

To: Open Philanthropy Project
From: Bruce Friedrich, Executive Director
Cc: Clare Bland, Development Director
Re: Proposal for Funding, Science & Technology Department
Date: August 19, 2016

I. The Good Food Institute Thesis & Overview

Every time someone chooses to consume alternatives to animal products, their choice has a positive effect on our climate, sustainability, human health, and animals. While advocacy and outreach about the impacts of animal product consumption is important, GFI believes that efforts to significantly reduce consumption of meat, dairy, and eggs will be most successful if alternatives are as inexpensive, delicious, and convenient as possible.

Thus, GFI is focused on accelerating the market expansion of affordable and appetizing plant-based and clean alternatives (grown outside of animals, eliminating the need for slaughter) to animal-based meat, dairy, and eggs.

We sincerely appreciate your invitation to present our funding request, and respectfully invite Open Philanthropy Project to consider a grant of up to \$325,000 to underwrite the work of our Science & Technology Team.

II. Grant Proposal

Launched in February 2016, GFI is a 501(c)(3) nonprofit organization powered by philanthropy. Gift support is vital to our mission to transform the current course of global food production and advance a new course that is healthy, humane, and sustainable. We will achieve this through our four programs:

- **Fostering Innovation:** Outreach to top universities for entrepreneurship, synthetic and plant biology, and tissue engineering—to create private and public sector activity focused on advancing plant-based and clean products.
- **Supporting Innovation:** Working with the most transformational plant-based and clean companies on communications, regulatory work, business plans, venture capital support, and all aspects of their success—to mobilize markets and food technology for maximum transformation from animal-based products.
- **Corporate Engagement:** Creating collaborative relationships with restaurants, grocery stores, and foodservice companies to maximize the quality, quantity, and promotion of plant-based alternatives.
- **Institutional Outreach:** Educating large grant-making institutions, corporations, and governments about the value of R&D in this field as a critical component in

addressing sustainability, climate change, and global hunger—to divert tens of millions of dollars in government and foundation grant money toward plant-based and clean alternatives to meat, dairy, and eggs.

Visit GFI.org/our-team to meet our team.

Due to the nature of our work, GFI's largest budget item is staff salaries and associated program costs.

- Your grant of \$100,000 would underwrite all activities of our Scientific Foundations Liaison. S/he will focus on helping scientists in the plant-based and clean fields secure large grants from scientific grant-making institutions, resulting in millions of additional dollars for this research—money that would otherwise be spent on other projects.
- Your grant of \$225,000 would support all the above items, plus one of our Senior Scientists and all associated program costs. GFI's scientists are focused on gathering, analyzing, synthesizing and sharing information on the state-of-the-science globally in the plant-based and clean products space; identifying knowledge gaps where research needs to be undertaken to foster robust growth in this field; and providing expertise to entrepreneurs in this space to help ensure their success.
- Your grant of \$325,000 would support all the above items, plus our second Senior Scientist and all associated program costs.

The Science & Technology Department has significant capacity for the effective expenditure of additional funding; roles and responsibilities for four new positions within the department are articulated below. We will be happy to provide full position descriptions and additional budget information on request.

III. Reports

GFI will provide you with monthly reports that will include both highlights related to all organizational activities as well as a more detailed breakdown of activities related to the Science & Technology Department. A detailed annual report on the impact of your support will also be provided. If you would like an annual (or more frequent) in person briefing, we are happy to provide that as well.

IV. GFI's Science & Technology Department

So far, we've only explored about 8 percent of the world's plant proteins as potential meat alternatives. ... Remaking meat is one sector of the food industry that is ripe for innovation and growth.

—Bill Gates

The other half of GFI's core mission is the **science and technology team**, because developing and promoting the science of plant-based and clean food technologies is the “food technology” half of “markets and food technology.” Specifically, our scientists work to ensure that the most delicious and cost-competitive plant-based and clean alternatives to conventional animal products appear on the market as quickly as possible.

GFI's scientists will become the global experts on plant-based and clean alternatives to conventionally produced animal products. They are laser-focused on six principal activities:

- **Creating and Maintaining Comprehensive Documentation Related to the Fields of Plant-Based and Clean Technologies**

Thus far, there is no one-stop source for the latest information on any aspect of plant-based or clean alternatives to animal agriculture. This means that anyone interested in these fields must dig through volumes of literature—much of it of dubious quality, outdated, or paywall-restricted—and cannot access a comprehensive, reliable overview of the science.

Thus, GFI will create white papers that are the definitive work on plant-based and clean alternatives to animal products. These will be published in the resources section of our website, heavily publicized, and continually updated. For example, we will publish and vigorously promote papers on the state of animal-free media for clean meat and on the expansion opportunities for utilizing more types of plant-based proteins. We will also contact researchers—both in academia and in industry—who are doing relevant work, in order to gain deeper insight into the fields of synthetic biology, tissue engineering, and food science to assess the landscape of opportunity.

