Alfred P. Sloan FOUNDATION

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Program Director

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September 15, 2016

Dear Colleague –

The Alfred P. Sloan Foundation announces a funding opportunity in its Microbiology of the Built Environment (MoBE) program, the Sloan ISS MoBE Postdoctoral Fellowship—Research Opportunities for Post-Doctoral Fellowships in Space Biology to Study the Microbiome of the ISS as a Built Environment: Using ISS as a Microbiological Observatory.

Deadline for Required Notice of Intent: October 31, 2016
Proposals due: November 30, 2016, 11:59 Eastern Time
Estimated Selection Announcement: On or about March 1, 2017

This solicitation invites proposals for Sloan ISS MoBE Postdoctoral Fellowships from potential postdoctoral fellows to conduct studies to characterize microbial populations isolated from the International Space Station (ISS). Selected studies will provide insights into how microbes and microbial populations adapt to spaceflight. Proposed experiments will use microbial isolates collected from the ISS that have been archived at the Johnson Space Center. Studies must advance the goals of NASA's Space Biology program and the Alfred P. Sloan Foundation.

NASA and the Alfred P. Sloan Foundation (hereafter "Sloan") have a shared and synergistic interest in promoting microbiology research that that will enhance scientific understanding of the Microbiology of the Built Environment (MoBE). NASA and Sloan have entered into a Space Act Agreement to facilitate this work.

The goal of the Sloan MoBE program is to grow a new field of scientific inquiry in the complex microbial ecosystems found in human built and occupied environments. The Sloan program objectives are described at http://www.sloan.org/major-program-areas/basic-research/mobe/?L=0. The goal of NASA in this area is to build a better understanding of the effects of spaceflight on microbial ecosystems in spacecraft such as the ISS to prepare for future exploration missions far from earth. NASA-sponsored research in this area is guided by recommendations of the National Research Council (NRC) which in 2011 published research priorities for the next decade in "Recapturing a Future for Space Exploration: Life and Physical Sciences Research for a New Era" (hereafter "Decadal Survey") at http://www.nap.edu/catalog/13048.html. The Decadal Survey recommended that NASA "establish a microbial observatory program on ISS to conduct long-term multi-generational studies of microbial population dynamics.

Sloan anticipates awarding two grants. The Sloan ISS MoBE Postdoctoral Fellowship program provides a $140,000 award, payable in two $70,000 installments. Funds are normally expended over a period of two years after the appointment of the fellow. Charges associated with indirect costs or

institutional overhead are not allowed. The stipend support for the fellow should be at least $54,000 of the total annual award amount (stipends may be supplemented from institutional or other sources). $6,000 is provided as a stipend to the fellow for travel or research expenses. Fringe benefits from this award may not exceed $10,000 per year. In the event that institutions/laboratories receiving the Sloan ISS MoBE Postdoctoral Fellowship award have higher rates for fringe benefits, the institution must provide the difference.

Eligibility Requirements Specific to this Solicitation:
Proposals will be accepted from graduate students in their final year of their PhD or equivalent degree program, from postdoctoral fellows (PhD, MD, DDS, DVM or equivalent doctoral degree from an accredited domestic or foreign institution) or from applicants who received a doctoral degree within the past 2 years, but have not yet had postdoctoral training. Applicants must have no more than 4 years of postdoctoral research experience at the time of the initial or the subsequent resubmission or revision application. The program is open to U.S. citizens, permanent residents, or persons with pre-existing visas obtained through their sponsoring institutions that permit postdoctoral training for the project's duration. Sponsoring institutions must be U.S. academic, government, or commercial institutions that will provide appropriate mentors.

Additional information on the Sloan ISS MoBE Postdoctoral Fellowship program as well as detailed instructions for proposal submission are included at the end of this Solicitation.

Sincerely,

Paula J. Olsiewski, Ph.D.

Additional Information on the Sloan ISS MoBE Postdoctoral Fellowship Program:

Research Emphases Specific to this Solicitation

The use of microorganisms isolated from previous spaceflight missions has provided insight into characteristics of microbial ecology expected aboard current and future spacecraft. To facilitate applied and basic microbiological research on Earth, and to insure that the most contemporary techniques can be used to study space microbiology, NASA maintains a collection of frozen microbial isolates collected over the past 15 years from various ISS locations.

NASA and the Sloan Foundation have agreed through a Space Act Agreement to work in parallel for a common purpose, to sponsor studies designed to provide insight into the MoBE of the ISS that will advance our knowledge of human-built habitats on Earth and to enhance ISS utilization. This Solicitation invites research applications for Postdoctoral Fellowships from early career scientists to design experiments that utilize this collection of microbial isolates to help understand better how microbial communities colonize, adapt, and evolve on the ISS.

Available isolates include microorganisms cultured from samples of vehicle air and surfaces throughout the ISS habitable volume. Sample locations represent a wide variety of crew activities, including the crew galley, hygiene area, and living quarters. Also included are microorganisms isolated from potable water samples collected from multiple water systems aboard ISS.
The current list of available isolates and the methodology used in their collection and processing can be found by going to the website:
https://lsda.jsc.nasa.gov/scripts/experiment/exper.aspx?exp_index=13823.

