Genealogy of Life FY 2016 (GoLife)

PROGRAM SOLICITATION
NSF 16-522

REPLACES DOCUMENT(S):
NSF 15-520

National Science Foundation

Directorate for Biological Sciences
Division of Environmental Biology
Division of Biological Infrastructure

Directorate for Geosciences
Division of Earth Sciences

Full Proposal Deadline(s) (due by 5 p.m. submitter's local time):

March 23, 2016

Fourth Wednesday in March, Annually Thereafter

IMPORTANT INFORMATION AND REVISION NOTES

Any proposal submitted in response to this solicitation should be submitted in accordance with the revised NSF Proposal & Award Policies & Procedures Guide (PAPPG) (NSF 16-1), which is effective for proposals submitted, or due, on or after January 25, 2016. Please be advised that proposers who opt to submit prior to January 25, 2016, must also follow the guidelines contained in NSF 16-1.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Genealogy of Life (GoLife)

Synopsis of Program:

Comprehensive understanding of life and how and why it changes over time depends on knowledge of the phylogeny (evolutionary relationships) of living and extinct organisms. The goals of the Genealogy of Life (GoLife) program are to resolve the phylogenetic history of all life's diverse forms and to integrate this genealogical architecture with underlying organismal and environmental data.

The ultimate vision of this program is an open access, comprehensive Genealogy of Life that will enable the comparative framework necessary for testing questions in systematics, evolutionary biology, ecology, paleontology, and other fields. Strategic integration of this genealogy of life with data layers from genomic, phenotypic, spatial, ecological, geological, and temporal data will produce an extensive synthesis of biodiversity and evolutionary sciences. The resulting knowledge infrastructure will enable synthetic research on biological dynamics throughout the *history* of life on Earth, within *current* ecosystems, and for predictive modeling of the *future* evolution of life.

Projects submitted to this program should emphasize increased efficiency in contributing to a complete Genealogy of Life and strategic integration of various types of organismal and environmental data with phylogenies.

This program also seeks to broadly train the next generation of integrative phylogenetic biologists, creating the human resource infrastructure and workforce needed to tackle emerging research questions in comparative biology. Projects should train students for diverse careers by exposing them to the multidisciplinary areas of research within the proposal.

Cognizant Program Officer(s):

Please note that the following information is current at the time of publishing. See program website for any updates to the points of contact.

- Simon Malcomber, telephone: (703) 292-8227, email: smalcomb@nsf.gov
- Reed S. Beaman, telephone: (703) 292-7163, email: rsbeaman@nsf.gov
- Judith E. Skog, telephone: (703) 292-7909, email: jskog@nsf.gov

Applicable Catalog of Federal Domestic Assistance (CFDA) Number(s):

- 47.050 --- Geosciences
- 47.074 --- Biological Sciences

Award Information

Anticipated Type of Award: Standard Grant or Continuing Grant

Estimated Number of Awards: 4 to 6

4 to 6 awards anticipated in Fiscal Year 2016.

Anticipated Funding Amount: $10,000,000

$10,000,000 is the anticipated budget available to the program in FY 2016, pending the availability of funds. Each award, whether single-institution or collaborative project, may range up to durations of five years. The maximum budget for any single project award is $2,500,000.

Eligibility Information

Who May Submit Proposals:

The categories of proposers eligible to submit proposals to the National Science Foundation are identified in the Grant Proposal Guide, Chapter I, Section E.

Who May Serve as PI:

There are no restrictions or limits.

Limit on Number of Proposals per Organization:

There are no restrictions or limits.

Limit on Number of Proposals per PI or Co-PI: 1

An individual may appear as PI, co-PI, or other senior personnel on no more than one GoLife proposal submitted to any annual GoLife competition.

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- **Letters of Intent:** Not required
- **Preliminary Proposal Submission:** Not required
- **Full Proposals:**
  - Full Proposals submitted via FastLane: NSF Proposal and Award Policies and Procedures Guide, Part I: Grant Proposal Guide (GPG) Guidelines apply. The complete text of the GPG is available electronically on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg.
  - Full Proposals submitted via Grants.gov: NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov Guidelines apply (Note: The NSF Grants.gov Application Guide is available on the Grants.gov website and on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide)

B. Budgetary Information

- **Cost Sharing Requirements:**

  Inclusion of voluntary committed cost sharing is prohibited.

- **Indirect Cost (F&A) Limitations:**

  Not Applicable

- **Other Budgetary Limitations:**

  Other budgetary limitations apply. Please see the full text of this solicitation for further information.

C. Due Dates

- **Full Proposal Deadline(s)** (due by 5 p.m. submitter's local time):

  March 23, 2016

  Fourth Wednesday in March, Annually Thereafter

Proposal Review Information Criteria

Merit Review Criteria:

National Science Board approved criteria. Additional merit review considerations apply. Please see the full text of this solicitation for

further information.

Award Administration Information

Award Conditions:

Additional award conditions apply. Please see the full text of this solicitation for further information.

Reporting Requirements:

Additional reporting requirements apply. Please see the full text of this solicitation for further information.

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I. INTRODUCTION

The evolution of life on Earth began over 3.5 billion years ago, is ongoing today, and will continue as long as life exists on the planet. The rich tapestry and legacy of life's evolution is commonly captured in the Tree of Life, depicting the phylogenetic relationships among living and extinct organisms. It is widely recognized now that this evolutionary framework provides the foundation for all of comparative biology and paleontology and underpins the study of the origins, evolution, and maintenance of biodiversity.

Understanding the tree of life has been a goal of evolutionary biologists since the time of Darwin. During the past decade, unprecedented gains in gathering and analyzing phylogenetic data have advanced our understanding immensely. Diverse fields of science also now recognize the need for immediate access to environmental and biodiversity data that is integrated with the Tree of Life. The centrality of evolution and phylogeny for biodiversity study over time is fundamental to next generation biodiversity sciences.

