientific priorities** or mission **recommendations** provided in the decadal survey and related NRC reports but **may provide guidance** on implementation of the recommended science and activities portfolio and on other potential **activities in preparation for the next decadal survey.**

Committee Membership

Jacqueline N. Hewitt, Massachusetts Institute of Technology (Chair)

Adam S. Burrows, Princeton University

Neil J. Cornish, Montana State University

Andrew W. Howard, University Hawaii-Manoa

Bruce Macintosh, Stanford University

Richard F. Mushotzky, University of Maryland

Angela V. Olinto, University of Chicago

Steven M. Ritz, University of California, Santa Cruz

Alexey Vikhlinin, Harvard-Smithsonian CfA

David H. Weinberg, Ohio State University

Rainer Weiss, Massachusetts Institute of Technology

Eric M. Wilcots, University of Wisconsin

Edward L. Wright, University of California, Los Angeles

A. Thomas Young, Lockheed Martin, retired

Midterm Assessment Timeline

8-10 October 2015	First meeting, Washington, DC
12-14 December 2015	Second meeting, Irvine, CA (Science symposium on December 12)
5 January 2015	AAS session, Kissimmee, FL
11-13 January 2015	Third meeting, Washington, DC
1 March 2015	Report delivered to NRC for review
May 2015	Report released
June 2015	AAS presentation

First Meeting - Summary

Presentations from agencies

NASA/Astrophysics – Paul Hertz

NSF/AST – Jim Ulvestad

DOE/HEP – Kathy Turner

OSTP – Meredith Drosback

JAXA – Kazuhisa Mitsuda

ESA – Fabio Favata

Presentations from activities and projects

WFIRST/AFTA – Neil Gehrels

MSIP – Vern Pankonin

U.S. LISA – Tuck Stebbins

U.S. Athena – Rob Petre

Second Meeting – Beckman Center

12-14 December 2015

Perspective on New Worlds, New Horizons, Roger Blandford, Stanford Univ.

Science symposium - organized around NWNH Science Frontier Panel areas

Cosmology and Fundamental Physics - Rachel Bean, Cornell University

Galaxies Across Cosmic Time - Alison Coil, University of California, San Diego

Stars and Stellar Evolution - Roger Chevalier, University of Virginia

The Galactic Neighborhood - Michael Shull, University of Colorado

Planetary Systems and Star Formation - Lee Hartmann, University of Michigan

Project presentations

LSST, GMT, TMT, CTA

Exoplanet Technology for Direct Imaging Space-Based Missions

European Consortium's LISA mission

Discussion with OMB

Committee deliberations

Connecting with A&A Community

The three Committee meetings – open sessions

Committee meetings have time set aside for public comment

AAS splinter session

Open letter to community inviting input – posted on AAS web page

Email input via astromidterm2015@nas.edu - publicly available as per federal law

Need to strike a good balance between inclusiveness and scope; keep focus on

NWNH implementation

(We are not doing another survey/prioritization!)

Not asking for white papers

Not asking for contributed talks

Some Observations...

The current reality is **very** different from what NWNH assumed

Budgets available for NWNH activities much lower, NSF facilities inflexible

ESA has made mission decisions

Science has progressed (e.g., exoplanets, CMB precision, (GW signal?))

NASA first 2010 decadal new **start (WFIRST)** occurring later in decade than anticipated

NWNH explicitly deferred some decisions to mid-decade

Contributions of big AFTA mirrors to NASA changes WFIRST cost model

WFIRST scope and risk have increased, and some capabilities have been lost

Even mid-decade is different (e.g., LISA Pathfinder launched late for results to be considered)