- **Evaluating Plant-Based and Clean Technologies and the R&D Needs for Industry Development**

Our senior scientists will provide industry-level evaluations of technologies and research projects needed to support the clean and plant-based product industries. These Technology Readiness Assessments (TRAs) provide information on the product-level maturity or readiness (i.e., Technology Readiness Levels [TRLs]) to launch a company, and industry-level information on new technologies, research, and companies needed to support the market as a whole. Opportunities for industry-focused, university-based research quickly emerge from TRA and TRL evaluations.

These efforts will allow both GFI and the rest of the world to fully understand the state of the science and engineering with regard to plant-based and clean alternatives to animal products. Our expectation is that this work will ensure that more scientists get involved in these fields and that duplicative work is minimized, both within GFI and in the broader world.

- **Supporting Entrepreneurial Efforts**

GFI offers entrepreneurs and start-ups guidance, expertise, and access to experts in scientific development of their products. GFI senior scientists support entrepreneurs in early stages of company development with technical information and direction. For example, the GFI science and technology team assists entrepreneurs in formulating and articulating the scientific aspects of their company proposals to make them suitable for approaching potential scientific co-founders and venture capitalists. GFI senior scientists will assist company-based scientists by connecting them with technical experts.

- **Creating Relationships with Academic and Industry Researchers**

Right now, there is limited information on and discussion of plant-based and clean technologies at the top schools for food science, tissue engineering, and synthetic biology. While thousands of students and researchers work in these fields, they are not yet aware of the potential to use their expertise to address global problems by creating affordable and sustainable alternatives to conventional animal products. GFI will perform a thorough literature review and will stay current on all publications related to plant-based and clean technologies, both work directly related to food and work in other fields that is applicable (e.g., tracking advances in biomedicine that can be translated to clean meat).

In order to increase the number of startup companies and the quality of both private and public sector work on alternatives to animal products, GFI will speak annually at premier schools for synthetic biology, plant sciences, and entrepreneurship. GFI's senior scientists will speak in classes, departmental symposiums, and student forums with the goal of increasing the number and caliber of food scientists, entrepreneurs, tissue engineers, and synthetic biologists working on plant-based and clean alternatives to animal products.

Further, GFI will invite professionals from industry (medical biotech, chemical engineering, etc.) to learn about the opportunities presented through GFI via networking events for scientific professionals, LinkedIn invitations to learn more from GFI's website, and webinars on scientific and entrepreneurial opportunities.

- **Creating Relationships and Excitement in the Science Media**

The scientific media, like everyone else, loves food. Newsworthy information related to technological innovation in food has captured the imagination of both the science and the business media, even without significant effort on the part of the plant-based and clean community.

GFI's scientific team will work with our communications manager to generate contacts in science media—online and conventional—that will create a better understanding of the need for the alternatives to animal agriculture that we are promoting and also generate more and better stories about plant-based and clean alternatives to meat, dairy, and eggs. Our scientists will help translate the scientific aspects of these emerging technologies into accessible vernacular to address and alleviate public concerns.

In combination with the rest of our efforts, these stories will increase work by scientists focused on creating the best and most affordable plant-based and clean alternatives to conventional meat, dairy, and eggs.

- **Mobilizing Funding for Academic Research and Early-Stage Commercialization**

Our senior scientists will work with our scientific foundations liaison to generate additional scientific work in plant-based and clean alternatives to animal-based meat, dairy, and eggs among academic research institutes and small businesses. Specifically, our scientists will develop proposals for directed research to submit to top governmental grant-making

agencies (National Science Foundation, National Institutes of Health, Department of Energy, etc.) and private foundations (Gates Foundation, Packard Foundation, etc.).

Our senior scientists will be deeply immersed in plant-based and clean technology and will identify the most promising endeavors. Thus, our proposals will focus on the most critical areas of research for advancing plant-based and clean meat technologies.

Additionally, our senior scientists will be focused on creating connections at top universities for plant sciences, synthetic biology, and tissue engineering. Thus, they will be able to handpick the best possible scientists for the questions we want answered—moving beyond scientists who happen to be interested in this market sector and ensuring that the best possible minds are working on the questions we want answered and the research we want done.

Finally, we will mobilize funding to launch two novel research centers: one for cellular agriculture and one for plant-based product innovation. The locations of these centers will be selected based on the research portfolios of leading universities.

GFI's Science & Technology Department is critical to GFI's mission (the bottom line).

GFI's Science & Technology Department will create a publicly accessible roadmap for plant-based and clean technologies so that far more top scientists will be engaged in plant-based and clean food production, and millions of additional dollars will be put into the science of transforming animal agriculture. In short, GFI's scientists are essential to the success of GFI's vision of a world in which all animal products are plant-based or clean.

Examples of Potential Grant Projects

GFI Senior Scientist Christie Lagally prepared four examples of university research programs that could be directed to support meat alternatives—two of these are plant-based, and two of them are clean. We believe that these four proposals have a high likelihood of funding success, as do many others; these four simply offer a sense of what we'll be working on.

