

## THE ETHICS AND POLITICS OF PLANT-BASED AND CULTURED MEAT

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Résumé de l'article

Dans cet article, j'examine plusieurs des questions morales et politiques que soulève la production de nouvelles formes de viandes. J'aborde d'abord les risques et les dangers liés à l'agriculture animale industrielle, et je soutiens que la viande à base de plantes et la viande cultivée représentent des alternatives prometteuses à la viande conventionnelle. J'examine ensuite les défis d'ordre moral, conceptuel, social, politique, économique, et technique, qui font obstacle à l'adoption généralisée de ces alternatives. Par exemple, cette dernière dépendra de si on arrive ou non à convaincre les dirigeants politiques et les chefs d'entreprise de voir la viande à base de plantes et la viande cultivée comme une opportunité plutôt que comme une menace. Enfin, je prends en considération plusieurs façons de relever ces défis, et j'appelle à la vigilance quant aux types de problèmes à éviter, auxquels d'autres innovations technologiques ont déjà été confrontés.

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# THE ETHICS AND POLITICS OF PLANT-BASED AND CULTURED MEAT

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## ABSTRACT:

In this paper I examine several of the moral and political questions raised by new kinds of meat. I begin by discussing the risks and harms associated with industrial animal agriculture, and I argue that plant-based meat and cultured meat are promising alternatives to conventional meat. I then explore the moral, conceptual, social, political, economic, and technical challenges that stand in the way of widespread adoption of these alternatives. For example, whether or not we achieve widespread adoption will depend on whether or not we can persuade business and political leaders to see plant-based and cultured meat as an opportunity rather than as a threat. Finally, I consider several ways of meeting these challenges, and I argue that we must be very careful if we want to avoid the kinds of problems that other, similar technological innovations such as GMOs have faced.

## RÉSUMÉ :

Dans cet article, j'examine plusieurs des questions morales et politiques que soulève la production de nouvelles formes de viandes. J'aborde d'abord les risques et les dangers liés à l'agriculture animale industrielle, et je soutiens que la viande à base de plantes et la viande cultivée représentent des alternatives prometteuses à la viande conventionnelle. J'examine ensuite les défis d'ordre moral, conceptuel, social, politique, économique, et technique, qui font obstacle à l'adoption généralisée de ces alternatives. Par exemple, cette dernière dépendra de si on arrive ou non à convaincre les dirigeants politiques et les chefs d'entreprise de voir la viande à base de plantes et la viande cultivée comme une opportunité plutôt que comme une menace. Enfin, je prends en considération plusieurs façons de relever ces défis, et j'appelle à la vigilance quant aux types de problèmes à éviter, auxquels d'autres innovations technologiques ont déjà été confrontés.

## 1. INTRODUCTION

The twentieth century changed the global food system in a fundamental way. As the previous century drew to a close, people were still growing food on relatively small, free-range farms. This system was far from ideal, a point that people often forget now. Still, the means of production limited the harm that the food system could bring about. But then, with the emergence of modern technology and assembly-line production, everything changed. People started producing food in factories, which allowed for an unprecedented increase in volume, as well as an unprecedented level of harm to humans, nonhumans, and the environment. As a result, the world is now at a crossroads. As we will see, the current food system harms and kills 70+ billion land animals per year; consumes more land, water, and fuel than most other industries; and releases more carbon dioxide, methane, and nitrous oxide into the air than most other industries. Meanwhile, this food system is still not feeding everyone, and many of the people it feeds are suffering from a variety of health problems.

In response to this predicament, many people are now advocating for alternatives to industrial animal agriculture, including nonindustrial agriculture and non-animal agriculture. But, while it would be wonderful if these alternatives were enough to persuade people to stop supporting industrial animal agriculture, it does not seem likely that they will be, at least not any time soon.

Is there another alternative? Recent developments have raised an intriguing possibility: that science, technology, and meat are not only the cause of (or at least a partial cause of) but also the solution to (or at least a partial solution to) the current food crisis. In particular, researchers have made tremendous strides in developing plant-based meat (i.e., meat that comes from plants) as well as cultured meat (i.e., meat that comes from a cell culture). Many organizations are now developing these products, and with each passing year they are reaching new milestones in terms of quality, quantity, and affordability. If this progress continues, then plant-based and cultured meat could be a game changer: unlike other alternatives to our current food system, they could allow people to eat what they want while eliminating many of the human, nonhuman, and environmental costs of what people currently eat.

The emergence of plant-based and cultured meat, then, represents a promising development. However, it will not be easy to make good on this promise. There are substantial conceptual, moral, social, political, economic, and technical challenges that supporters of plant-based and cultured meat will need to overcome if they want to create an alternative to conventional meat that producers and consumers alike can accept. And what happens over the next decade will play a major role in determining whether or not they are able to overcome these challenges. As a result, this is a pivotal moment in the history of the food system. If people develop and promote these products in a thoughtful and strategic way, then these products stand a real chance of doing a lot of good in the world. If, however, people squander this opportunity, then there may not be another one like it for decades.

