

Virtual Institute on Feedstocks of the Future (VIFF)

Request for Expressions of Intent

The Virtual Institute on Feedstocks of the Future (VIFF) is soliciting short expressions of intent (EOIs) from U.S.-based researchers and consortia, targeting scientific research to advance the use of future feedstocks in bioproduction. **EOIs are due June 26, 2023, by 11:59 pm (EDT).**

Future feedstocks is a collective term for biomass feedstocks derived from waste materials, as well as those not currently in common use due to technical and other challenges. These include agricultural residues, animal waste, forestry residues, the organic fraction of municipal solid waste, and processing residues. For this funding opportunity, future feedstocks do not include industrial gases or dedicated biomass crops.

VIFF is an initiative of [Schmidt Futures](#) and its [BioFutures Program](#), which aims to catalyze a future for a vibrant, competitive, resilient, and circular U.S. bioeconomy in which biological resources are sustainably transformed into food, feed, energy, and biomaterials. The BioFutures Program builds on the work of the Schmidt Futures [Task Force on Synthetic Biology and the Bioeconomy](#) and its national strategy, [The U.S. Bioeconomy: Charting a Course for a Resilient and Competitive Future](#). The BioFutures Program is now acting to implement many of the recommendations of the strategy, starting with a focus on: (1) repurposing sustainable waste biomass; (2) overcoming engineering constraints; and (3) mobilizing talent for bioeconomy-related federal agencies. VIFF responds to the first of these three areas.

Mission. VIFF's mission is to support U.S.-based science and technology research towards the use of underutilized biomass carbon sources as future feedstocks for biomanufacturing.

Approach. We aim to establish a Virtual Institute hosting several independent (but complementary) integrated, interdisciplinary, and regionally distributed teams of researchers and partners. These teams will focus on advancing cutting-edge research, supported with sustained funding and connections across the Schmidt Futures talent network. As one of Schmidt Futures' Virtual Institutes of Science, VIFF will build a network of carefully selected scientific and technical talent to solve hard and important scientific problems, accelerated through the use of advanced computing and innovative technologies.

Thematic background. Replacing fossil feedstocks with renewable biomass sources will be a key element of a successful circular bioeconomy. It has the potential to increase the environmental sustainability of manufacturing, provide new revenue sources for farmers, ranchers, and municipalities, support manufacturing supply-chain resilience, and increase local sourcing of

production materials. The carbon needed for bioproducts abounds in the environment, but it is locked into materials that are not yet cost-effective to use. Efficiently deconstructing biomass into useful carbon building blocks, or “turning the carbon we have into the carbon we want,” will require new scientific approaches and interdisciplinary collaboration.

Considerable research has addressed the conversion of biomass feedstocks rich in sugars, starches, and oils. Additional research has addressed the use of large-volume agricultural residues such as corn stover, wheat straw, and rice straw. Moving towards a more sustainable and circular bioeconomy will require considering a broader assortment of nontraditional biomass sources that do not substantially compete with food production, and that divert waste streams from unproductive or environmentally harmful pathways. Significant research opportunities remain for future feedstocks, including heterogeneous, lignocellulosic, and nontraditional biomass sources, which may be primary biomass sources, or waste resources from other processes.

VIFF intentionally focuses its efforts on the interdisciplinary science and technology (S&T) research required to accelerate the adoption of future feedstocks in bioproduction. These S&T approaches may leverage innovations in biology, chemistry, biochemistry, and genetic engineering, but also mechanical engineering, process engineering, and logistics; agriculture, rural development, and economics; and computer modeling and data management. Individually and collectively, VIFF projects will work to advance S&T for society.

Scope

EOIs for VIFF research projects focused on one or more of the following areas will be considered.