To view the list of available microbial isolates at this website, scroll down to the “Data Information” section and click on the ”View data” link under the “Data Availability”. On the following page the link labeled “ISS_Micro_Analysis_Isolates” will direct you to a webpage were the list of available samples can be downloaded as a Microsoft Excel spread sheet. Spreadsheet search criteria can be refined by filters that can be accessed by buttons located to the right of the column headers.

Support documentation detailing the methods used to collect microbial samples can also be found at the above website by clicking on the appropriate links filed under the “Documents” heading in the “Data information” section of the webpage. Additional links containing information specific for each expedition during which these samples were collected can be found at the bottom of the page. The number of microbial isolates that can be requested is not limited for any proposal; however, the hypothesis and associated scientific need must be clearly stated in the proposal and must clearly justify the number and types of organisms requested.

Applicants should describe in detail the experiments in which they will make use of the archived samples to address the research emphases of NASA and the Sloan foundation.

Proposal Information Specific to this Solicitation

Type of Award Instrument: Sloan anticipates awarding grants. It is anticipated that 2 awards will be made for this research emphasis area.

Length and Dollar Amount: The Sloan ISS MoBE Postdoctoral Fellowship program provides a $140,000 award, payable in two $70,000 installments. Funds are normally expended over a period of two years after the appointment of the fellow. Charges associated with indirect costs or institutional overhead are not allowed. The stipend support for the fellow should be at least $54,000 of the total annual award amount (stipends may be supplemented from institutional or other sources). $6,000 is provided as a stipend to the fellow for travel or research expenses. Fringe benefits from this award may not exceed $10,000 per year. In the event that institutions/laboratories receiving the Sloan ISS MoBE Postdoctoral Fellowship award have higher rates for fringe benefits, the institution must provide the difference.

Eligibility Requirements Specific to this Solicitation
Proposals will be accepted from Graduate students in their final year of their PhD or equivalent degree program, from Postdoctoral fellows (PhD, MD, DDS, DVM or equivalent doctoral degree from an accredited domestic or foreign institution) or from applicants who received a doctoral degree within the past 2 years, but have not yet had postdoctoral training. Applicants must have no more than 4 years of postdoctoral research experience at the time of the initial or the subsequent resubmission or revision application. The program is open to U.S. citizens, permanent residents, or persons with pre-existing visas obtained through their sponsoring institutions that permit postdoctoral training for the project's duration. Sponsoring institutions must be U.S. academic, government, or commercial institutions that will provide appropriate mentors.

Detailed instructions for proposal submission are included at the end of this Solicitation.

Proposal Intrinsic Scientific or Technical Merit Review and Evaluation Criteria
Compliant proposals will undergo a merit peer review by a panel of scientific and/or technical subject matter experts nominated by NASA and Sloan. This panel of experts may include non-NASA and or non-Government personnel. The number and diversity of experts required will be determined by the response to this NRA and by the variety of disciplines represented in the proposals relevant to the research emphases described in this NRA. The merit review panel will assign a score from 0-100 based upon the intrinsic scientific or technical merit of the proposal. This score will reflect the consensus of the panel.

The cost of the proposed work and the programmatic relevance of the proposed work to NASA and Sloan will not affect the score assigned by panel conducting a merit peer review. As part of the panel's review, however, the evaluation may include comments regarding appropriateness of proposal budgets in relationship to the work proposed. Such comments will not be part of the scientific/technical merit score.

To be responsive to this research solicitation, proposed studies should be hypothesis-driven and lead to new knowledge within accepted scientific standards. Purely phenomenological approaches with no significant mechanistic basis or likely gain in scientific knowledge are not acceptable.

All of the following criteria will be used in determining the merit score (significance and approach are the most important and weigh more than investigator and environment):

- Significance: Does this study address an important problem? If the aims of the application are achieved, how will scientific knowledge or technology be advanced? What will be the effect of these studies on the concepts, methods, or products that drive this field?

- Approach: Are the conceptual framework, design, methods, and analyses adequately developed, well integrated, and appropriate to the aims of the project? Is the proposed approach likely to yield the desired results? Does the applicant acknowledge potential problem areas and consider alternative tactics?
- Investigator: Is the investigator appropriately trained and well suited to carry out this work? Is the work proposed appropriate to the experience level of the Principal Investigator and any Co-investigators? Is the evidence of the investigator's productivity satisfactory?
- Environment: Does the scientific environment in which the work will be performed contribute to the probability of success? Do the proposed experiments take advantage of unique features of the scientific environment or employ useful collaborative arrangements? Is there evidence of institutional support?