We must therefore think seriously about how to develop and promote plant-based and cultured meat in a thoughtful and strategic way, including how to meet the many challenges that these products will inevitably face. My aim in this article is not to show exactly how we should do that. Instead, my aim is to survey some of the main issues that will be relevant to this discussion and show how these issues interact, so that we can appreciate the task that lies ahead. I will begin by making the case for plant-based and cultured meat. I will then survey conceptual, social, cultural, religious, political, economic, technical, and moral questions that these products will raise. The upshot will be that we have strong reason to support these products, but that we need to be extremely cautious about how we do so.

Before I begin, I should make a remark about the scope of my discussion in this paper. I will be focusing on plant-based and cultured meat for the sake of simplicity and specificity. Much of what I will say can extend to other plant-based and cultured animal products as well (for example dairy, eggs, and leather), though the details will vary from case to case depending on the meaning and value that these products have for people. I will also be focusing here on questions, challenges, and opportunities that plant-based and cultured meat are likely to raise in the context of developed countries with industrial animal agricultural systems, such as the United States. Some of what I say about these countries can extend to other countries too (and, of course, one question that people are likely to face in developed countries is how to promote plant-based and cultured meat in developing countries in an ethical and effective way), but the details will vary a lot from case to case depending on local beliefs, values, and practices around food, as well as on local, social, political, economic, and technological conditions in the relevant countries.

## 2. INDUSTRIAL ANIMAL AGRICULTURE

The first step in making the case for plant-based and cultured meat is to observe that industrial animal agriculture is responsible for a lot of unnecessary harm in the world. This harm accrues to humans, nonhumans, and the environment.

Start by considering nonhumans. On a conservative estimate, industrial animal agriculture currently raises and kills more than 70 billion land animals in the world for food each year. If you factor in aquatic animals, this number increases substantially. Market forces govern most of what happens to these animals in the food system. Many of these animals are bred to grow as big as possible as quickly as possible. They are separated from friends and family and confined in cramped spaces, either small cages or large sheds with tens of thousands of other animals. They are controlled through castration, debeaking, tail docking, and more, typically without anesthesia. They are transported in crowded trucks without food, water, or medical care. And they are killed in slaughterhouses that place a high premium on efficiency and a low premium on welfare. This is, to say the least, a moral problem. To put the scale of this problem into perspective, consider that the estimated total number of nonhumans who die in this food

system every 1-2 years is greater than the estimated total number of humans who have ever lived throughout history.<sup>1</sup>

Now consider the impact on humans. Industrial animal agriculture has harmful health impacts for producers as well as consumers. Regarding food production, industrial animal agriculture typically requires minimum-wage workers to engage in demanding and repetitive labour in toxic and dangerous environments with few if any legal protections, with the result that many workers develop a wide range of physical and mental health problems. Regarding consumption, industrial animal agriculture produces low-quality food in an inefficient manner, and then makes this food available at artificially low prices. As a result, many people either have no access to food at all, or have access exclusively or primarily to industrial animal agricultural products (along with other unhealthy foods), which can lead to health problems related to malnutrition, diabetes, and obesity.<sup>2</sup>

Industrial animal agriculture also has harmful impacts on public health. Use of antimicrobials on factory farms is either unregulated or poorly regulated, allowing for heavy use to prevent the spread of disease and to stimulate growth in animals. Consequently, factory farms are breeding grounds for antimicrobial-resistant pathogens, which substantially increases the risk of public-health crises. Similarly, waste treatment and disposal in factory farms is either unregulated or poorly regulated. Many factory farms dump waste (for example, blood, vomit, feces, and urine) in surrounding areas in much higher quantities than these areas can absorb, thereby contaminating local air, water, and soil. This practice not only makes local communities unpleasant to live in; it also correlates with increased rates of cancer and other physical- and mental-health issues.<sup>3</sup>

Finally, consider the impact on the environment (which, of course, impacts human and nonhuman health and wellbeing too). Animal agriculture consumes more land, water, and energy than most other industries, and it also emits more carbon dioxide, methane, and nitrous oxide than most other industries. In particular, animal agriculture is responsible for an estimated 9 percent of global carbon dioxide emissions, 37 percent of global methane emissions, and 65 percent of global nitrous oxide emissions (Steinfeld, 2006). As a result, animal agriculture is a leading contributor to environmental harms including global climate change, biodiversity loss, and ecosystem collapse. And, as industrial animal agriculture expands into other markets, these impacts will expand as well.<sup>4</sup>

It is crucial to emphasize that these impacts of industrial animal agriculture are not the result of a system working improperly. They are instead essential to its proper functioning. It is only by externalizing many of these costs through deregulation (as well as by accepting financial benefits through taxes and subsidies) that this food system is able to maintain the appearance of efficiency and affordability. If, in contrast, industrial animal agricultural corporations were to try to minimize many of these costs—or, in the case of public health and environmental costs, to cause them but then provide compensation for them—then it would be much less likely to survive in a free market, and it would be clear to

everyone that an alternative is not only morally but practically necessary. As it stands, an alternative is morally and practically necessary, yet people will have to try to find a way to bring an alternative about without global consensus to that effect.