1. **Heterogeneity.** Biomass heterogeneity, variability, and availability remain key obstacles to utilizing future feedstocks in existing bioproduction systems. Various S&T approaches exist to address these challenges and make use of future feedstocks that - individually - may not be available in consistent quantities or at consistent quality for end users. For example, can we aggregate and preprocess diverse and variable biomass into consistent feedstocks to match the quality and reliability in supply that industries need? Can we codevelop microbes and novel future feedstocks for efficient conversion into desired products? What advancements in harvest, deconstruction, pretreatment, or conversion technology can accelerate our ability to make use of heterogeneous feedstocks?

Eligible approaches will focus on (a) developing processes and engineering innovations (e.g., individual processes or coordinated systems for future feedstock harvest, deconstruction, pretreatment, and conversion) that are resilient to heterogeneous inputs, and/or (b) making heterogeneous materials more homogeneous and predictable.

2. **Data, Modeling, Digital Tools, and Knowledge-Sharing.** A dearth of publicly accessible data about future feedstocks and the necessary analytical tools to understand them impedes their

increased use in bioproduction. For example, what future feedstocks are available - where, when, and at what price? What are their biochemical and physical characteristics? What target molecules - including bioprivileged or bioadvantaged molecules - could yield successful results?¹ Can novel modeling methods predict outcomes of conversion processes from bench-scale to full-scale with increasing accuracy? How can we improve the utility and accuracy of techno economic analyses (TEAs) and life-cycle assessments (LCAs)?

Eligible approaches will address (a) characterization relevant to future feedstocks, (b) data collection and developing new platforms for data and knowledge-sharing, and/or (c) developing and improving modeling approaches to improve predictions of the best uses of future feedstocks and best approaches to using them in bioproduction.

Out of Scope. VIFF will not support projects focused on developing dedicated biomass crops through genetic engineering, petroleum-based plastics, or fermentation of industrial gases. Projects that aim to utilize gaseous byproducts of other biomass utilization processes could be considered within scope. VIFF will not fund physical infrastructure (e.g., bioproduction facilities) or projects focused solely on infrastructure design or workforce development.

Project Types

EOIs should come from teams of researchers interested in pursuing high-impact, high-risk ideas over a five-year timeframe. The following project types - or combinations of types - may be included.

- **Scientific Research** (research efforts of individual or teams of organizations)
- **Tools and Technology Development** (research efforts of individual or teams of organizations)

Team Types

- **Single-institute**
- **Multi-institute**
- **Regional consortia:** consortia of interdisciplinary researchers focused on advancing the use of future feedstocks available in a particular U.S. region through scientific research and/or tools and technology development.

Projects are anticipated to be led by PIs at research institutions, who will manage collaborations that may include subgrants to other types of institutions. Preference will be given to regional consortia.

VIFF encourages collaborations that are difficult to fund through existing funding opportunities, with particular interest in collaborations with partners from across scientific disciplines and among disparate sectors (e.g., research, regional economic development, and industry). EOIs may present

¹ *Bioprivileged molecules* are chemical intermediates derived from biology that can be converted efficiently into diverse chemical products, including both novel molecules and drop-in replacements for petroleum-based products. *Bioadvantaged molecules* are molecules derived from biology that have performance advantages relative to those derived from fossil carbon feedstocks.

proposed project team members as preliminary suggestions, with the opportunity to adjust team membership at the invited proposal stage due to availability and/or fit.

If selected for an award, we expect all teams to operate in an integrated manner to tackle technological, cultural, and logistical challenges that are pervasive in this field. Project integration may be developed early in the life of the Virtual Institute, facilitated by a launch convening. Demographic and disciplinary diversity within project teams is encouraged, as are opportunities for early career scientists. We expect project teams to make results and methods as transparent as possible across the virtual institute, and publicly available as open source and open data in a timely manner.

EOI Submission

Eligibility. Research teams led by Principal Investigators (PIs) based in university, national laboratory, nonprofit research institute, or agency settings (including agricultural experiment stations) will all be considered. Multi-institute research consortia, U.S.-regional focus, and partnerships with regional economic development organizations and/or industry are strongly encouraged. VIFF is focused on U.S. bioproduction, and as such, lead institutions/PIs must be based in the United States. PIs and lead research institutions must demonstrate that they can manage large and complex projects.