Instructions on Proposal Submission

NASA and Sloan have agreed to work together to conduct and supervise the peer review of the proposals submitted to this solicitation through the use of the NASA Solicitation and Proposal Integrated Review and Evaluation System (NSPIRES) which will host the review. Instructions for submission of proposals is as follows:

1) NSPIRES Registration

Applicants must register key data concerning their intended submission with the NASA Solicitation and Proposal Integrated Review and Evaluation System (NSPIRES) located at http://nspires.nasaprs.com. Potential applicants are urged to access this site well in advance of the proposal due dates of interest to familiarize themselves with its structure and enter the requested identifier information. It is especially important to note that every individual named on the proposal's Cover Page (see further below) must be registered in NSPIRES and that such individuals must perform this registration themselves; that is, no one may register a second party, even the Principal Investigator (PI) of a proposal. This website is secure and all information entered is confidential and is strictly for NASA or Sloan use only.

Every organization that intends to submit a proposal in response to this solicitation, including educational institutions, industry, nonprofit institutions, and U.S. Government agencies, must be registered in NSPIRES, to submit a proposal. Such registration must be performed by an organization's electronic business point-of-contact (EBPOC) in the System for Award Management (SAM) at http://sam.gov/.

2) Electronic Submission

Proposals must be submitted electronically by an official at the PI's organization who is authorized to make such a submission, the Authorized Organizational Representative (AOR). No hard copy of the proposal will be accepted. All team members must be registered in NSPIRES and confirm their organizational affiliation when added to a proposal before the PI organization official can submit. It is strongly recommended that the PI work closely with his/her team members and organization official to ensure the proposal is submitted by the due date and time listed in this solicitation. Proposals will not be accepted after the listed due dates and times.

Applicants must use NSPIRES (http://nspires.nasaprs.com) for proposal submission. All applicants, team members, and agency officials must be registered with NSPIRES before proposal submission.

NSPIRES accepts fully electronic proposals through a combination of data-based information (e.g., the electronic Cover Page and its associated forms) and uploaded PDF file(s) that contain the body of the proposal. The system will conduct an element check to identify any item(s) that may be missing or incomplete. Applicants are strongly encouraged to begin their submission process early.

The required sections of the Proposal Attachment (see below) must be submitted to NSPIRES as one searchable, unlocked PDF file that is attached to the electronic submission. Applicants must comply with the format and page limit requirements described in this solicitation.

Important note on creating PDF files for upload: It is essential that all PDF files generated and submitted by the applicant meet the requirement outlined in this document, and contain all the appropriate elements listed in the sections below. This will ensure that the submitted files can be ingested by NSPIRES. At a minimum, it is the responsibility of the applicant to: (1) ensure that all PDF files are unlocked and that edit permission is enabled – this is necessary to allow NSPIRES to concatenate submitted files into a single PDF document; and (2) ensure that all fonts are embedded in the PDF file and that only Type 1 or TrueType fonts are used. In addition, any applicant who creates files using TeX or LaTeX is required to first create a DVI file and then convert the DVI file to Postscript and then to PDF. See http://nspires.nasaprs.com/tutorials/PDF_Guidelines.pdf for more information on creating PDF documents that are compliant with NSPIRES. PDF files that do not meet NSPIRES requirements may be declared noncompliant and may not be evaluated.

It is each applicant's responsibility to verify the accuracy and completeness of his/her proposal, including all text, figures, tables, and required forms. NSPIRES allows applicants to verify before submission that all information contained in proposal PDF file(s) being provided to NSPIRES is complete and accurate.

There is a 10 MB file size limit for proposals. In order to meet the 10 MB file size limit, applicants should crop and compress any embedded photos and graphic files to an appropriate size and resolution. Only attachments that are specifically requested should be submitted.

Requests for assistance in accessing and/or using the NSPIRES website may be directed by e-mail to nspires-help@nasaprs.com or by telephone to 202-479-9376, Monday through Friday, 8:00 a.m. – 5:00 p.m. Eastern Time. Frequently Asked Questions (FAQ) may be accessed through NSPIRES Help page at http://nspires.nasaprs.com/external/help.do. Tutorials of NSPIRES are available at http://nspires.nasaprs.com/tutorials/.

3) Proposal Format and Contents

A) General Format:

The format for all proposals responding to this solicitation are as follows below:

- Text must be single-spaced, typewritten, in English-language, formatted using one column, and must use an easily readable font having no more than 15 characters per inch including spaces,

(e.g., 12-point, Times New Roman Western font). The font size for symbols in equations should be consistent with this guideline. Proposers may not adjust the character spacing or otherwise condense a font form from its default appearance.

- While text within figures and tables may use a 10-point font, the text must in the judgment of reviewers be legible without magnification. Expository text necessary for the proposal may not be located solely in figures or tables, or their captions.
- In addition, the text shall have no more than 5.5 lines per inch of text proposers should not use a smaller font or squeeze lines of text in order to gain more text per page as it makes the evaluation process difficult. Proposers may not adjust line spacing settings for a selected font below single spaced.
- The required page size is 8.5x11. Pages should have at least 1-inch (2.5 cm) margins on all sides.
- Units must be only metric and standard discipline-unique unless referring to existing hardware fabricated in English units or where the fabrication of proposed hardware using metric units would be cost prohibitive (Note: If English units are used, approximate metric units shall also be provided as reference).
- Use colored illustrations, and/or images only as needed for the display of unique and critically important proposal data (Note: if such formats are used, all copies of the proposal must also include the same materials).
- Headers and footers are allowed as long as they do not contain proposal material. Only non-proposal material, e.g., page numbers, section titles, disclaimers, etc., is permitted in headers and footers.

