D.4 ASTROPHYSICS THEORY

1. Scope of Program

The Astrophysics Theory Program (ATP) supports efforts to develop the basic theory for NASA's space astrophysics programs. Abstracts of previously selected ATP projects may be found online at http://nspires.nasaprs.com/ (choose "Solicitations" then "Closed/Past Selected" on the left). The periods of performance of investigations for this research element may range from one to four years. Most awards will have a duration of three years, but four-year awards may be made if the need for the longer duration is sufficiently well justified in the proposal.

The Astrophysics Theory Program does not permit multiple Principal Investigators (PIs) (see Section IV(b)i of the Summary of Solicitation). Each proposed investigation must be led by a single PI. The PI institution is expected to fund Co-Investigator(s) (Co-I(s)) participating via subawards, except where the Co-I is at a Government laboratory, including the Jet Propulsion Laboratory (JPL).

Proposals submitted for this program must both:

- Be directly relevant to space astrophysics goals by facilitating the interpretation of data from space astrophysics missions or by leading to predictions that can be tested with space astrophysics observations; and
- Consist predominantly of theoretical astrophysics studies or the development of theoretical astrophysics models.

ATP proposals satisfying both of the above requirements may involve development of data analysis methods for astrophysics missions and may incidentally include actual data analysis as a test of the theory or the method.

Proposals to the ATP program may not:

- Consist primarily of data reduction or data analysis (such proposals should be directed to the mission-specific programs or the Astrophysics Data Analysis Program (ADAP) described in Appendix D.2 in this solicitation);
- Propose theoretical work pertaining to atomic and molecular astrophysics and other topics directly related to Laboratory Astrophysics (these should be proposed to the Astrophysics Research and Analysis (APRA) program element described in Appendix D.3);
- Develop experimental payloads to test theories of gravitation and fundamental physics (such proposals should be submitted to the APRA program element described in Appendix D.3);
- Address theoretical topics that are predominantly unrelated to the needs of NASA's space astrophysics programs (such proposals should be directed to other appropriate Federal agencies);
- Deal strictly or predominantly with Solar System objects or solar-terrestrial interaction studies, including solar energetic particles (see Appendices B and C for appropriate programs);
- Propose to develop technologies or experimental concepts for future NASA missions (these proposals should be submitted to the APRA program element described in Appendix D.3 or the Strategic Astrophysics Technology program element described in Appendix D.8);

- Propose to develop new data analysis methods for future space missions (these proposals should be submitted to the APRA program element described in Appendix D.3)
- Primarily aim at studying new mission concepts;
- Request support for organizing and/or hosting scientific meetings; or
- Request support for substantial computing facilities or resources beyond nominal workstation or network requests.

2. Proposal Category and Research Areas

ATP proposals will only be accepted from individual Principal Investigators (PIs) whose proposed work has a clear, single focus. Group proposals, i.e., those in which several researchers submit an omnibus proposal of related, but separate, theoretical research investigations under a designated PI, are not solicited for the ATP and will be considered unresponsive to this solicitation. However, individual theory PIs may include as many Co-Investigators and Collaborators as they wish on their proposals.

Investigators may submit more than one proposal to the ATP if the research program of each proposal is significantly distinct. If a proposal is submitted as a successor to work supported by an earlier proposal, the new proposal must identify the related work and clearly summarize all significant results from it.

For the purposes of conducting the peer review, every proposal for this ATP must identify one (or more, if appropriate) of the Topic Categories from the list below in both its Notice of Intent to propose and in the proposal submission itself. The primary use of these Topic Categories is to facilitate the assignment of the proposal to an appropriate review panel. NASA reserves the right to assign a proposal to a different category. Depending on the mix of proposals received, review panels may not correspond exactly to these categories.

1. Star and Exoplanet Formation (e.g., star forming clouds, protostars, protoplanetary and debris disks, planet formation, astrochemistry);
2. Stellar Astrophysics and Exoplanets (e.g., asteroseismology, convection, stellar evolution, brown dwarfs and exoplanets, mass loss, circumstellar disks);
3. Collapsed Objects and X-ray Astrophysics (e.g., white dwarfs, neutron stars, cataclysmic variables, X-ray binaries, black-hole binaries);
4. Supernovae and Gamma Ray Bursts;
5. Interstellar Medium, Cosmic Rays, and Galactic Structure (e.g., supernova remnants, dark clouds, interstellar dust, H II regions, diffuse galactic emission, planetary nebulae, stellar clusters);
6. Normal Galaxies (e.g., quiescent galaxies, interacting galaxies, starburst galaxies);
7. Active Galaxies and AGNs (e.g., population studies, accretion discs, jets);
8. Large Scale Cosmic Structures and Dark Matter (e.g., clusters of galaxies, galaxy environment and evolution, intracluster medium, diffuse photon backgrounds);
9. Dark Energy and the Cosmic Microwave Background (e.g., theoretical studies of cosmological observation techniques, theoretical cosmology, dark energy models);
10. Gravitational Astronomy (e.g., gravitational wave sources, computation of gravitational radiation waveforms, data analysis methods for future missions to investigate gravitational radiation); and

11. Other Astrophysics Theory (NASA Headquarters will assign the proposal to what it deems is the most appropriate review panel).

3. Availability of High-End Computational Resources

Those investigators whose research requires high-performance computing should refer to the *Summary of Solicitation*, Section I(d), "NASA-provided High-End Computing Resources." This section describes the opportunity for successful proposers to the Astrophysics Theory program to apply for computing time on either of two NASA computing facilities at the Goddard Space Flight Center's Computational and Information Sciences and Technology Office or at the Ames Research Center's Advanced Supercomputing Division.

4. Summary of Key Information

Expected program budget for first year of new awards	~ $4M
Number of new awards pending adequate proposals of merit	~ 30
Maximum duration of awards	4 years; shorter term proposals are encouraged; four-year proposals must be well justified
Due date for Notice of Intent to propose (NOI)	See Tables 2 and 3 in the *ROSES Summary of Solicitation*.
Due date for proposals	See Tables 2 and 3 in the *ROSES Summary of Solicitation*.
Planning date for start of investigation	No earlier than 6 months after the proposal due date, but no later than July 1, 2017.
Page limit for the central Science-Technical-Management section of proposal	15 pp; see also Chapter 2 of the *NASA Guidebook for Proposers*
Relevance	This program is relevant to the Astrophysics questions and goals in the NASA Science Plan. Proposals that are relevant to this program are, by definition, relevant to NASA.
General information and overview of this solicitation	See the *ROSES Summary of Solicitation*.
Detailed instructions for the preparation and submission of proposals	See the *NASA Guidebook for Proposers* at http://www.hq.nasa.gov/office/procurement/nraguidebook/.
Submission medium	Electronic proposal submission is required; no hard copy is required or permitted. See Section IV of the *ROSES Summary of Solicitation* and Chapter 3 of the *NASA Guidebook for Proposers*.
Web site for submission of proposal via NSPIRES	http://nspires.nasaprs.com/ (help desk available at nspires-help@nasaprs.com or (202) 479-9376)
Web site for submission of proposal via Grants.gov	http://grants.gov (help desk available at support@grants.gov or (800) 518-4726)

Funding opportunity number for downloading an application package from Grants.gov	NNH16ZDA001N-ATP
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