First, previous work on mock meat production has shown that random fiber creation and orientation can be achieved by shearing materials with different intrinsic shear rates in a couette cell configuration. A variety of different wheat glutes, from wheat grown to produce longer or shorter protein chains, could be tested for working these materials in combination. A modified wheat variety could come from hybridized or genetically modified wheat for custom protein properties, in order to create better macroscopic properties in a gluten-based meat. There are many other ways in which plant-based meats could be developed and worked through various machinery to produce plant-based meats with different textures, protein combinations, etc.

Second, plant-based meat research could be enhanced by supporting university programs that systematically characterize and catalog the wide variety of currently unexplored plant-based proteins, such as the Food Protein R&D Center at Texas A&M. Opportunities to create plant-based meats that are either more similar to animal-based meats, or perhaps less

processed than traditional meat analogs, start with assessing various raw ingredients as candidate proteins. Targeting this research for processing a wider variety of plant sources of protein, or methods of processing known protein sources, could be invaluable for better, cheaper plant-based meats.

Third, microfluidics research, similar to the work being done at UC Riverside, has been used and studied extensively to streamline research of chemical and cell characteristics by allowing researchers to use very small samples and making sensors to study them at the cellular or molecular level. Such technology research could be directed toward the development of sensors for real-time monitoring of cultured meat cells within bioreactors, enabling dynamic regulation of culture conditions to maximize yields.

Finally, recent work at MIT, Stanford, and Harvard on creating bio-printed vascularity could be utilized for the development of clean meat cuts as thick as steaks. This research is currently being used to 3D-print organs for medical purposes, but could also be utilized for the development of cultured meat. A grant to encourage co-development of vascularity for edible and medical applications could potentially benefit both outcomes.

Staff Expansion (4 new roles)

The Science & Technology Team has the capacity to incorporate at least four additional roles in the fairly near term: a food scientist, an academic research advisor, an environmental scientist, and a director of science and technology, whose proposed roles are outlined below.

As GFI works to address major campaign areas that are deemed most promising to launch sustainable endeavors for plant-based and clean meat, dairy, and eggs, our organization will hire a **food scientist** to advise on the next generation of plant-based and clean foods. Currently, plant-based meats represent a tiny fraction of the meat industry and clean meats are a nascent technology. Hence, there is enormous opportunity to broaden this market sector and make strategic decisions regarding entrepreneurial and research efforts based on food science, from taste profiles to manufacturing methods. This work directly translates into entrepreneurial opportunities for GFI to launch new companies or expand existing companies to make these new products.

GFI will also hire an **academic research advisor** tasked with supervising and mentoring interns who are contributing to GFI's white papers and fundamental research. The academic research advisor will also serve as GFI's formal co-advisor for students pursuing GFI-articulated research projects in university settings -- for example, through entrepreneurship competitions like University of Colorado's New Venture Challenge or innovation incubators like the UC Berkeley Sutardja Center. This position will be especially valuable after Year 1, when fundamental academic research questions have been identified in the process of mapping the landscape of opportunity and state of the field; these questions can be delegated to student teams at universities across the country with the academic research advisor as the focal GFI contact.

GFI efforts are poised to have a major influence on the mitigation of climate change as we systematically replace animal agriculture with significantly more environmentally friendly

alternatives. Enumeration of these effects is necessary to educate the environmental community on these food alternatives and impacts on climate change and climatic tipping points. Hence GFI will add an **environmental scientist** to the Science & Technology Team to work on environmental considerations, from life cycle analyses and groundwater preservation methods to sustainable farming practices, and to forge relationships with major environmental groups and institutions to influence public policy around plant-based and clean meat options.

As our department grows, a **director of science & technology** is needed to oversee the entire department and to manage GFI's science and technology strategy. In close collaboration with the Science & Technology Team staff, the director will develop and manage a comprehensive yet fluid science and technology strategy around the most important areas of innovation. This strategy will be both proactive to address the anticipated growth needs of the clean and plant-based products industry and reactive to industry-articulated research needs. The director will be responsible for ensuring coordinated efforts of Science & Technology Team staff are most efficiently directed towards GFI's mission while acquiring funding, tools, and resources needed for department-related work. This includes access to journals, databases, software tools, and data management or mathematical tools.

The director will ensure protections are in place managing sensitive technology information from industry partners, while also ensuring access to open source research funded in partnership with GFI. S/he will develop and manage a scientific professionals outreach plan (in academia and industry) and internal CRM development (with respect to GFI science/technology needs) as well as manage webinars to highlight both internal and external expertise in the field.

V. Conclusion

We hope you will agree that funding our Science & Technology Department will be an especially effective way to help the environment, improve the sustainability of the food production system, ameliorate global health, and protect farmed animals. Thus, we respectfully request your consideration of a two to three-year grant of up to \$325,000 annually. We feel confident that this grant will generate *exponentially more* than the dollar value of the grant in research into plant-based and clean alternatives to meat, dairy, and eggs.

Please let us know if you would like more information on this proposal. We would be happy to discuss any and all aspects of it, and we would also be happy to share the job descriptions for our science and technology positions.

The Good Food Institute's efforts have the potential to be transformational in achieving a more just food system. On behalf of the entire GFI team, we sincerely appreciate your consideration, and look forward to our partnership.