This program builds on the progress of the Assembling the Tree of Life (AToL) program, and implements recommendations from the 'Where to Next with The Tree of Life?" workshop, and the Assembling, Visualizing and Analyzing the Tree of Life (AVAToL, http://avatol.org) Ideas Lab. The Genealogy of Life (GoLife) program is focused on determining the genealogical patterns for all species, enhancing the use of phylogenetic knowledge across biology and paleontology via tree-based integration of organismal and environmental data, and training the next generation of phylogenetic biologists. The GoLife program also builds upon the AToL program by further accommodating the complexity of diversification patterns across all of life's history.

For optimal utility, the Genealogy of Life framework for comparative biology requires complete phylogenetic data at all levels across life's history. For example, use of the Genealogy of Life for understanding the evolution of development and the origin of novel traits requires knowledge of phylogenetic relationships and timing of both lineage splitting and gene duplication events *over deep time*. Use of the Genealogy of Life for advancing our understanding of speciation, extinction, biogeographical, and ecological patterns and processes requires *all species-level taxa (tips of tree)* to be accurately placed and linked to other data for cross-species comparative studies. Optimal utility also requires the integration of organismal, environmental, and geological data with the Genealogy of Life.

II. PROGRAM DESCRIPTION

The Genealogy of Life program has four main goals: 1) *Taxonomic completeness* -- containing all species of a given clade, including both extant and extinct, 2) *Data completeness* -- including diverse underlying data layers (e.g., digitized images, specimen collection information, environmental and habitat data, geographic, paleogeographic, and stratigraphic distributions, genomic and phenomic data, developmental data and ontologies), 3) *Dynamic and open structure* -- allowing the automatic incorporation of new data and taxa, and mechanisms for accessibility to the broad scientific and non-scientific communities, and 4) *Training of the next generation of phylogenetic biologists* -- integrative training in diverse fields across comparative evolutionary biology. Successful projects will describe how research and training activities will achieve these four overarching goals.

A. Research

All successful proposals will have the goal of massively increasing the taxonomic and character data space that contributes to making our understanding of life's genealogy as thorough as possible. When preparing a GoLife proposal, proposers are required to justify the need for phylogenetic analysis on their chosen taxonomic group of study and their approach to advancing data inclusiveness. Taxonomic completeness, as described above in Goal 1, will likely be group-dependent. For example, work on clades that include a rich fossil record should include the fossil taxa in the proposed research.

Proposals should focus on poorly sampled clades or dark areas of the Genealogy of Life where new data will significantly increase our knowledge of the evolutionary relationships of life. Data layers should be new data that will have a profound impact when integrated with the Genealogy of Life to provide new understanding of the pattern of life's evolution. In accordance with Goal 2 above, justification of data layers to be added is expected to be strategic and to enable future hypothesis-based research. Chosen data layers are likely to be clade-specific. For example, some vertebrate, invertebrate and plant clades will enable approaches that add substantial phenotypic, geochronological, environmental, spatial, and other types of data layers; some prokaryotic clades will enable approaches that add metabolic pathway, genomic and environmental data layers. GoLife proposals should outline the specific types of novel, hypothesis-driven research that would be enabled by the specific phylogenetic and data layer choices that are proposed.

For this year's solicitation, along with the generation of new phylogenetic data and phylogenetic analyses, GoLife research projects must integrate at least two different data types. Proposals that do not integrate at least two data layers will be returned without review.

Examples of data layers (not an exhaustive list) that could be integrated in GoLife proposals include:

a. Genomic/Phylogenomic sequence data
b. Genotype-phenotype linkage and mapping
c. Morphological data for extant and extinct taxa
d. Fossil data such as sediments, paleoniches, and extinction events
e. Geochronological data
f. Developmental data
g. Geospatial data
h. Environmental data including paleoenvironmental
i. Voucher specimen data
j. Behavioral data
k. Physiological data
l. Metabolic pathways

Length and size of award will depend upon the number and size of the data sets to be added to the Genealogy of Life. Priority will be given to those proposals that provide: 1) the most substantial increase in volume of tree space added, and/or 2) the most significant increase in annotated organismal and environmental data layers. The phylogenetic scope of a GoLife proposal should vastly exceed that of a typical Phylogenetic Systematics core program proposal. Given advances in the field, the size and scope of GoLife proposals should also vastly exceed that of AToL projects.

GoLife projects should leverage existing infrastructure when possible, to avoid redundancy in tools available for comparative biology. Examples of existing infrastructure that GoLife projects could build upon, or access digital data from, include iDigBio, GenBank, the Open Tree of Life as well as previously awarded GoLife projects. Examples of previously funded GoLife projects can be found here: http://www.nsf.gov/awardsearch/simpleSearchResult?queryText=6133&ActiveAwards=true

Proposals should focus on poorly sampled clades or data layers within the Genealogy of Life where new data will have a profound impact on our understanding of the pattern of life's evolution. Projects that largely repeat or replicate existing work will not be funded. Additional examples of projects that will not be considered by this program include: 1) projects that only use a single data type (e.g. genomic/phylogenomic *or* morphological), 2) projects that consist of species surveys, inventories, or descriptions (e.g., Biodiversity: Discovery and Analysis projects), 3) projects that are focused on revisionary systematics (e.g., Advancing Revisionary and Taxonomy and Systematics projects), 4) projects that aim to test a particular comparative hypothesis related to the evolution of a particular group (e.g., Phylogenetic Systematics projects), 5) projects that focus on the changing aspects of life, ecology, environments, and biogeography in geologic time based only on fossil plant, animal and microbes and not integrated completely with extant forms (e.g., Sedimentary Geology and Paleobiology projects), and 6) projects that are solely focused on the development of new methods or technologies without the generation of substantial amounts of new phylogenetic data. **Research proposals that do not focus on poorly sampled clades or data layers within the Genealogy of Life should be submitted to other relevant NSF programs.**

B. Training

The GoLife program requires broad student training that focuses on producing the integrative phylogenetic biologists of the future. The future of phylogenetic systematics and evolutionary biology requires broad research competence in all areas of phylogenetic biology. Training should promote intellectual and methodological interaction, and encourage an integrative perspective to understanding phylogenetic biology.