NWNH advised DSIAC to deal with many issues – did not happen

The landscape is complicated

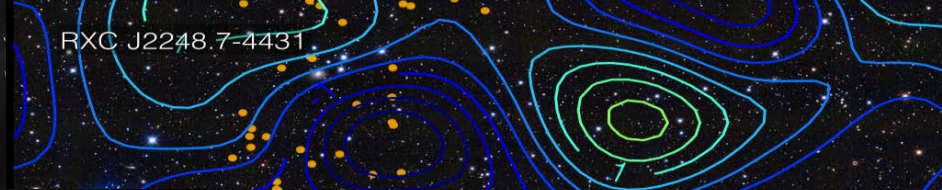
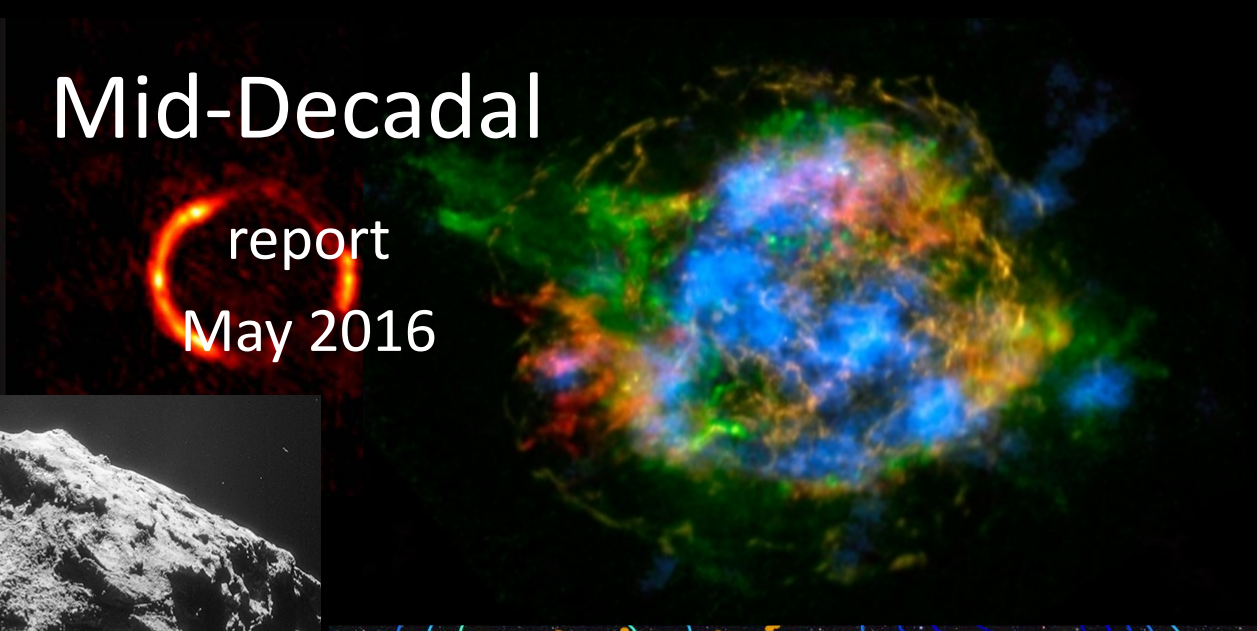
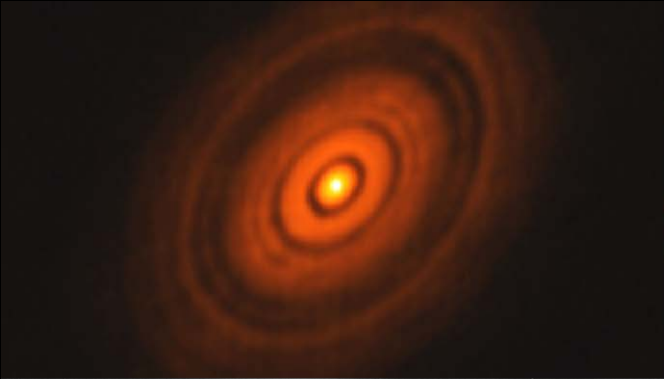
There are many unresolved issues, some requiring detailed study, some now in 2020's

Committee will have to select scope carefully, recommend further study for some topics

Mid-Decadal

report

May 2016



Distant
quasar

Thank you

Measurement of Expansion Velocity