B) Proposal Contents

Instructions for Proposal Preparation:

Proposals must be prepared by the prospective Sloan MoBE Fellow in conjunction with his/her Mentor. Proposals will be submitted by the Mentor (PI) and an official from the Mentor's organization after the Mentor (PI) has released the prepared proposal to the Authorized Organizational Representative (AOR). It is strongly recommended that the proposer work closely with the mentor to ensure the proposal is submitted by the due date and time listed in this solicitation. The Post-doctoral applicant must write the proposal in its entirety, with the exception of the Mentor Statement. However, Mentors are encouraged to provide feedback and guidance particularly with regard to crafting and refining the specific aims and hypotheses of the proposed scientific research. Proposals will not be accepted after the listed deadline. Only the Mentor can initiate the creation of a new proposal and assign the student proposer as a team member with editing privileges. The student proposer will then be able to access and create the proposal application.

Applicants must use NSPIRES (http://nspires.nasaprs.com) for proposal submission. Notices of Intent (NOI's) to submit proposals for this solicitation must be submitted using NSPIRES. All applicants, mentors, agency officials and team members, must be registered with NSPIRES before proposal submission. Detailed instructions on proposal/NOI submission for this solicitation, and registration with NPSIRES can be found at: http://tinyurl.com/SloanMoBE2016.

i) Notice of Intent to Submit a Proposal

a) **Notice of Intent: An NOI is required for the submission of a proposal.** NOIs must be submitted electronically through the NSPIRES website and should not exceed 4000 characters. Detailed instructions on proposal/NOI submission for this solicitation, and registration with NPSIRES can be found at: [[NRESS will insert an appropriate link before the NRA is released.]]

ii) Proposal Cover Page

The information below is required to complete the Proposal Cover Page:

a) Proposal Summary (Abstract): The Proposal Summary should be concise, should not exceed 4,000 characters in length, and should not contain any special characters, graphics or formatting (use text only).

b) Program Specific Data (PSD): This section consists of questions specific to this Research Announcement. NSPIRES will automatically prompt the applicant to answer the PSD questions prior to submission.

c) Proposal Team: Each team member (PI, Co-Investigators, collaborators, postdoctoral associates, support staff, etc.) must register him/herself in NSPIRES and complete all the required information. Each individual team member must also be included on the proposal's electronic cover page. The organizational affiliation specified on the cover page must be the organization through which the team member would work and receive funding while participating in the proposed effort. If the individual has multiple affiliations, then this organization may be different from the individual's primary employer or preferred mailing address. Team members are asked to ensure that their contact information in NSPIRES is up-to-date. Changes can be made using the "Account Management" link on the "NSPIRES Options" page

d) Business Data: please refer to tutorial at https://nspires.nasaprs.com/tutorials/ for more information.

NOTE: A budget is not required for this section and does not need to be completed.

iii) Proposal Attachment: To ensure proper proposal transmission, the required sections of the Proposal Attachment must be submitted as one searchable, unlocked PDF file that is attached to the electronic submission using NSPIRES. The following elements should be included in the Proposal Attachment in the following order:

a) Mentor Statement:
The Mentor must provide a "Mentor Statement" indicating that if selected, the MoBE Fellow will be fully supported by his/her laboratory if the Fellowship is granted. The statement should indicate that a structured mentoring program will be in place and will address 1) the Mentor's ability to cover the cost of all research to be performed by the MoBE Fellow including animals, reagents and any unique support and/or required expertise beyond that of the Mentor's laboratory (i.e., facilities, other scientific or technical expertise); 2) a plan for development of the Fellow's career (to include research ethics, human subjects, animal use, grant preparation, effective curriculum vitae preparation, career interview skills, effective scientific writing and communication skills, networking, and mentoring skills for the future); 3) previous successful experiences in guiding the

research efforts and career development of students and postdoctoral fellows; and 4) a discussion of the potential Fellow's strengths as a researcher that will enable her/him to enjoy a successful career in space life sciences research.

The Mentor Statement should be written considering the scientific and career development goals of Space Biology, especially the goal of the MoBE Fellow Program to train outstanding independent, productive investigators in space-related biomedical/biotechnological research. The entire Mentor Statement should not exceed four pages of single-spaced text using 12-point font with 1-inch margins.

b) Letters of Recommendation:

The applicant should obtain three letters of reference from faculty members or professionals with detailed knowledge of the trainee's abilities. Letters should be on institutional letterhead and must be signed. **The applicant's proposed Mentor may not provide one of the three letters of reference since an opportunity was presented to address the applicant's strengths in the Mentor Statement. Applications without the three required letters will be considered incomplete, and may be returned without review.**

c) Biographical Sketches and Information:

The MoBE Fellowship applicant should provide a complete curriculum vitae in a format of his/her choice; this document will not count toward the application page limitation, and should include the month and year of the award of the doctoral degree. The time span of any previous postdoctoral experience(s) must be included in the Biographical Sketch, and any gaps in professional training must also detailed. If not included elsewhere, please list the previous and current teaching responsibilities and educational outreach activities of the candidate. The candidate's curriculum vitae should include professional activities during all months after the award of the terminal degree. A biographical sketch must be provided for the Mentor. Neither the biographical sketch for the mentor nor the candidate should exceed four pages. NIH-style Biographical Sketch format is acceptable. Font and margins are specified above in Section 3.A of this document.

d) Facilities and Equipment:

Describe available facilities and major items of equipment especially adapted or suited to the proposed project, and any additional major equipment that will be required. Identify any Government-owned facilities, industrial plant equipment, or special tooling that are proposed for use. Include evidence of its availability and the cognizant Government points of contact.

e) Scientific/Technical Section (Project Description – Research Plan):

The length of the Scientific/Technical Section cannot exceed 12 pages. Please note that the Proposal Summary on the Cover Page is not considered part of the 12-page Research Plan. Referenced figures must be included in the page limit of the project description; however, the figure captions may use a 10-point font. Literature cited and other proposal sections are not considered part of the 12-page limit.

The proposal must contain sufficient detail to enable reviewers to make informed judgments about

the overall scientific merit of the proposed research and about the probability that the MoBE Fellow will be able to accomplish the stated objectives with the resources available and within the two year timeframe of the fellowship. The proposed research must directly benefit the career path of the potential MoBE Fellow and allow the potential fellow to develop an independent research path. The hypotheses and specific aims of the proposed research must be clearly stated. The experimental design must include a thorough statistical treatment section that includes a power analysis for the estimate of sample size. **Research Plans that exceed the 12-page limit will be declined without review.**

f) Data Management Plan:

Each proposal must include a Data Management Plan (DMP) that describes how data generated by proposed research will be shared and preserved and how data collected will be made available to the public on completion of experiments. The applicant must justify any exceptions to making data publicly available, explaining why data-sharing and/or preservation is not possible or scientifically appropriate. Additionally, the DMP must describe how data sharing and preservation will enable validation of results, or how results could be validated if data are not shared or preserved. DMPs must provide a plan for making all research data underlying results and findings in publications digitally accessible at the time of publication. DMPs will be reviewed during the peer review of your research proposal. Costs of the DMP should be included in the proposed budget.

The DMP must be included in the proposal attachment. And should not exceed one page. The DMP does not count towards the project description page limit.

g) Current Support:

For other current projects being conducted by the principal investigator, provide title of project, sponsoring agency, and ending date.

h) Special Matters:

1. Include any required statements of environmental impact of the research, human subject or animal care provisions, conflict of interest, or on such other topics as may be required by the nature of the effort and current statutes, executive orders, or other current Government-wide guidelines.
2. Identify and discuss risk factors and issues throughout the proposal where they are relevant, and your approach to managing these risks.
3. Applicants should include a brief description of the organization, its facilities, and previous work experience in the field of the proposal. Identify the cognizant Government audit agency, inspection agency, and administrative contracting officer, when applicable.

i) Vertebrate Animal Scientific Review (VASR), if applicable:

Refer to Attachment A below.

j) References and Citations:
References cited are not considered part of the 12-page Research Plan. Reviewers are not, however, required to consider web links in their evaluation of the proposal.

k) Appendices and Reprints*:*

Reviewers are required to perform their evaluations based on the research plan described in the scientific/technical (Project Description) section. Appendices and reprints, if the applicant wishes to submit them, will be included following all other sections of the proposal. Reviewers are not, however, required to consider Appendices and reprints in their evaluation of the proposal.

4) Post-Award Program Reporting

A) Annual Reporting and Task Book Reporting

The postdoc/mentor shall provide an annual written report to both NASA and Sloan on or before the anniversary of the start of funding. This information will be used to assess the degree of progress of the project. A component of this annual report will be used for the NASA Task Book (http://taskbook.nasaprs.com). The Task Book includes descriptions of all peer-reviewed Life and Physical Sciences activities funded by the HEOMD. The Task Book is an invaluable source of information for NASA biological, biomedical, and physical sciences researchers, as well as the external scientific and technical communities.
This information will consist primarily of:

- An abstract;
- A bibliographic list of publications;
- Copies of publications;
- A statement of progress, including a comparison with the originally proposed work schedule.

B) Final Report

A final report must be provided to both NASA and the Sloan Foundation at the end of the award funding period, including a detailed listing of all peer-reviewed publications. This information will consist primarily of:

- Statement of the specific objectives;
- Significance of the work;
- Background;
- Overall progress during the performance period;
- Narrative discussion of technical approaches including problems encountered;
- Accomplishments related to approach;
- An appendix with bibliography and copies of all publications and reports;

Any publications or other public materials containing data are particularly important to include in this section.