Taking into account these impacts, we can see that our industrial animal agricultural system represents a moral, social, and political problem of the highest order. It has already caused massive amounts of suffering and death and ensured that much more will occur. This raises a couple of questions: In a world with a rising population of humans who want to eat meat and an increasingly capitalist global economy that aims to provide humans with food that they want to eat, what alternative to industrial animal agriculture, if any at all, can both (a) achieve widespread adoption and (b) have better impacts under widespread adoption? And what if anything can people do to increase the probability that such an alternative will, in fact, achieve widespread adoption and have better impacts under widespread adoption?

### 3. ALTERNATIVES TO INDUSTRIAL ANIMAL AGRICULTURE

The next step in making the case for plant-based and cultured meat is to show that other alternatives are not, in and of themselves, likely to be enough to solve the problems caused by industrial animal agriculture.

Of course, there are many kinds of harm that industrial animal agriculture causes, and there are alternatives for each one. For example, local food focuses on reducing the harmful impacts of transportation. Organic food focuses on reducing the harmful impacts of synthetic chemicals. Food sovereignty focuses on reducing the harmful impacts of colonialism. And so on. In a full discussion of the future of food, we would need to consider each of these alternatives carefully to see whether and to what degree they should be part of the ideal alternative to the status quo. But since the most harmful aspects of the status quo are its combination of animal and industrial agriculture, I will focus on alternatives that address one or both of those features here. (That said, this broader set of issues is very important too, and I will return to it below, when I discuss the challenges that supporters of plant-based meat and cultured meat will likely face moving forward.)

With that in mind, we can consider two options here. First, there is *nonindustrial animal agriculture*. Many people think that the solution to the current food crisis is a return to a past nonindustrial system that produces animal as well as plant products. This would eliminate many of the aspects of the current food system that cause so much harm: it would cause less suffering and death (in total and on average, since fewer animals would be farmed and the average farmed animal would experience less harm); it would consume less water and energy (in total, maybe not on average); and it would produce less waste and pollution (in total, maybe not on average). Moreover, people would still get to eat animal products (though fewer people would get to do so), and these products would likely be healthier (Schlottmann and Sebo, 2018).

But while nonindustrial animal agriculture may well be part of a solution in the short term, it cannot be anything more than that. One issue is that, while this alternative would reduce costs for welfare, health, and the environment, it might not reduce them enough: it would still harm and kill animals, it would still create pathways for disease, and it would still consume energy in the conversion from feed to flesh. Moreover, even if we set these issues aside, another issue is that we could never feed the world this way. Free-range animal agriculture takes too much time, energy, and money—as well as too specific a set of environmental conditions—for producers to be able to provide healthy, affordable meat, dairy, and eggs to everyone who wants them this way. Thus, if this kind of food system were to replace industrial animal agriculture, animal products would become a rare luxury item. And while many critics of industrial animal agriculture are happy to embrace this result, as far as it goes, the producers and consumers who actually determine the fate of our food system might not be.<sup>5</sup>

The second alternative is industrial *non-animal industrial agriculture*. Many people think that the solution to the current food crisis is, rather than a return to a past nonindustrial system, a conversion to a new, partly industrial and partly nonindustrial system that produces plant products (and, in particular, plant products that convert energy efficiently, such as legumes). This would eliminate many of the aspects of the current food system that cause so much harm, including many of the animal-welfare, public-health, and environmental impacts. Moreover, producers would still get to selectively and strategically use industrial methods as part of production and distribution, which would allow them to provide affordable, healthy food for many people who need it.

But while industrial plant agriculture may well be part of a solution, it likely cannot be anything more than that either—at least, not in the short term. The reason is simple: while there are currently many people in the world who are satisfied with a plant-based diet, there are also many people who are not. And while the total number of vegans in the world is rising every day (given increased availability of vegan options as well as increased demand for vegan options in developed countries), the total number of nonvegans in the world is rising every day too (given increased availability of animal products as well as increased demand for animal products in developing countries).<sup>6</sup> This makes it unlikely that a meatless food system will be desirable for everyone we need to be appealing to in the short term. Of course, that may change in the long run. But, for now, food advocates need to think about how we can get from here to where we need to go. And that means accepting that neither a global demand for meat nor a market-driven economy will be going anywhere anytime soon.<sup>7</sup>

What we need, then, is an alternative to conventional meat that provides as many people as possible with healthy, affordable food that they actually want to eat, without causing unnecessary harm to animals, public health, or the environment. Of course, people can, and should, continue to advocate for plant-based food (as well as changes to our political and economic systems), with the aim of eventually creating a world no longer bound by these constraints. But in the

meantime (and as a partial means to this end), we need an alternative that can work within current constraints. The question is, is there such an alternative? If so, what is it, and what can we do to bring it about?

