**Directorate for Mathematical and Physical Sciences – Division of Astronomical Sciences (NSF-MPS/AST)**

**Products of Research**

Describe the types of data and products that will be generated in the research, such as images of astronomical objects, spectra, data tables, time series, theoretical formalisms, computational strategies, software, and curriculum materials.

* Give a short description of what "data" and "data collection" will mean in your research—explain what the contents of the datasets will be, including size if known. If size is not known, please provide an estimate. *Consider these questions*:
  + What data will be generated in the research?
  + What data types will you be creating or capturing?
  + How will you capture or create the data? (e.g. experimental measures, observational or qualitative, model simulation, processed etc.)
  + If you will be using existing data, state that fact and include where you got it.
  + What is the relationship between the data you are collecting and the existing data?

**Data Format**

Describe the format in which the data or products are stored (e.g., ASCII, HTML, FITS, VO compliant tables, XML files, etc.). Include a description of the metadata that will make the actual data products useful to the general researcher. Where data are stored in unusual or not generally accessible formats, explain how the data may be converted to a more accessible format or otherwise made available to interested parties. In general, solutions and remedies should be provided.

* Explain the specific format of your data. You are also asked to provide a description of what metadata will be available and necessary for accessing your data. Think about how a "general researcher" would perceive your data, and what information you can include with your data to help that researcher use the data. Metadata may entail descriptions of research details such as: experiments, apparatuses, computational codes, etc. An example of metadata could also be as simple as a "readme" file to explain variables, the structure of the files, etc. *Consider these questions*:
  + Which file formats will you use for your data, and why?
  + What transformations (to more shareable formats) will be necessary to prepare data for sharing?
  + What form will the metadata describing/documenting your data take?
  + How will you create or capture these details?
  + Which metadata standards will you use and why have you chosen them? (e.g. accepted domain-local standards, widespread usage).
  + What contextual details (metadata) are needed to make the data you capture or collect meaningful?

**Access to Data and Data Sharing Practices and Policies**

"Access to data" refers to data made accessible without explicit request from the interested party, for example those posted on a website or made available to a public database. Describe your plans, if any, for providing such general access to data, including websites maintained by your research group, and direct contributions to public databases. If maintenance of a web site or database is the direct responsibility of your group, provide information about the period of time the web site or data base is expected to be maintained. Note that data taken at national or private observatories may be accessible through public archives (perhaps after a standard proprietary period). Various forms of data (e.g., FITS images and tables, other data tables) also may be deposited with published articles in the AAS journals and other journals. Particular attention should be paid to data sets that are products of well-defined surveys. Also describe your practice or policies regarding the release of data for access, for example whether data are posted before or after formal publication. "Data sharing" refers to the release of data in response to a specific request from an interested party. Describe your policies for data sharing, including where applicable provisions for protection of privacy, confidentiality, intellectual property, national security, or other rights or requirements.

* The differentiation between "Access to data" and "Data sharing" is a key distinction made by the AST data management plan guidelines. Please keep in mind that you are expected to adequately provide responses for both how you plan on making your data accessible without a specific request from a researcher, and how you will be able to provide data upon demand. Use this section to also explain issues of confidentiality and intellectual property as their impact on the dissemination of your data.*Consider these questions*:
  + How and when will you make the data available? (Include resources needed to make the data available: equipment, systems, expertise, etc.)
  + What is the process for gaining access to your data?
  + How long will the original data collector/creator/principal investigator retain the right to use the data before opening it up to wider use?
  + Do you plan on publishing findings which rely on the data? If so, do your prospective publishers place any restrictions on other avenues of publication?
  + Explain details of any embargo periods for political/commercial/patent or publisher reasons.
  + Are there ethical and privacy issues? If so, how will these be resolved?
  + What have you done to comply with your obligations in your IRB Protocol?
  + Who will hold the intellectual property rights to the data and how might this affect data access?

**Policies and Provision for Re-Use, Re-Distribution and Products of Derivatives**

Describe your policies regarding the use of data provided via general access or sharing. For example, if you plan to provide data and images on your website, will the website contain disclaimers, or conditions regarding the use of the data in other publications or products? If the data or products (e.g., images) are copyrighted (by a journal, for example), how will this be noted on the website?

* Explain how the policies you outlined in the section above can be applied to the re-use and re-distribution of your data. Identify who will be allowed to use your data, how they will be allowed to use your data and whether or not they will be allowed to disseminate your data. **If you will be restricting access, use or dissemination of the data, you must explain how you will codify and communicate these terms**. *Consider these questions*:
  + Will any permission restrictions need to be placed on the data?
  + What and who are the intended or foreseeable uses/users of the data?
  + How will the dataset be licensed if rights exist? (e.g. any restrictions or delays on data sharing needed to protect intellectual property, copyright or patentable data.)

**Archiving of Data**

Describe whether and how data will be archived and how preservation of access will be handled. If the data will be archived by a third party (e.g., national observatory or journal), please refer to their preservation plans if available.

* This portion of the Data Management Plan asks the researcher to provide a long-term strategy for archiving and preserving the data from the research described in the proposal. *Consider these questions*:
  + What is the long-term strategy for maintaining, curating and archiving the data?
  + Which archive/repository/database have you identified as a place to deposit data?
  + What procedures does your intended long-term data storage facility have in place for preservation and backup?
  + How long will/should data be kept beyond the life of the project?

Also consider these questions about the data and associated information that will be deposited:

* + What data will be preserved for the long-term?
  + What transformations will be necessary to prepare data for preservation?
  + What metadata/documentation will be submitted alongside the data or created on deposit/transformation in order to make the data reusable?
  + What related information will be deposited (e.g. references, reports, research papers, fonts, the original bid proposal, etc.)?