Training of students in phylogenetics is a required element of GoLife projects, whether undergraduate, graduate, or postgraduate in status. The training goal of GoLife is to prepare researchers to develop and integrate hypotheses, datasets, and analyses, and to become well-versed in all aspects of phylogenetic biology. This may be accomplished, for example, through lab rotations among PI institutions, cross-training plans, and/or integrative training workshops. A training plan must be included that explains the approach, depth and breadth of instruction. Proposers should describe specifically how the proposed training plan will enhance the future human resource infrastructure for the field of phylogenetic comparative biology, and how trainees will be better able to engage in emerging research areas employing phylogenetic tools.

C. Other requirements

In the context of a highly competitive merit review, proposals must make a case for significant cost efficiency and impact on

progress toward the goals of the program. Priority will be given to innovative projects that fill large gaps in phylogenetic, taxonomic, character, spatial and temporal data space; integrate with other ongoing biodiversity efforts; and increase the efficiency and lower the cost of such activities. Such explanations may include gap or needs analyses that assess the most important areas requiring additional data, a cost efficiency plan for number of taxa or data layers to be added to the Genealogy of Life, or other justifications.

Integration and standardization of data consistent with three AVAToL projects [Open Tree of Life (www.opentreeoflife.org,), ARBOR (www.arborworkflows.com), and Next Generation Phenomics (http://avatol.org/) is required. Other data should be made available through broadly accessible community efforts (e.g., specimen data through iDigBio, occurrence data through BISON, etc...).

III. AWARD INFORMATION

Estimated program budget, number of awards and average award size/duration are subject to the availability of funds. Four to six projects (either single or collaborative proposals) are anticipated to be funded in FY 2016 made as standard or continuing grants, from the anticipated $10 million in FY 2016 available to the program.

IV. ELIGIBILITY INFORMATION

Who May Submit Proposals:

The categories of proposers eligible to submit proposals to the National Science Foundation are identified in the Grant Proposal Guide, Chapter I, Section E.

Who May Serve as PI:

There are no restrictions or limits.

Limit on Number of Proposals per Organization:

There are no restrictions or limits.

Limit on Number of Proposals per PI or Co-PI: 1

An individual may appear as PI, co-PI, or other senior personnel on no more than one GoLife proposal submitted to any annual GoLife competition.

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Full Proposal Preparation Instructions: Proposers may opt to submit proposals in response to this Program Solicitation via Grants.gov or via the NSF FastLane system.

- Full proposals submitted via FastLane: Proposals submitted in response to this program solicitation should be prepared and submitted in accordance with the general guidelines contained in the NSF Grant Proposal Guide (GPG). The complete text of the GPG is available electronically on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg. Paper copies of the GPG may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from nsfpubs@nsf.gov. Proposers are reminded to identify this program solicitation number in the program solicitation block on the NSF Cover Sheet For Proposal to the National Science Foundation. Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.

- Full proposals submitted via Grants.gov: Proposals submitted in response to this program solicitation via Grants.gov should be prepared and submitted in accordance with the NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov. The complete text of the NSF Grants.gov Application Guide is available on the Grants.gov website and on the NSF website at: (http://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide). To obtain copies of the Application Guide and Application Forms Package, click on the Apply tab on the Grants.gov site, then click on the Apply Step 1: Download a Grant Application Package and Application Instructions link and enter the funding opportunity number, (the program solicitation number without the NSF prefix) and press the Download Package button. Paper copies of the Grants.gov Application Guide also may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from nsfpubs@nsf.gov.

In determining which method to utilize in the electronic preparation and submission of the proposal, please note the following:

Collaborative Proposals. All collaborative proposals submitted as separate submissions from multiple organizations must be submitted via the NSF FastLane system. Chapter II, Section D.5 of the Grant Proposal Guide provides additional information on collaborative proposals.

See Chapter II.C.2 of the GPG for guidance on the required sections of a full research proposal submitted to NSF. Please note that the proposal preparation instructions provided in this program solicitation may deviate from the GPG instructions.

The following instructions supplement GPG or NSF Grants.gov Application Guide guidelines.

Results from Prior NSF Support:

Be aware that if any PI or co-PI on the project has received NSF funding in the past five years, information on the prior award(s) is required. Each PI and co-PI who has received more than one prior award (excluding amendments) must report on the award most closely related to the proposal. The information required is described in the GPG and the NSF Grants.gov Application Guide. Reviewers will be asked to comment on the quality of the prior work described in this section of the proposal. Please note that the proposal may devote up to five pages to describe the results, within the maximum 15 pages of Project Description. Results may be summarized in fewer than five pages, which would leave the balance of the 15 pages for the Project Description.

Focus of proposals unique to GoLife:

Proposals should focus on poorly sampled clades or data layers within the Genealogy of Life where new data will have a profound impact on our understanding of the pattern of life's evolution. Projects that largely repeat or replicate existing work will not be funded. Additional examples of projects that will not be considered by this program include: 1) projects that only use a single data type (e.g. genomic/phylogenomic *or* morphological), 2) projects that consist of species surveys, inventories, or descriptions (e.g., Biodiversity: Discovery and Analysis projects), 3) projects that are focused on revisionary systematics (e.g., Advancing Revisionary and Taxonomy and Systematics projects), 4) projects that aim to test a particular comparative hypothesis related to the evolution of a particular group (e.g., Phylogenetic Systematics projects), 5) projects that focus on the changing aspects of life, ecology, environments, and biogeography in geologic time based only on fossil plant, animal and microbes and not integrated completely with extant forms (e.g., Sedimentary Geology and Paleobiology projects), and 6) projects that are solely focused on the development of new methods or technologies without the generation of substantial amounts of new phylogenetic data. Research proposals that do not focus on poorly sampled clades or data layers within the Genealogy of Life should be submitted to other relevant NSF programs.