#### 4. MAKING WELL-DONE MEAT LESS RARE

The third step in making the case for plant-based and cultured meat is to show that these products represent a different kind of alternative, one that can combine many of the pros of the other main alternatives while eliminating many of the cons.

Plant-based and cultured meat systems attempt to satisfy consumer demand for meat without breeding, raising, or killing any animals (or at least not billions of animals) in the process. In short, plant-based meat refers to meat that comes from plants—e.g., a burger made out of veggies, grains, soy, and so on. In contrast, cultured meat refers to meat that comes from a cell culture—e.g., a burger made out of flesh that, instead of coming from an animal, comes from a scaffolding and growth medium in a brewery.

Most people are more familiar with plant-based meat than with cultured meat, since plant-based meat has been around for a much longer time than cultured meat has. In the East, recipes for plant-based meats date back centuries (Shurtluff and Aoyagi, 2014). In the West, recipes for veggie burgers date back to at least 1969, with the first documented sale of a veggie burger occurring in London in 1982 (Smith, 2014). At the present moment, multinational corporations are selling plant-based products all over the world. Veggie burgers now sit on menus and store shelves alongside plant-based chicken, turkey, bacon, sausage, hot dogs, and more. Initially these products were easy to distinguish from conventional meat. They might have resembled conventional meat enough to play a similar functional role in some social contexts, but everybody knew which was which. But increasingly, companies are finding ways to create plant-based meat that is difficult to distinguish from conventional meat. For example, companies such as Beyond Meat are researching ways to break plants down into core parts including “amino acids, lipids, water, and a trace amount of minerals and carbohydrates” and then restructure those parts so that they have the same structure as in conventional meat (Brown, 2016, p. 3). As this technology improves, the functional and structural gap between plant-based and conventional meat will continue to close.

In contrast to plant-based meat, cultured meat is still in early stages of development, though the idea of cultured meat has been around for a long time. Science-fiction writers have been imagining it since at least the end of the nineteenth century, and Winston Churchill predicted it by the end of the twentieth century (Rowland, 2017). The basic technology to produce cultured meat has also existed for decades; for example, Russell Ross performed the first documented cultured cultivation of muscular fibers in 1971 (Ross, 1971). However, use of this technology to produce meat is still relatively new. Researchers produced the first



sample—a fish filet made out of goldfish cells—at the turn of the twenty-first century (Benjaminson, Gilchrist, and Lorenz, 2002). In 2005 the Dutch Government agency SenterNovem started funding cultured meat research, and in 2013 Mark Post debuted the first edible cultured hamburger in London (Datar and Luining, 2015). Now, many companies are working on or supporting such efforts. Prominent examples include New Harvest and the Good Food Institute, which are making direct progress through research and development as well as indirect progress through advocacy and philanthropy.

Plant-based and cultured meat are a promising alternative to conventional meat. As with non-animal industrial agriculture (and unlike nonindustrial animal agriculture), a food system based on plant-based and cultured meat would be capable of producing healthy, affordable food with relatively few costs for humans, nonhumans, and the environment. For instance, one study predicts that cultured meat will require only 1 percent as much land and 4-18 percent as much water as conventional meat, and that it will emit only 4-22 percent as much greenhouse gas as conventional meat (Tuomisto and de Mattos, 2011).<sup>8</sup> Meanwhile, as with nonindustrial animal agriculture (and unlike non-animal industrial agriculture), a food system based on plant-based and cultured meat has the potential to produce the kind of food that most people actually want to eat (assuming that we can meet some of the challenges discussed below). In short, if we develop and market these products in the right kind of way, then we can provide the world with healthy, tasty, affordable meat without having to breed, raise, and kill hundreds of billions of animals; decimate forests, wetlands, and other natural spaces; increase risk of cancer, global pandemics, and other such health impacts; intensify the ecological impacts of global climate change; and so on along the way.<sup>9</sup>

At least in theory, then, plant-based and cultured meat seem to be exactly the kind of alternative that we need in order to move away from, rather than further toward, dependence on industrial animal agriculture. The question now is, How can we realistically move toward this solution without succumbing to the many challenges that stand in the way?