C) GeneLab Data System

All awardees must upload data produced from this research that is relevant to GeneLab into the GeneLab Data System (http//genelab.nasa.gov) upon publication of the results or end of the final year of the award. NASA/Sloan will follow its discretionary policy to allow the investigator exclusive rights to GeneLab relevant data, as outlined in Section I.E. Data input must conform to the GeneLab data submission requirements defined on the GeneLab website. Instructions for data input procedures, type of acceptable and required data, and supporting information required can be found on the GeneLab website.

D) Career Tracking
To assess the impact of MoBE Fellowships on the career advancement of young scientists and to provide an active network of investigators in space biomedical research, Sloan and NASA will request brief, periodic updates on the career status and accomplishments of MoBE Fellows throughout their careers. Requests for updates will include, but not be limited to, interviews or a requested current curriculum vitae from participants.

E) Formative Assessment
Sloan and NASA will be actively engaged in the on-going assessment of the MoBE Fellowship Program to assure that the program has been implemented as planned and to make program enhancements. Formative assessments during the funding period will include, but not be limited to, institutional site visits to assess research facilities and accomplishments, and to interview the MoBE Fellows and Mentors. It is expected that both the MoBE Fellow and the Mentor cooperate with these assessments.

F) Special Considerations for Graduate Student Awards
Sloan assumes that awards to selected Graduate Student/Postdoc proposals are for the funding of the trainee identified in the proposal to conduct the research at the institution submitting the proposal. If the trainee decides to end his/her training prior to the end of the grant, the award may not be transferred to another trainee; instead, the grant will be terminated.

Attachment A: Vertebrate Animal Scientific Review (VASR)

If vertebrate animals are to be used, the following five points must be addressed completely by applicants in the VASR worksheet of their proposal:

1. Detailed description of the proposed use of the animals, including species, strains, ages, sex and number to be used
2. Justification of the use of animals, choice of species and numbers to be used, and applicant's assessment of potential benefits and knowledge to be gained.
3. Information on the veterinary care of the animals
4. Description of procedures for ensuring discomfort, distress, pain and injury is minimized
5. Method of euthanasia and the reasons for its selection

Each of the five points must be addressed, for all performance sites, in the VASR worksheet. The VASR worksheet will be reviewed by the scientific merit review panel and the proposal coded as either No Vertebrate Animals, No Concerns/Acceptable, or Concerns/Unacceptable. If coded as Unacceptable, Sloan staff will work with the applicant to resolve concerns prior to award. Coding of the proposal as Acceptable or No Vertebrate Animals is required prior to award.

In order to be coded as "No vertebrate animals" the vertebrate tissue used in the study will be obtained from other sources (e.g., tissue repository, animals euthanized for an unrelated purpose). The source of the tissue should be included in the VASR to validate the coding as no vertebrate animals used. If vertebrate tissues are obtained through euthanasia for tissue harvest, the proposed research is coded as use of live vertebrate animals. The generation of custom antibodies is coded as use of live vertebrate animals.

A "performance site(s)" is defined as the institutions where procedures with animals will be

performed. If the applicant institution is not the site where animal work will be performed, the performance site must be identified. If there is more than one performance site, the description of animal care and use at each site must be included and must address the five points.

B. Instructions for Scientific Reviewers
These instructions are to assist Scientific Merit Review Panel (SMRP) members in the VASR review of the proposal.

Subsequent to evaluation of the VASR worksheet by a SMRP, all proposals are coded as either No Vertebrate Animals, No Concerns/Acceptable, or Concerns/Unacceptable.

Coding as NO VERTEBRATE ANIMALS - If vertebrate tissue used in the study is obtained from other sources (e.g., tissue repository, animals euthanized for an unrelated purpose), the proposal is coded as no vertebrate animals used. The source of the tissue should be included in the VASR to validate the coding as no vertebrate animals used. If vertebrate tissues are obtained through euthanasia for tissue harvest, the proposed research is coded as use of live vertebrate animals. The generation of custom antibodies must be coded as use of live vertebrate animals.

Coding as NO CONCERNS/ACCEPTABLE or CONCERNS/UNACCEPTABLE - Coding is based on the review of the five required points for each of the performance sites.

Performance site(s): This is defined as the institutions where procedures with animals will be performed. If the applicant institution is not the site where animal work will be performed, the performance site must be identified. If there is more than one performance site, the description of animal care and use at each site must be included and must address the five points.

C. Detailed Instructions for Preparation of the VASR
These instructions are to assist applicants in preparing their VASR information.

Preparation of the VASR worksheet:
Typically, all of the required elements for the VASR can be addressed within 1-2 pages.