Coordination among Projects for Genealogy of Life:

If phylogenetic research on the chosen group of organisms is already funded by another NSF GoLife award (check the NSF FastLane website for award listings at , the PI must provide a plan for coordinating activities with the other funded project. If two or more proposals with substantially overlapping goals and scope remain in consideration for funding after initial merit review, the PIs of those proposals may be asked to collaborate, and to submit a coordination plan prior to the final funding decision. As conditions of funding the PIs must coordinate activities with any future funded GoLife funded project on the same group of organisms.

The project should include a plan for integration and standardization of data consistent with three AVAToL projects: Open Tree of Life (www.opentreeoflife.org), ARBOR (www.arborworkflows.com), and Next Generation Phenomics (http://avatol.org/).

All projects must ensure that data and biological materials are collected, archived, digitized, and made available using methods that allow current and future investigators to address new questions as they arise. Funded projects must disseminate project data broadly, using widely accepted electronic data standards. As conditions of funding: 1) any image and/or digitized data of physical specimens must be made available through the online National Resource for Digitized BioDiversity Collections (iDigBio.org), funded by the ADBC program at NSF, and 2) all genealogies and underlying data sets must be formatted for inclusion within the Open Tree of Life (see http://blog.opentreeoflife.org/data-sharing for instructions). For both of these types of data the PI is expected to format all data appropriately and meet the standards set by these two resources so that data can be immediately made accessible through these two resources. PIs are advised to investigate these resources in advance and familiarize themselves with the data requirements, and include information within the data management plan for accomplishing the integration and dissemination of the data.

All projects must include within the project description a Management Plan which describes the following: personnel responsible for all major tasks and the time-schedule for task completion; plans for coordination with any projects, nationally or internationally, on the same or related organisms and, if this is a collaborative project, plans for integration of all the collaborative projects to form a comprehensive final product.

International collaboration where appropriate should be described as part of the overall project in the project description. International collaborators are encouraged to seek support from their respective funding organizations. NSF guidelines allow the following expenses to be included in the project budget:

a. Travel expenses for US scientists and students participating in exchange visits integral to the project.
b. Project-related expenses for international partners to engage in research activities while in the US as project participants.
c. Project-related expenses for US participants to engage in research activities while abroad.

Required Supplementary Documents

1. Data Management Plan

   Within the two-page data management plan required for all NSF proposals, include one document for the collaborative project that explains the curatorial, computational, sequencing, and informatics facilities and resources to be used; a plan for long-term preservation and accessibility of collected samples for researchers; any analyses developed that improve or enhance the ability to utilize the genealogical data produced by the project; the database schema if appropriate, including database design and metadata standards; interface for Internet query; and plans for maintenance beyond the duration of the grant. This may not exceed two pages in length.

2. Collection and Transfer of Samples

   Plans to collect and transfer samples must be approved by the appropriate government authorities. Arrangements for the use of traditional knowledge or the collection of samples from the lands of local peoples should be based upon full disclosure and informed consent of those peoples. Under best practices such arrangements develop as a partnership with early and ongoing full participation of community representatives in project design. If cooperating indigenous groups, on the basis of religious or other concerns, object to specific uses, widespread dissemination or other treatments of the knowledge or resources they provide, these concerns should be respected. Any dissemination of samples or data that were collected in a foreign country, or dissemination of results based on samples or data collected in a foreign country, should be done with the full knowledge and consent of collaborators in that country, and must be done under any agreements that exist within government agencies in that country. Copies of these documents should be submitted as supplemental documents.

3. Postdoctoral mentoring plan (Required if proposal includes a postdoctoral scholar)

   This plan (one document for the collaborative project) should describe training activities for all aspects of the overall project for all postdoctoral scholars on the collaborative effort. The mentoring plan must not exceed one page and only one plan may be submitted for collaborative projects and all postdoctoral scholars must be covered by this single one-page document. Different institutions on the same project may not submit different mentoring plans. Proposals that do not comply with this requirement will be returned without review.

4. Integrative student training plan (Required if proposal includes support for undergraduate researchers and/or graduate students)

   This plan should describe the integrative training activities planned for undergraduates, graduate students, and postdoctoral researchers associated with the proposed research. Training activities should promote intellectual and methodological integration and encourage a systems/integrative perspective to understanding phylogenetic biology. This could be accomplished through lab rotations, virtual courses or seminar series, integrative training workshops, or other student-directed learning opportunities. Proposers should describe specifically how the proposed training plan will enhance the future human resource infrastructure for the field of phylogenetic comparative biology, and how trainees will be better able to engage in emerging research areas employing phylogenetic tools. The training plan must not exceed two pages and only one plan may be submitted for collaborative projects. Different institutions on the same project may not submit different training plans. Proposals that do not comply with this requirement will be returned without review.

5. BIO Proposal Classification Form

   Applicants must complete the Proposal Classification Form. The Proposal Classification Form is required for all submissions to BIO; FastLane will not allow processing of the proposal without it.