## 5. NEW QUESTIONS, CHALLENGES, AND OPPORTUNITIES

The final step in making the case for plant-based and cultured meat is to identify the new questions that these products are likely to raise and the new challenges and opportunities that supporters of these products are likely to face, and to show that we can answer these questions, meet these challenges, and take advantage of these opportunities. This step is doubly important: it is essential not only for making the case for plant-based and cultured meat but also for indicating how to realize the promise of these technologies rather than develop and market them in ineffective or counterproductive ways.

For an example of a promising technology that has not yet been able to fully live up to its promise, consider genetically modified organisms (GMOs). Once

hailed as a technological silver bullet that could usher in a green revolution and feed the world, GMOs are now widely regarded, rightly or wrongly, as more problem than solution at present. Part of the issue in this case has been technological: it turns out to be more difficult to engineer crops that are, say, flood and drought resistant than crops that are, say, herbicide and pesticide resistant. Another part of the issue is social and political. Many people are concerned that GMOs are “unnatural.” And, while companies could focus on goals such as flood and drought resistance in theory, many companies have not done so in practice, since they tend to make decisions based on short-term economic self-interest rather than on long-term moral, social, political, and economic considerations. As a result, the best-case scenario for GMOs at present is that people develop and market this technology in a positive direction moving forward, in spite of the fact that (a) many of the people who currently support GMOs are not prioritizing the right goals and (b) many of the people who currently prioritize the right goals are not supporting GMOs.<sup>10</sup>

Will plant-based and cultured meat suffer the same (short-term) fate as GMOs? That depends on what we do over the next decade. Plant-based and cultured meat are similar enough to GMOs that they will face many of the same challenges. But they are also different in certain ways—and we also have the benefit of hindsight—so supporters of plant-based and cultured meat may well be able to overcome these challenges if they are careful—and lucky. I will not be able to discuss every challenge that plant-based and cultured meat will face in this paper (nor will I be able to discuss any particular challenge in full detail). But my hope is to survey what I take to be some of the main challenges and say a bit about how supporters of plant-based and cultured meat might be able to overcome them.

### 5.1. Conceptual questions

First, conceptual and linguistic questions will arise. Plant-based and cultured meat will disrupt standard ways of thinking and talking about what we eat and who we are. And, since our concepts shape our experiences and our experiences shape our behaviour, these disruptions will be more than conceptual and terminological: they will be practical too. We will therefore have to try to clarify and/or modify our thinking and communicating about what we eat and who we are in ways that are both accurate and useful in light of these disruptions.

For an example of how plant-based and cultured meat will disrupt our thinking about what we eat, consider the following question: are plant-based and cultured meats real meat? This question is harder to answer than it might first appear. Many people think of meat as flesh that came from a once-living animal. But do they think that because meat is, in their view, *essentially* flesh that came from a once-living animal? We have at least three options. (These are not exhaustive.) First, we can say that meat is essentially flesh that came from a once-living animal. On this account, both the substance and origin of meat are essential, and so neither plant-based nor cultured meat counts as real meat, since they have

other origins. Second, we can say that meat is essentially flesh. On this account, the substance but not the origin of meat is essential, and so plant-based and cultured meats count as real meat whether or not they have the same origin as conventional meat (as long as they have the same substance, which some but not all will). Third, we can say that meat is, essentially, anything that plays the same functional—i.e., aesthetic and nutritional—role as conventional meat. On this account, neither the substance nor the origin of meat is essential, and so plant-based and cultured meat count as real meat whether or not they have the same origin or substance as conventional meat (as long as they have the same function, which many but not all will). Of course, similar questions will also arise for other animal products such as milk and eggs, and similar answers will be available in these cases as well.

Now consider two examples of how plant-based and cultured meat will disrupt our thinking about who we are. First, consider how these products will affect people whose self-conceptions involve meat consumption. This might include people who see their gender identity, sexual orientation, cultural identity, religious identity, national identity, professional identity, and so on as connected to meat consumption. In this case the question will be, Is my identity as someone who eats meat compatible with my eating plant-based and cultured meat instead of conventional meat? If so, then people with these identities can start replacing conventional meat with plant-based and cultured meat while keeping their sense of identity intact (though many of the standard ways of thinking and talking about meat consumption might have to change). If not, then people will have to ask, Should I try to keep my current identity, or should I adopt a new identity as someone who eats plant-based and cultured meat instead of conventional meat? Of course, similar questions will arise for cultural and religious practices and traditions that centre around meat as well. In this case people will have to ask, Are these practices and traditions compatible with our eating plant-based meat and cultured meat instead of conventional meat? And if not, how should we resolve this conflict?<sup>11</sup>

Similarly, consider how these products will disrupt our thinking about identities that involve *abstention* from meat consumption. Those whose identities involve such abstention might include ethical vegans as well as people whose cultural or religious identities involve respect for certain species of animal or adherence to certain kinds of custom. In this case the question will be, Is my identity as someone who never eats any meat at all, or who never eats certain kinds of meat, compatible with eating plant-based and cultured meat? If so, then people with these identities can start eating plant-based and cultured meat while keeping their sense of identity intact (with the same caveats as before). If not, then people will have to ask, Should I try to keep my current identity as someone who never eats any meat at all, or who never eats certain kinds of meat, or should I adopt a new identity as someone who eats plant-based meat and cultured meat? As before, similar questions will arise for cultural and religious practices and traditions that centre around not eating meat, and similar answers will be available for these questions. We will return to these issues below.

