

Solicitation for Research Projects for Undergraduate Participants in the LDEO Summer Intern Program Application Deadline: Dec. 20, 2021

Eligible Research Advisors include:

- 1) Scientists and Faculty at LDEO, Columbia and Barnard (including postdocs)
- 2) Post orals graduate students with the permission of their advisor.

Research projects can be based in New York City as well as at Lamont.

You do not need to provide funding for the student stipend, housing and travel. We anticipate funding for 26 undergraduate students.

All of the information about yourself, your mentoring statement and your proposed research project should be submitted online through this link.

<https://forms.gle/zabSUSvZ7ZZ4CX2W7>

The online form ensures that all proposals are received and reviewed.

Before you fill out the form you must assemble the following information:

- 1) Contact information and fields of expertise for you and your collaborators
- 2) A research project description (research question, background, analysis required and prerequisites) that is accessible to an undergraduate. The project should be able to yield significant results with 6 to 8 weeks of full time effort. Your project description should be one page long or less.
- 3) A short statement of your mentoring philosophy. We encourage new mentors to apply, as lead or co-mentors.
- 4) If you are a post-orals graduate student, you should discuss the proposed research project with your own mentor(s) before you submit your proposal.

Areas of Research Covered by this Solicitation: Ocean Science, Earth Science, Atmospheric Science, Environmental Science, and Sustainable Development. Projects involving the student in laboratory work and/or fieldwork and measurements are usually favored but must be doable within the constraints of possible limited laboratory access during the summer of 2022. In some disciplines research projects must involve pre-existing data. For the latter we prefer research projects involving analysis of newly collected data or a novel analysis of pre-existing data. Projects should be designed to obtain results within 6 to 8 weeks. Students often continue their summer research project as a senior thesis but this is not guaranteed.

Funding Sources and Expenses Covered: The NSF REU sites grant covers salary, housing and other programmatic costs for 14 interns, who must be selected from a national pool. The REU grant allocates \$1000 per PI that may be used to support field, laboratory or analytical costs. The mentor or their collaborators usually support further field, analytical, and laboratory costs. More funds are negotiable if the student will have an opportunity to participate in significant fieldwork. The REU cannot support purchases of computers or software.

U.S. Science Support Program (USSSP) for I.O.D.P. will cover housing, salary and programmatic costs but not analytical costs for up to six interns, three of whom must be members of ethnic groups under-represented in STEM. All USSSP interns must work exclusively on cores or data collected by the I.O.D.P. or its predecessors.

Earth Intern Program. Rising juniors enrolled in Columbia or Barnard and majoring in Earth and Environmental Sciences, Sustainable Development or other science disciplines may be funded wholly or in part by institutional resources provided by the Lamont Director's Office, Earth Institute, DEES, Barnard as part of the Earth Intern Program.

PI Support: Some PIs may wish to support an intern with their own funds. The basic cost per intern is less than \$11,010 but this cost does not include overhead, analytical, field or other laboratory costs.

In addition to the one-page project description, we request one paragraph on your mentoring approach and plan for undergraduates. Your paragraph should cover three broad areas: 1) a work plan for mentoring, 2) your philosophy on student involvement in research, and 3) examples of educational outreach/mentoring activities you have participated in before. Your work plan should include details on how much time you will spend with the student each day, how you will interact with the student prior to and during the program, how you will hold check-in meetings, and how you will provide opportunities for feedback and discussion, etc. Your philosophy on student involvement in research can include details on your approaches to mentoring, how you think mentoring benefits and impacts student research experiences, how you've benefited from mentoring, how you will encourage ethical practices in data collection/analysis, and how your project/approaches will encourage students to attend national scientific meetings and

to become more involved in science. For REU-funded students, list specific examples of one local and one national meeting you would encourage students to attend to present a first-authored poster. List examples of how you've participated in educational outreach/mentoring activities at Lamont or elsewhere. If you have not been a mentor before, you can discuss your potential plans for student-mentor interaction. We are supportive of new mentors and encourage early career scientists to speak to senior personnel on mentoring prior to submission.