Other allowed Supplementary Documents

Letters of Collaboration

This section may include letters of collaboration from individuals or organizations that will play an integral role in the proposed project (e.g., individuals or organizations who will provide materials, data, or analytical capabilities). Letters of collaboration must focus solely on affirming that the individual or organization is willing to collaborate on the project as specified in the project description of the proposal. No additional text, especially elaboration of the nature of activities to be undertaken by the collaborator and endorsements of the potential value or significance of the project for the collaborator, may be included. The template that must be used for the preparation of letters of collaboration is provided below. Letters of collaboration should not be provided for any individual designated as a principal investigator or senior personnel, nor are letters of collaboration required for any organization that will be a sub-awardee in the proposal budget. Letters of collaboration should not be provided from data repositories where deposition of relevant data is already in scope (e.g., Genbank, Dryad, iDigBio, MorphBank, Open Tree of Life). Each letter of collaboration must be signed by the designated collaborator. The PI should request letters of collaboration well in advance of the proposal submission deadline, because they must be included at the time of the proposal submission. Letters deviating from this template will not be accepted and may be grounds for returning the proposal without review.

The following template must be used for letters of collaboration

To: NSF Genealogy of Life Program

From: _____(Printed name of the individual collaborator or name of the organization and name and position of the official submitting this memo) By signing below (or transmitting electronically), I acknowledge that I am listed as a collaborator on this proposal, entitled "__(proposal title)__," with _(PI name)_ as the Principal Investigator. I agree to undertake the tasks assigned to me or my organization, as described in the project description of the proposal, and I commit to provide or make available the resources specified therein.

Signed: _____

Organization: _____

Date: _____

B. Budgetary Information

Cost Sharing:

Inclusion of voluntary committed cost sharing is prohibited.

Other Budgetary Limitations:

The maximum total request for any project (whether single proposal or collaborative proposals) will be $2.5 million.

C. Due Dates

- **Full Proposal Deadline(s)** (due by 5 p.m. submitter's local time):

  March 23, 2016

  Fourth Wednesday in March, Annually Thereafter

D. FastLane/Grants.gov Requirements

For Proposals Submitted Via FastLane:

To prepare and submit a proposal via FastLane, see detailed technical instructions available at: https://www.fastlane.nsf.gov/a1/newstan.htm. For FastLane user support, call the FastLane Help Desk at 1-800-673-6188 or e-mail fastlane@nsf.gov. The FastLane Help Desk answers general technical questions related to the use of the FastLane system. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this funding opportunity.

For Proposals Submitted Via Grants.gov:

Before using Grants.gov for the first time, each organization must register to create an institutional profile. Once registered, the applicant's organization can then apply for any federal grant on the Grants.gov website. Comprehensive information about using Grants.gov is available on the Grants.gov Applicant Resources webpage: http://www.grants.gov/web/grants/applicants.html. In addition, the NSF Grants.gov Application Guide (see link in Section V.A) provides instructions regarding the technical preparation of proposals via Grants.gov. For Grants.gov user support, contact the Grants.gov Contact Center at 1-800-518-4726 or by email: support@grants.gov. The Grants.gov Contact Center answers general technical questions related to the use of Grants.gov. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this solicitation.

Submitting the Proposal: Once all documents have been completed, the Authorized Organizational Representative (AOR) must submit the application to Grants.gov and verify the desired funding opportunity and agency to which the application is submitted. The AOR must then sign and submit the application to Grants.gov. The completed application will be transferred to the NSF FastLane system for further processing.

Proposers that submitted via FastLane are strongly encouraged to use FastLane to verify the status of their submission to NSF. For proposers that submitted via Grants.gov, until an application has been received and validated by NSF, the Authorized Organizational Representative may check the status of an application on Grants.gov. After proposers have received an e-mail notification from NSF, Research.gov should be used to check the status of an application.

VI. NSF PROPOSAL PROCESSING AND REVIEW PROCEDURES

Proposals received by NSF are assigned to the appropriate NSF program for acknowledgement and, if they meet NSF requirements, for review. All proposals are carefully reviewed by a scientist, engineer, or educator serving as an NSF Program Officer, and usually by three to ten other persons outside NSF either as *ad hoc* reviewers, panelists, or both, who are experts in the particular fields represented by the proposal. These reviewers are selected by Program Officers charged with oversight of the review process. Proposers are invited to suggest names of persons they believe are especially well qualified to review the proposal and/or persons they would prefer not review the proposal. These suggestions may serve as one source in the reviewer selection process at the Program Officer's discretion. Submission of such names, however, is optional. Care is taken to ensure that reviewers have no conflicts of interest with the proposal. In addition, Program Officers may obtain comments from site visits before recommending final action on proposals. Senior NSF staff further review recommendations for awards. A flowchart that depicts the entire NSF proposal and award process (and associated timeline) is included in the GPG as Exhibit III-1.

A comprehensive description of the Foundation's merit review process is available on the NSF website at: http://www.nsf.gov/bfa/dias/policy/merit_review/.

Proposers should also be aware of core strategies that are essential to the fulfillment of NSF's mission, as articulated in *Investing in Science, Engineering, and Education for the Nation's Future: NSF Strategic Plan for 2014-2018*. These strategies are integrated in the program planning and implementation process, of which proposal review is one part. NSF's mission is particularly well-implemented through the integration of research and education and broadening participation in NSF programs, projects, and activities.

One of the strategic objectives in support of NSF's mission is to foster integration of research and education through the programs, projects, and activities it supports at academic and research institutions. These institutions must recruit, train, and prepare a diverse STEM workforce to advance the frontiers of science and participate in the U.S. technology-based economy. NSF's contribution to the national innovation ecosystem is to provide cutting-edge research under the guidance of the Nation's most creative scientists and engineers. NSF also supports development of a strong science, technology, engineering, and mathematics (STEM) workforce by investing in building the knowledge that informs improvements in STEM teaching and learning.

NSF's mission calls for the broadening of opportunities and expanding participation of groups, institutions, and geographic regions that are underrepresented in STEM disciplines, which is essential to the health and vitality of science and engineering. NSF is committed to this principle of diversity and deems it central to the programs, projects, and activities it considers and supports.