Of course, people express concepts through language, and so each of these conceptual questions will correspond to a linguistic question about meat and about identities involving eating meat and not eating meat. People are already debating these issues now. For example, proponents of conventional meat call conventional meat “real meat” and plant-based and cultured meat “fake meat” so that they can frame conventional meat as real and standard and plant-based and cultured meat as fake and nonstandard. They also describe meat eating as masculine and veganism as feminine so that they can draw from sexist assumptions about gender, power, and normalcy to frame meat eaters as strong and normal and vegans as weak and deviant (Adams, 1990). Meanwhile, proponents of plant-based and cultured meat call conventional meat “animals,” “bodies,” and/or “violence” and plant-based and cultured meat “clean meat,” “cultured meat,” and/or “cruelty-free meat” so that they can frame conventional meat as harmful and plant-based and cultured meat as (relatively) harmless.<sup>12</sup> As we move forward, it will be interesting to see how efforts to frame conventional meat as flesh, not food, interact with efforts to normalize plant-based and cultured meat through comparison with conventional meat.

One complication is that no matter how we answer these conceptual and linguistic questions in theory, we may find that for many people the origin, substance, and functional profile of food are bound together in practice. For example, some people think that plant-based and cultured meat are a threat to food culture, since, they think, food should be about aesthetics, not ethics. On the surface, this is a strange view to hold, since, even if we accept that food should be about aesthetics, plant-based and cultured meat will increase, not decrease, our options for gustatory pleasure (to say nothing of morally permissible gustatory pleasure). One possibility is that people are unaware of this fact. Another, compatible possibility is that people enjoy eating meat that they think came from a once-living animal more than meat that they think did not (whether or not these products are, in fact, substantively identical), in much the same way that many people enjoy eating food that they think came from a name-brand company more than food that they think did not (whether or not these products are, in fact, substantively identical).<sup>13</sup> If so, this would be disturbing, though not surprising. Either way, this tension reveals an important fact: when conceptual and linguistic disruptions occur, people can react defensively, in an attempt to preserve familiar ways of thinking, talking, and behaving. That will add to the social and political challenges that stand in the way of widespread adoption that we will consider below.

There is a sense in which these conceptual and linguistic questions are familiar. There have always been boundary cases that put pressure on standard ways of thinking and talking about food, and there have always been competing interests that motivate different answers to these questions. In the case of meat and identities related to meat consumption, these boundary cases have traditionally concerned the type of animal in question (e.g., are bivalves meat in the relevant sense?), the amount of animal in question (e.g., are foods that contain trace amounts of animal flesh meat in the relevant sense?), and (for identities involv-

ing abstention) the method of acquisition in question (e.g., is eating roadkill or scrounged meat compatible with veganism in the relevant sense?). But up until now these boundary cases have been exceptional enough that people could disagree about them (or not know what to think about them) while still preserving their identity as people who do, or do not, eat meat as a general matter. However, the prospect of plant-based and cultured meat changes all that. If people decide that these products count as real meat, then these “boundary cases” will not be exceptional at all. So, people will have to take a stand on whether or not to eat these products, and they may or may not then have to revise or replace certain aspects of their self-conceptions and self-descriptions as a result.

## 5.2. Social questions

There will also be social, cultural, and religious questions that are connected to these conceptual and linguistic questions. As we have seen, many people and groups have identities, practices, and traditions that centre around eating meat or not eating meat, and they will accept or reject plant-based and cultured meat based in part on how they see these products interacting with who they are and what they care about. So, in addition to (and as part of) asking how to revise our concepts of what we eat and who we are, supporters should also ask how to clarify and revise the relevant social, cultural, and religious practices and traditions—and how to persuade others to do the same.

One source of resistance to widespread adoption of plant-based and cultured meat will be personal. People like what they like, in part because they have preferences among foods that they have experience with, and in part because they have preferences against experiencing new kinds of food. So not only will there be resistance based on taste and habit. There will also be resistance based on the impression that plant-based and cultured meat are unnatural and, as a result, disgusting or dangerous. This may well happen more as plant-based and cultured meat become increasingly similar to conventional meat, since plant-based and cultured meat may then enter the uncanny valley where they disrupt our conceptual and perceptual systems and consequently appear distasteful to many people.<sup>14</sup>

Another source of resistance to widespread adoption will be cultural and religious. Food is central not only to many of our personal practices but also to many of our family, cultural, and religious traditions. People eat certain kinds of foods to mark certain kinds of occasions, and in some cases they tell stories about the food as part of the ritual. Of course, these stories are often misleading, since, for example, the idea of happy animals making noble sacrifices for human benefit often fails to square with the reality of modern industrial animal agriculture. Still, people are attached to these stories, and these attachments can be difficult to dislodge even if the stories are based on myth, and even if plant-based and cultured meat are not, in fact, any less compatible with the relevant cultural traditions than conventional meat is (especially given the reality of modern industrial animal agriculture).