Point 1 - Description of animals and how they will be used
A concise, complete description of the proposed procedures must be included in the VASR. While additional details may be included in the Research Strategy, a coherent, albeit brief, description of the proposed use of the animals must be provided within the VASR. The description must include sufficient detail to allow evaluation of the procedures. Examples of the types of procedures that should be described include blood collection, surgical procedures, administration of substances, tumor induction and post-irradiation procedures. In describing the animals, investigators must provide the following information for each species and/or strain to be used:

- Species
- Strain
- Ages
- Sex
- Number of animals to be used

Point 2 - Justifications for use of animals
Investigators must justify the use of animals in the proposed research. The justification must

indicate why alternatives to animals (e.g., computer models, cell culture) cannot be used and should indicate the potential benefits and knowledge to be gained. In addressing this point, researchers are encouraged to consider means to replace, reduce and refine the use of animals. Rationale for the choice of species must be provided. The rationale should indicate the advantages of the species chosen and why alternative species are not appropriate. If less highly evolved or simpler animal models are available, justification must be provided for using more advanced species. For example, the use of non-human primates (NHP), dogs or cats should be thoroughly justified. If NHP species are to be used, a comparison to other NHP species may be appropriate. If animals are in short supply, costly, or to be used in large numbers, provide an additional rationale for their selection and the number of animals used.

Estimates for the number of animals to be used should be as accurate as possible. Justification for the number of animals to be used should include considerations of animal availability, experimental success rate, inclusion of control groups and requirements for statistical significance; cite power calculations where appropriate.

Point 3 - Veterinary care
Descriptions of veterinary care should indicate the availability of veterinarians or veterinary technicians. For example, the VASR might indicate the number of veterinarians and veterinary technicians associated with the applicant institution, and their proximity to the performance site(s). The frequency with which veterinary staff observe or monitor animals should be stated. If survival surgeries are proposed, veterinary involvement or post-surgical monitoring should be described. For example, if animal use involves invasive approaches that might result in discomfort, distress or pain, the investigator should indicate if or when veterinary care is necessary. The indicators for veterinary intervention to alleviate discomfort, distress or pain should be described. The ways in which veterinary staff may intervene should be described.

Point 4 - Provisions to minimize discomfort, distress, pain and injury
Procedures or circumstances that may result in more than momentary discomfort, distress, pain or injury should be identified. Methods to alleviate discomfort, distress or pain should be described. If pharmacological agents are used, the agent(s) should be specified by name or class. Any additional (e.g., non-pharmaceutical) means to avoid discomfort, distress, pain or injury should be described briefly. The manner, circumstances and duration of all post-surgical provisions and care should be described. If special housing is necessary following surgery or manipulations, the VASR should describe these provisions, the duration and type of monitoring provided. If procedures (e.g., pharmacological or surgical) might lead to severe discomfort, distress, pain or injury, indicators for humane endpoints and euthanasia (e.g., severe infection, respiratory distress, failure to eat, tumor size) should be described. All of these issues are particularly important for survival surgeries. If multiple surgeries are proposed, these must be well justified and provisions to avoid any potential complications must be described. Describe how restraining devices will be used, if applicable.

Point 5 - Euthanasia
The method(s) of euthanasia must be described and must comply with the *AVMA Guidelines on Euthanasia*. If the method(s) do not comply with AVMA recommendations, the rationale and scientific justification for use of the method(s) must be provided. The indicators for euthanasia (i.e., termination of experiment or humane endpoints) should be stated. It is not sufficient to state simply that humane methods will be used, that are consistent with the recommendations of the *AVMA Guidelines on Euthanasia* or the Institutional Animal Care and Use Committee (IACUC).

References
Guidance in this document is based on PHS and Alfred P. Sloan Foundation policies, and federal requirements. The Sloan and PHS policies incorporate the standards in the *Guide for the Care and Use of Laboratory Animals* and require that euthanasia be conducted according to the *AVMA Guidelines on Euthanasia*. Additional background information and references are available on the Office of Laboratory Animal Welfare website (http://grants.nih.gov/grants/olaw/olaw.htm).

PHS Policy
http://grants.nih.gov/grants/olaw/references/phspol.htm.

AVMA Guidelines on Euthanasia
https://www.avma.org/KB/Policies/Documents/euthanasia.pdf.

D. Worksheet to Assist in Addressing the Required Five Points of the VASR
Performance site(s):

The five points must be addressed for all performance sites.

__ If the applicant's institution is not where animal work will be performed, are all collaborative performance site(s) identified?

__ If more than one performance site is planned, are descriptions of animal care and use for each site provided?

Point 1 - Describe the animals and their proposed use; address the following for all species to be used:

__ Species
__ Strains
__ Ages
__ Sex
__ Number of animals to be used
__ A concise, but complete, description of proposed procedures (i.e., sufficient information for evaluation)

Point 2 - Provide justifications for:

__ The use of animals
__ Choice of species
__ Number of animals to be used (cite power calculations, if appropriate)

Point 3 - Provide a general description of veterinary care, including veterinary support that is specifically relevant to the proposed procedures. Indicate the following:

__ A brief account of veterinary staff and their availability
__ The regular schedule of monitoring of animals by veterinary staff
__ Any additional monitoring and veterinary support that may be required to ensure humane care, if relevant to the procedures proposed (e.g., post-surgical)
__ Indicators for veterinary intervention to alleviate discomfort, distress or pain, if relevant

Point 4 - Describe procedures to minimize discomfort, distress, pain and injury. Indicate the following:

__ Circumstances relevant to the proposed work, when animals may experience discomfort, distress, pain or injury
__ Procedures to alleviate discomfort, distress, pain or injury
__ Identify (by name or class) any tranquilizers, analgesics, anesthetics and other treatments (e.g., antibiotics) and describe their use
__ Provisions for special care or housing that may be necessary after experimental procedures
__ Plans for post-surgical care, if survival surgeries are proposed
__ Indicators for humane experimental endpoints, if relevant
__ Describe the use of restraint devices, if relevant

Point 5 - Describe methods of euthanasia:

__ Describe the method(s) of euthanasia and rationale for selection of method(s)
__ Indicate if the method is consistent with AVMA Guidelines on Euthanasia
__ Provide a scientific justification for the choice of method if not AVMA recommended

E. Example of a Complete VASR

(This VASR worksheet has been modified from the original. It addresses all five points concisely. Note that this example is for a ground-based project, but a similar document would be necessary for the flight research solicited by this NRA.)

Vertebrate Animals

Aims 1-3 will be addressed *in vitro*; Aim 4 will be addressed using a mouse model of ocular infection.

1. Female Balb/c mice will be used to determine if virions treated with enzyme can cause viral keratitis, and to test the *in vivo* efficacy of the test articles. The studies will require 700 mice, 4 to 6 weeks old. Based on prior experience, 70 groups, each including 10 mice will be required over five years to achieve adequate statistical power. Ocular infection is accomplished by scratching the cornea of anesthetized mice with a sterile needle and exposing the scarred portion of the cornea to inoculum. Test articles are applied directly to the scarified cornea as liquid or cream. Following inoculation and recovery, mice are monitored for 30 days. With the mice under anesthesia, the eyes will be examined at intervals, microscopically, and are flushed with medium with 2% serum to determine viral titers. Thirty days post-infection, with the mice under deep anesthesia, the trigeminal ganglia are removed aseptically for viral assay, followed immediately by euthanasia.

2. The proposal is to study mechanisms for the prevention of ocular disease caused by viral infections, a leading cause of blindness in the US. Mice are needed for these experiments because no alternative in vitro model incorporates all elements of the mammalian ocular immune system; too little is known about this system for the development of computer simulations. Mice are a well-accepted model for studying viral keratitis, assessing the virulence of viral strains and testing the efficacy of antivirals. Mice provide several advantages: a) The murine ocular immune system is similar enough to that of humans to allow extrapolation of the results; b) Their small size allows the use of smaller amounts of drugs for testing; c) The entire mouse genome is known and easily manipulated genetically, allowing extension of the work in future genetic studies. Female mice will be used due to compatibility issues. Balb/c mice will be used because they have intermediate resistance to infection. ABC-4 knockout and ABC-4 test-strains will be used. For the enzyme study, we will use 4 treatment groups: enzyme-1, enzyme-2, enzyme-3, and mock treated virus. We will also use different amounts of inoculum for each condition allowing a more accurate calculation as to the effect of the digestions on infectivity. For the test-article peptide study, we will use two formulations (one aqueous and one hydrophobic), test 4 different concentrations and also vary the treatment protocol. Two groups will receive a single dose of drug in each of the two formulations prior to the addition of virus to assess prophylactic activity. These groups will not receive any additional enzyme treatments. Two groups will be infected with virus and beginning 4 h post-infection, we will treat with each formulation and concentration 4 times daily for 7 days.

3. All mice are housed in the Animal Resources Center of the University. Animal housing rooms are under temperature and humidity control. The mice will not be subjected to water or food restrictions, and bedding material is placed in each cage. The facility is staffed by four full time veterinarians and six veterinary technicians; the veterinary staff is on site and a clinical veterinarian is available at all times. Animal care staff conducts routine husbandry procedures (e.g., cage cleaning, feeding and watering) and checks animals daily to assess their condition. Laboratory staff monitors mice when treatments are given, disease is scored or samples are collected for titering. The veterinary staff monitors mice in their home cages, weekly. If animals exhibit any indication of infection or distress, the veterinary staff confers with laboratory personnel to recommend appropriate antibiotics, analgesics or other pharmaceuticals. The veterinary staff may intervene or recommend euthanasia based on animal welfare concerns.

4. Mice will be anesthetized with isoflurane (3-5%) during the infection process, when treatments are administered and titer samples are collected. This eliminates the need for restraint devices

and topical anesthetics that would interfere with the infection and disease process. For post-procedural pain relief, we will administer buprenorphine twice daily for the duration of the experiments (i.e., approximately two weeks post-inoculation). Death is not an endpoint for the studies; the Balb/c strain was chosen because of its resiliency and resistance to this particular virus. Our goal is to avoid severe infections leading to death. Though unlikely, if an animal reacts severely, it will be euthanized, based on humane indicators (e.g., failure to groom or feed). These experiments involve no post-surgical survival animals.

5. All mice will be euthanized by cervical dislocation under isoflurane anesthesia. Isoflurane ensures that the mice are unconscious, while dislocation ensures quick death. This minimizes animal distress, is effective and efficient; it is consistent with the recommendations of the AVMA Guidelines on Euthanasia