A. Merit Review Principles and Criteria

The National Science Foundation strives to invest in a robust and diverse portfolio of projects that creates new knowledge and enables breakthroughs in understanding across all areas of science and engineering research and education. To identify which projects to support, NSF relies on a merit review process that incorporates consideration of both the technical aspects of a proposed project and its potential to contribute more broadly to advancing NSF's mission "to promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense; and for other purposes." NSF makes every effort to conduct a fair, competitive, transparent merit review process for the selection of projects.

1. Merit Review Principles

These principles are to be given due diligence by PIs and organizations when preparing proposals and managing projects, by reviewers when reading and evaluating proposals, and by NSF program staff when determining whether or not to recommend proposals for funding and while overseeing awards. Given that NSF is the primary federal agency charged with nurturing and supporting excellence in basic research and education, the following three principles apply:

- All NSF projects should be of the highest quality and have the potential to advance, if not transform, the frontiers of knowledge.
- NSF projects, in the aggregate, should contribute more broadly to achieving societal goals. These "Broader Impacts" may be accomplished through the research itself, through activities that are directly related to specific research projects, or through activities that are supported by, but are complementary to, the project. The project activities may be based on previously established and/or innovative methods and approaches, but in either case must be well justified.
- Meaningful assessment and evaluation of NSF funded projects should be based on appropriate metrics, keeping in mind the likely correlation between the effect of broader impacts and the resources provided to implement projects. If the size of the activity is limited, evaluation of that activity in isolation is not likely to be meaningful. Thus, assessing the effectiveness of these activities may best be done at a higher, more aggregated, level than the individual project.

With respect to the third principle, even if assessment of Broader Impacts outcomes for particular projects is done at an aggregated level, PIs are expected to be accountable for carrying out the activities described in the funded project. Thus, individual projects should include clearly stated goals, specific descriptions of the activities that the PI intends to do, and a plan in place to document the outputs of those activities.

These three merit review principles provide the basis for the merit review criteria, as well as a context within which the users of the criteria can better understand their intent.

2. Merit Review Criteria

All NSF proposals are evaluated through use of the two National Science Board approved merit review criteria. In some instances, however, NSF will employ additional criteria as required to highlight the specific objectives of certain programs and activities.

The two merit review criteria are listed below. **Both** criteria are to be given **full consideration** during the review and decision-making processes; each criterion is necessary but neither, by itself, is sufficient. Therefore, proposers must fully address both criteria. (GPG Chapter II.C.2.d.i. contains additional information for use by proposers in development of the Project Description section of the proposal.) Reviewers are strongly encouraged to review the criteria, including GPG Chapter II.C.2.d.i., prior to the review of a proposal.

When evaluating NSF proposals, reviewers will be asked to consider what the proposers want to do, why they want to do it, how they plan to do it, how they will know if they succeed, and what benefits could accrue if the project is successful. These issues apply both to the technical aspects of the proposal and the way in which the project may make broader contributions. To that end, reviewers will be asked to evaluate all proposals against two criteria:

- **Intellectual Merit:** The Intellectual Merit criterion encompasses the potential to advance knowledge; and
- **Broader Impacts:** The Broader Impacts criterion encompasses the potential to benefit society and contribute to the achievement of specific, desired societal outcomes.

The following elements should be considered in the review for both criteria:

1. What is the potential for the proposed activity to
    a. Advance knowledge and understanding within its own field or across different fields (Intellectual Merit); and
    b. Benefit society or advance desired societal outcomes (Broader Impacts)?
2. To what extent do the proposed activities suggest and explore creative, original, or potentially transformative concepts?
3. Is the plan for carrying out the proposed activities well-reasoned, well-organized, and based on a sound rationale? Does the plan incorporate a mechanism to assess success?
4. How well qualified is the individual, team, or organization to conduct the proposed activities?
5. Are there adequate resources available to the PI (either at the home organization or through collaborations) to carry out the proposed activities?

Broader impacts may be accomplished through the research itself, through the activities that are directly related to specific research projects, or through activities that are supported by, but are complementary to, the project. NSF values the advancement of scientific knowledge and activities that contribute to achievement of societally relevant outcomes. Such outcomes include, but are not limited to: full participation of women, persons with disabilities, and underrepresented minorities in science, technology, engineering, and mathematics (STEM); improved STEM education and educator development at any level; increased public scientific literacy and public engagement with science and technology; improved well-being of individuals in society; development of a diverse, globally competitive STEM workforce; increased partnerships between academia, industry, and others; improved national security; increased economic competitiveness of the United States; and enhanced infrastructure for research and education.

Proposers are reminded that reviewers will also be asked to review the Data Management Plan and the Postdoctoral Researcher Mentoring Plan, as appropriate.

Additional Solicitation Specific Review Criteria

Reviewers will also consider:

- sound and innovative responses to the Program Solicitation
- the degree to which proposed activities meet the overall goals for the Genealogy of Life program, especially the integration of the phylogenetic component and the data layers
- why this project uniquely fits the GoLife program rather than other programs in BIO
- the Management Plan for the project and coordination of the project
- the dissemination and integration of the data generated by the project
- an integrated training plan encompassing the various research areas and analyses employed in the project for Postdoctoral scholars and/or students involved (for Postdoctoral students, the Postdoctoral Mentoring Plan will provide further details on career development and mentoring)

B. Review and Selection Process

Proposals submitted in response to this program solicitation will be reviewed by Ad hoc Review and/or Panel Review.

Reviewers will be asked to evaluate proposals using two National Science Board approved merit review criteria and, if applicable, additional program specific criteria. A summary rating and accompanying narrative will generally be completed and submitted by each reviewer and/or panel. The Program Officer assigned to manage the proposal's review will consider the advice of reviewers and will formulate a recommendation.