Meeting these challenges requires persuading people to accept interpretations of, or revisions to, their personal, cultural, and religious identities, practices, and traditions to make these compatible with eating plant-based and cultured meat, so that supporting these products can be seen as identity preserving instead of as identity disrupting. However, while it might be clear that supporters should do this in theory, it might not be clear how they can do it effectively in practice. For example, there are two tempting strategies for persuading others to accept plant-based and cultured meat that supporters should, if not avoid, then at least be cautious about.

First, supporters should be cautious about focusing too much on rational appeals (such as education and argumentation) as well as too much on nonrational appeals (such as branding, marketing, and celebrity endorsements). Rational appeals are tempting because the relevant information and arguments are so compelling, and because nonrational appeals are often ineffective and counterproductive, especially in cases where one is advocating for a deviation from the status quo. And in this case, nonrational appeals in favour of “deviant” products such as plant-based and cultured meat are more likely to be seen as manipulative and, consequently, as objectionable than nonrational appeals in favour of “standard” products such as conventional meat. Meanwhile, nonrational appeals are tempting because they can shape our conceptions, perceptions, and behaviour in powerful ways, and because rational appeals are often ineffective and counterproductive, especially, again, in cases where one is advocating for a deviation from the status quo. And in this case, discourse around plant-based and cultured meat will be taking place in a conceptual, linguistic, social, political, and economic context that makes these products seem less appealing than conventional meat, which places supporters of the latter at a dialectical disadvantage. I think that the correct conclusion to draw is that thoughtful, strategic, rational appeals and (certain) nonrational appeals are both necessary. Supporters of plant-based and cultured meat should promote the benefits of these products as well as make them appear desirable through branding, marketing, celebrity endorsements, and so on (both in favour of plant-based and cultured meat and against conventional meat).<sup>15</sup>

Second, supporters should also be cautious about promoting plant-based and cultured meat to everyone directly, as well as about not promoting them to many people at all. Supporters might be tempted to promote them to many people directly because they might think, We have compelling information and arguments and we want to share them with as many people as possible. But that might be a mistake in many cases, since, if supporters of these products are coming primarily from one cultural group, then they might appear to be (as well as actually be) promoting these products in culturally imperialist ways.<sup>16</sup> Meanwhile, supporters might be tempted to not promote plant-based and cultured meat to many people at all because they might think, We can promote these products most effectively within our own culture, and we also want to avoid the appearance or reality of cultural imperialism. But that would be a mistake too, since our food system is a global collective-action problem that requires a global

collective-action solution. I think that the correct conclusion to draw here is that supporters should attempt to promote plant-based and cultured meat to everyone, but not always directly. In particular, they should attempt to promote plant-based and cultured meat (a) directly within their own culture and (b) indirectly within other cultures through collaboration with cultural insiders who can then promote them directly—as well as through engagement in multi-issue food activism and through the promotion of diversity, equity, and inclusion in food movements so that more cultural traditions are represented in these spaces in the first place.<sup>17</sup>

These social questions are related to the conceptual and linguistic questions discussed in the previous section. In particular, supporters of plant-based and cultured meat have to consider how their conceptions of meat as well as of personal, cultural, and religious identities, practices, and traditions involving meat will affect uptake of plant-based and cultured meat across cultures and languages. For example, if you want everyone to keep eating animals, then you might try to accomplish that in part by defining meat in terms of its origin (and using language to reinforce that) so that you can frame conventional meat as the only real meat. Meanwhile, if you want everyone to stop eating animals, then you might try to accomplish that in part by defining meat independently of its origin (and using language to reinforce that) so that you can frame plant-based and cultured meat as real meat too. Similarly, if you want everyone to keep eating animals, then you might try to accomplish that in part by interpreting cultural or religious identities, practices, and traditions as compatible with eating conventional meat and incompatible with eating alternatives (and using language to reinforce that). Whereas if you want everyone to stop eating animals, then you might try to accomplish that in part by interpreting cultural or religious identities, practices, and traditions as compatible with eating alternatives and incompatible with eating conventional meat (and using language to reinforce that). This might itself seem manipulative. But there is no neutral way to use language, and there is no objective fact of the matter about how to resolve disruptions in our current language, so we might have no choice but to think morally and politically about which ways of using language will be most useful moving forward.<sup>18</sup>

### 5.3. Political questions

There will also be political, economic, and technical questions that will be related to these conceptual, linguistic, social, cultural, and religious questions. What the general public thinks about these products will both impact and be impacted by what business and political leaders think about them—and whether they use their considerable resources to support or undermine these products. So, in addition to asking how to think and talk about plant-based and cultured meat and how to promote these products to the public, supporters should also be asking how to promote these products to business and political leaders.