Budget and Award Duration. Project budgets are intended to be up to approximately \$10 million distributed over a five-year period. However, proposals with total budgets above or below this amount may be considered. During the selection process, the VIFF project selection team will consider the potential complementarity of projects prior to finalizing teams recommended to advance to the invited proposal stage. EOIs will not include detailed budgets - these will be elaborated at the invited proposal stage.

Information to Include. An EOI is not a proposal, and should be brief (**two pages** in total). Please include the names and affiliations of Principal Investigators (PIs), team members, and partners in the EOI submission form linked below. Please do not include this information in the two-page EOI, as we will redact this information during the initial blinded EOI review process.²

The EOI must address each of the following elements:

- Primary area of innovation and key challenges being addressed in support of the VIFF mission.
- How the proposed work may inform or support the increased use of future feedstocks in bioproduction, and the work's relevance to advancing S&T for society.
- Scientific ability, relevant expertise, scientific project management experience, and capacity and ability of the PIs and partner institutions to implement a large collaborative project.
- Research infrastructure available to the project team to advance the proposed efforts.
- Project type(s) (see [above](#)).

² For an example of dual-anonymous peer review, see NASA, "Dual-Anonymous Peer Review (DAPR)," <https://science.nasa.gov/researchers/dual-anonymous-peer-review>.

- Team type (see [above](#)).
- Collaborative teamwork approach, plan for within-team coordination across research methods and disciplines. (If invited to submit a proposal, teams will be requested to provide ideas about how the team could interact with other VIFF-funded research teams to generate effective cross-cutting collaborations as members of the VIFF community.)

Submission and Questions. Please submit your EOI [here](#). Should you have any questions, please contact viff@schmidtfutures.com and include “VIFF EOI” in the email subject line. Responses to frequently asked questions about this VIFF request for EOIs can be found on the VIFF website, [here](#).

Submission Review and Award Process

Submitted EOIs will be anonymized (removing names and affiliations of PIs and partners; removing any included publications) for a blinded evaluation by a committee of peers and Schmidt Futures. Selected teams will be invited to submit full proposals for evaluation. We anticipate reaching out to EOI PIs who will advance to the invited full proposal stage in July 2023. The invitation for full proposals will include more-detailed requests for information on budgets, project operations, timelines, and team members, as well as provide information about relevant Schmidt Futures policies. Invited teams will have approximately eight weeks to submit a full proposal, typically eight pages long excluding citations, CVs, and budgets. We anticipate awarding up to five proposals in the first year.

Additional Background

VIFF is one of several Schmidt Futures Virtual Institutes of Science that work across institutions and disciplines. Schmidt Futures’ virtual institutes are designed to attract, excite, and retain the most talented researchers and students in their respective fields, from numerous institutions. We aim to assist our virtual institutes by leveraging our existing talent network, and to maximize their impact through community-building and knowledge-sharing activities within and outside of the virtual institutes. With these efforts, our goals are to disseminate new knowledge broadly, spur new innovation, and further extend the Schmidt Futures talent network.

Schmidt Futures and the Foundation for Food & Agriculture Research (FFAR) hosted an in-person expert convening focused on future feedstocks on March 28-29, 2023. FFAR is hosting a webinar to disseminate the convening’s findings and serve as an opportunity to ask questions, contribute perspectives, and learn about the next steps related to this initiative. The webinar will take place **June 5, 2023, from 2 pm – 3 pm (EDT) (recording to be available afterwards)**. To join the webinar and receive related communications, please visit [this site](#). The convening report, *Feedstocks of the Future for a Circular U.S. Bioeconomy: A Summary from a Stakeholder Convening*, as well as a webinar recording will be posted [here](#) after the event.