After scientific, technical and programmatic review and consideration of appropriate factors, the NSF Program Officer recommends to the cognizant Division Director whether the proposal should be declined or recommended for award. NSF strives to be able to tell applicants whether their proposals have been declined or recommended for funding within six months. Large or particularly complex proposals or proposals from new awardees may require additional review and processing time. The time interval begins on the deadline or target date, or receipt date, whichever is later. The interval ends when the Division Director acts upon the Program Officer's recommendation.

After programmatic approval has been obtained, the proposals recommended for funding will be forwarded to the Division of Grants and Agreements for review of business, financial, and policy implications. After an administrative review has occurred, Grants and Agreements Officers perform the processing and issuance of a grant or other agreement. Proposers are cautioned that only a Grants and Agreements Officer may make commitments, obligations or awards on behalf of NSF or authorize the expenditure of funds. No

commitment on the part of NSF should be inferred from technical or budgetary discussions with a NSF Program Officer. A Principal Investigator or organization that makes financial or personnel commitments in the absence of a grant or cooperative agreement signed by the NSF Grants and Agreements Officer does so at their own risk.

Once an award or declination decision has been made, Principal Investigators are provided feedback about their proposals. In all cases, reviews are treated as confidential documents. Verbatim copies of reviews, excluding the names of the reviewers or any reviewer-identifying information, are sent to the Principal Investigator/Project Director by the Program Officer. In addition, the proposer will receive an explanation of the decision to award or decline funding.

VII. AWARD ADMINISTRATION INFORMATION

A. Notification of the Award

Notification of the award is made to *the submitting organization* by a Grants Officer in the Division of Grants and Agreements. Organizations whose proposals are declined will be advised as promptly as possible by the cognizant NSF Program administering the program. Verbatim copies of reviews, not including the identity of the reviewer, will be provided automatically to the Principal Investigator. (See Section VI.B. for additional information on the review process.)

B. Award Conditions

An NSF award consists of: (1) the award notice, which includes any special provisions applicable to the award and any numbered amendments thereto; (2) the budget, which indicates the amounts, by categories of expense, on which NSF has based its support (or otherwise communicates any specific approvals or disapprovals of proposed expenditures); (3) the proposal referenced in the award notice; (4) the applicable award conditions, such as Grant General Conditions (GC-1)*; or Research Terms and Conditions* and (5) any announcement or other NSF issuance that may be incorporated by reference in the award notice. Cooperative agreements also are administered in accordance with NSF Cooperative Agreement Financial and Administrative Terms and Conditions (CA-FATC) and the applicable Programmatic Terms and Conditions. NSF awards are electronically signed by an NSF Grants and Agreements Officer and transmitted electronically to the organization via e-mail.

*These documents may be accessed electronically on NSF's Website at http://www.nsf.gov/awards/managing/award_conditions.jsp?org=NSF. Paper copies may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from nsfpubs@nsf.gov.

More comprehensive information on NSF Award Conditions and other important information on the administration of NSF awards is contained in the NSF *Award & Administration Guide* (AAG) Chapter II, available electronically on the NSF Website at http://www.nsf.gov/publications/pub_summ.jsp?ods_key=aag.

Special Award Conditions:

For awards that include specimen collection activities, the awardee shall ensure that award activities carried on both inside and outside the U.S. and its territories and possessions are coordinated, as necessary, with appropriate Government authorities, and that appropriate licenses, permits, or approvals are obtained prior to undertaking proposed activities. NSF does not assume responsibility for awardee compliance with the laws and regulations of the country in which the work is to be conducted.

C. Reporting Requirements

For all multi-year grants (including both standard and continuing grants), the Principal Investigator must submit an annual project report to the cognizant Program Officer no later than 90 days prior to the end of the current budget period. (Some programs or awards require submission of more frequent project reports). No later than 120 days following expiration of a grant, the PI also is required to submit a final project report, and a project outcomes report for the general public.

Failure to provide the required annual or final project reports, or the project outcomes report, will delay NSF review and processing of any future funding increments as well as any pending proposals for all identified PIs and co-PIs on a given award. PIs should examine the formats of the required reports in advance to assure availability of required data.

PIs are required to use NSF's electronic project-reporting system, available through Research.gov, for preparation and submission of annual and final project reports. Such reports provide information on accomplishments, project participants (individual and organizational), publications, and other specific products and impacts of the project. Submission of the report via Research.gov constitutes certification by the PI that the contents of the report are accurate and complete. The project outcomes report also must be prepared and submitted using Research.gov. This report serves as a brief summary, prepared specifically for the public, of the nature and outcomes of the project. This report will be posted on the NSF website exactly as it is submitted by the PI.

More comprehensive information on NSF Reporting Requirements and other important information on the administration of NSF awards is contained in the NSF *Award & Administration Guide* (AAG) Chapter II, available electronically on the NSF Website at http://www.nsf.gov/publications/pub_summ.jsp?ods_key=aag.

The Principal Investigator shall provide a summary in the "Special Requirements" section of each annual and final project report, of all permits, licenses, or other necessary approvals associated with specimen collection. The information should include the names of all permits/licenses/necessary approvals, the granting authority, date acquired, duration, and the purpose of the permit/license/approval.

VIII. AGENCY CONTACTS

Please note that the program contact information is current at the time of publishing. See program website for any updates to the points of contact.

General inquiries regarding this program should be made to:

- Simon Malcomber, telephone: (703) 292-8227, email: smalcomb@nsf.gov
- Reed S. Beaman, telephone: (703) 292-7163, email: rsbeaman@nsf.gov
- Judith E. Skog, telephone: (703) 292-7909, email: jskog@nsf.gov

For questions related to the use of FastLane, contact:

- FastLane Help Desk, telephone: 1-800-673-6188; e-mail: fastlane@nsf.gov.

For questions relating to Grants.gov contact:

- Grants.gov Contact Center: If the Authorized Organizational Representatives (AOR) has not received a confirmation message from Grants.gov within 48 hours of submission of application, please contact via telephone: 1-800-518-4726; e-mail: support@grants.gov.