Criteria for Selection of Research Projects and Students for each Research Program

NSF REU Sites Program- Students must be presently enrolled as undergraduates and must still be undergraduates the following fall. They must also be American citizens or permanent residents in order to be eligible. All research must be in the area of ocean, atmospheric or earth science. Research advisors are selected beforehand so each advisor can select the best student for their project. NSF favors student selection of projects. Therefore, potential advisors should have variations of the project or different projects in mind by the start of the summer that can be tailored to student interests and skills. We expect all REU-funded students to present their research results at a national meeting during the following academic year. **Only two students in the REU sites program can come from Columbia or Barnard. Half of the students must come from small colleges with limited research opportunities, which NSF defines as community colleges or small, minority-serving institutions with no graduate program or significant undergraduate research opportunities (e.g., Dominican College).**

Earth Intern Program- this program runs concurrently with the NSF REU Sites Program. This program is restricted to students from Barnard College, Columbia College, and Columbia Engineering. Students must be presently enrolled as undergraduates and must still be undergraduates the following fall. Students do *not* need to be American citizens or permanent residents. Research projects need not be in ocean, atmospheric or earth sciences, but they should be attractive to undergraduate students. Students are particularly interested in projects that involve fieldwork and/or have some societal relevance. Laboratory or modeling based projects are also appropriate. We find that undergraduates are most successful and engaged if their modeling projects involve a comparison with real world data. Research advisors are selected in advance so that each advisor can select the best student for their research project. Potential advisors should have variations of the project or different projects in mind by the start of the summer that that can be tailored to student interests and skills.

Barnard and Columbia Senior Thesis Projects- This research program runs during the academic year from September to early May. Students are also *strongly* encouraged to work on their projects during the summer before their senior year, as time and finances permit. Any reasonable research project that is submitted will be put on the Environmental Science website. Students who are interested in a research project will contact you about it.

The members of the Intern Advisory committee will review proposed research projects and mentoring statements:

EXAMPLE OF A RESEARCH PROJECT DESCRIPTION

What is the Flux of Microplastics into the Deep Sea?

Background: Microplastics including microbeads are synthetic polymer particles that have found extensive use as a replacement for natural exfoliating materials in personal care products and abrasives in cleaning supplies. They typically range between 5 μm and 1 mm and are made of polymers such as polyethylene, nylon etc. that are not easily degraded and are potentially toxic to marine life. They enter the aquatic environment primarily through surface runoff or effluent release from wastewater treatment plants. Recent studies have shown that microplastics are capable of adsorbing a wide variety of toxic organic compounds found in waste treatment plants, for example PCBs (polychlorinated biphenols) and polycyclic aromatic hydrocarbons (PAHs, carcinogens), and can therefore serve as efficient vectors for dispersal of pollutants. After being released to coastal waters, microplastics can find their way offshore or even into the deep sea. Microplastics were observed in the Mariana Trench, 10,898 meters (35,756 feet) below the ocean surface. Although some studies have been conducted, the types and fluxes of microplastics to the deep sea are still largely unknown.

Analysis Required: This project will analyze abundances and types of microplastics in sediment traps collected from the Gulf of Mexico. Since 2010, traps at three locations in the northern Gulf of Mexico have collected sinking particles in the water column. Lab work includes isolating microplastics from other sinking particles, characterizing microplastics using several optical approaches, and identifying them using advanced pyrolysis gas chromatography/mass spectrometry (GS/MS). Lab work will average 30 hrs. /wk., with the rest of the time being focused on data analysis, literature review, etc. We also plan to arrange a field trip to an urban lake in New York City to collect sediment cores.

Prerequisites: General chemistry and lab courses are required; Organic chemistry with interests in biological and environmental issues would be a plus.

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