IX. OTHER INFORMATION

The NSF website provides the most comprehensive source of information on NSF Directorates (including contact information), programs and funding opportunities. Use of this website by potential proposers is strongly encouraged. In addition, "NSF Update" is an information-delivery system designed to keep potential proposers and other interested parties apprised of new NSF funding opportunities and publications, important changes in proposal and award policies and procedures, and upcoming NSF Grants Conferences. Subscribers are informed through e-mail or the user's Web browser each time new publications are issued that match their identified interests. "NSF Update" also is available on NSF's website.

Grants.gov provides an additional electronic capability to search for Federal government-wide grant opportunities. NSF funding opportunities may be accessed via this mechanism. Further information on Grants.gov may be obtained at http://www.grants.gov.

Related Programs:

Within the Division of Environmental Biology, the Systematics and Biodiversity Science cluster supports projects that are relevant to this program, but they do not have the same focus or data integration aspects. The Phylogenetics Systematics program supports projects that are hypothesis-driven and that address significant questions about organismal evolution using phylogenetic approaches; they may or may not contribute to an overall genealogy of life. The Biodiversity Discovery and Analysis program supports projects that seek to uncover and classify new biodiversity information. The Dimensions of Biodiversity program supports projects that integrate functional, genomic and phylogenetic research in of biodiversity processes. In the Division of Biological Infrastructure, the Advances in Biological Informatics program supports development of informatics tools and resources that have the potential to advance research in biology. In the Directorate for Geosciences, Earth Sciences Division, the Sedimentary and Geology Program supports projects that focus on the changing aspects of life, ecology, environments, and biogeography in geologic time. Any projects fitting within these programs should not be submitted to Genealogy of Life.

ABOUT THE NATIONAL SCIENCE FOUNDATION

The National Science Foundation (NSF) is an independent Federal agency created by the National Science Foundation Act of 1950, as amended (42 USC 1861-75). The Act states the purpose of the NSF is "to promote the progress of science; [and] to advance the national health, prosperity, and welfare by supporting research and education in all fields of science and engineering."

NSF funds research and education in most fields of science and engineering. It does this through grants and cooperative agreements to more than 2,000 colleges, universities, K-12 school systems, businesses, informal science organizations and other research organizations throughout the US. The Foundation accounts for about one-fourth of Federal support to academic institutions for basic research.

NSF receives approximately 55,000 proposals each year for research, education and training projects, of which approximately 11,000 are funded. In addition, the Foundation receives several thousand applications for graduate and postdoctoral fellowships. The agency operates no laboratories itself but does support National Research Centers, user facilities, certain oceanographic vessels and Arctic and Antarctic research stations. The Foundation also supports cooperative research between universities and industry, US participation in international scientific and engineering efforts, and educational activities at every academic level.

Facilitation Awards for Scientists and Engineers with Disabilities provide funding for special assistance or equipment to enable persons with disabilities to work on NSF-supported projects. See Grant Proposal Guide Chapter II, Section D.2 for instructions regarding preparation of these types of proposals.

The National Science Foundation has Telephonic Device for the Deaf (TDD) and Federal Information Relay Service (FIRS) capabilities that enable individuals with hearing impairments to communicate with the Foundation about NSF programs, employment or general information. TDD may be accessed at (703) 292-5090 and (800) 281-8749, FIRS at (800) 877-8339.

The National Science Foundation Information Center may be reached at (703) 292-5111.

The National Science Foundation promotes and advances scientific progress in the United States by competitively awarding

grants and cooperative agreements for research and education in the sciences, mathematics, and engineering.

To get the latest information about program deadlines, to download copies of NSF publications, and to access abstracts of awards, visit the NSF Website at http://www.nsf.gov

- **Location:** 4201 Wilson Blvd. Arlington, VA 22230
- **For General Information** (NSF Information Center)**:** (703) 292-5111
- **TDD (for the hearing-impaired):** (703) 292-5090
- **To Order Publications or Forms:**

  Send an e-mail to: nsfpubs@nsf.gov

  or telephone: (703) 292-7827
- **To Locate NSF Employees:** (703) 292-5111

PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

The information requested on proposal forms and project reports is solicited under the authority of the National Science Foundation Act of 1950, as amended. The information on proposal forms will be used in connection with the selection of qualified proposals; and project reports submitted by awardees will be used for program evaluation and reporting within the Executive Branch and to Congress. The information requested may be disclosed to qualified reviewers and staff assistants as part of the proposal review process; to proposer institutions/grantees to provide or obtain data regarding the proposal review process, award decisions, or the administration of awards; to government contractors, experts, volunteers and researchers and educators as necessary to complete assigned work; to other government agencies or other entities needing information regarding applicants or nominees as part of a joint application review process, or in order to coordinate programs or policy; and to another Federal agency, court, or party in a court or Federal administrative proceeding if the government is a party. Information about Principal Investigators may be added to the Reviewer file and used to select potential candidates to serve as peer reviewers or advisory committee members. See Systems of Records, NSF-50, "Principal Investigator/Proposal File and Associated Records," 69 Federal Register 26410 (May 12, 2004), and NSF-51, "Reviewer/Proposal File and Associated Records," 69 Federal Register 26410 (May 12, 2004). Submission of the information is voluntary. Failure to provide full and complete information, however, may reduce the possibility of receiving an award.

An agency may not conduct or sponsor, and a person is not required to respond to, an information collection unless it displays a valid Office of Management and Budget (OMB) control number. The OMB control number for this collection is 3145-0058. Public reporting burden for this collection of information is estimated to average 120 hours per response, including the time for reviewing instructions. Send comments regarding the burden estimate and any other aspect of this collection of information, including suggestions for reducing this burden, to:

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