One source of resistance to widespread adoption of plant-based meat and cultured meat will be political. As I indicated above, part of why individuals and groups may be resistant to plant-based and cultured meat is that countries such

as the United States have made conventional meat appear to be more affordable than it actually is through taxes, subsidies, and deregulation. For example, many major food corporations benefit from low taxes and high subsidies, and they also benefit from not having many laws that regulate their behaviour, not having much enforcement of these laws, and not having steep fines in cases of enforcement. The upshot is that many states have empowered major food corporations to consume land, water, and energy; pollute land, water, and air; and contribute to global antimicrobial resistance and anthropogenic climate change with few if any resulting internal costs. The general public is then responsible for paying for these externalized costs, which allows major food corporations to sell meat at artificially low prices. Meanwhile, plant-based meat and cultured meat experience different political treatment. Not only do they not enjoy the same level of political support as conventional meat, but they also face additional political obstacles, including possible legal challenges surrounding their use of terms associated with conventional meat.<sup>19</sup>

Another, related, source of resistance to widespread adoption will be economic. Part of why countries such as the United States have made conventional meat appear to be so accessible and affordable is that food corporations have, through donations and lobbying, made conventional meat appear worthy of support to politicians and, through marketing, made conventional meat appear desirable to the public. As a result, they both directly and indirectly persuade political leaders to support conventional meat more than the alternatives. And, while change is possible, a further obstacle is that many food corporations have a lot of power (which can make it difficult to work around them), and they also have incentive to maintain the status quo (which can make it difficult to work with them). In particular, they have a lot of power because of the vertical integration of our food system. Instead of having one company make food, another distribute it, another sell it, and so on, we have individual corporations doing all of the above, which reduces competition and increases profit for these corporations. These corporations then have incentive to maintain the status quo because they have incentive to maximize short-term economic self-interest rather than long-term economic self-interest and/or moral goods. And, rightly or wrongly, in many cases they appear to think that continuing current practices is a more responsible choice, by this standard, than adopting new practices that involve accepting expected short-term costs in exchange for expected long-term benefits.<sup>20</sup>

Another, related, source of resistance to widespread adoption will be technical. Part of why food corporations have promoted conventional meat so much is that they know how to make and sell these products and they have an infrastructure in place for doing so. In contrast, they do not know as much about how to make or sell plant-based or cultured meat or have an infrastructure in place for doing so. Especially in the case of cultured meat, some of the issue here is technological. For example, companies are currently able to make cultured duplicates of simple, relatively processed meats like hamburgers and chicken patties, but they are not yet able to make cultured duplicates of complex, relatively nonprocessed meats like steak or ribs. Additionally, it currently costs much more money to



produce a cultured hamburger or chicken patty than it costs to produce a conventional hamburger or chicken patty (even setting aside the effect of externalized costs). Fortunately, the cost of producing cultured meat has already gone down substantially, and it will likely keep doing so as research continues and other conditions change (though there are no guarantees about how far the price can go down). But, unless and until cultured meat becomes competitive with conventional meat (which may require both lowering the price of cultured meat and raising the price of conventional meat), this technical challenge will remain critically important.<sup>21</sup>

As before, it is crucial to emphasize how interconnected these challenges are, with each other as well as with the conceptual, linguistic, social, cultural, and religious issues discussed above. As we have seen, our current conceptual and linguistic frameworks concerning plant-based and cultured meat make it harder to find social, cultural, and religious support for these products, which, in turn, makes it harder to find political and economic support for these products, which, in turn, leads to challenges in research and development. Challenges in research and development then make it harder to find political and economic support for these products, which, in turn, makes it harder to find social, cultural, and religious support for these products, which, in turn, makes it harder to disrupt current conceptual and linguistic frameworks concerning these products.

These connections among challenges can make a transition away from conventional meat seem daunting, even hopeless. If each change is necessary for all the others, how can supporters of plant-based and cultured meat bring any of these changes about? But these connections can also be an opportunity. Granted, supporters of plant-based and cultured meat might not be able to fully bring about many of these changes in isolation. But they can at least make incremental progress with respect to many of these changes in isolation, and the more progress they make with respect to each, the more progress will become possible with respect to all. What this means is that supporters of plant-based and cultured meat can solve this (literal) chicken-and-egg problem by pursuing all of these changes at once: they can attempt to persuade people to think and talk about meat differently, attempt to persuade the public to demand alternatives to conventional meat, attempt to persuade politicians to support these alternatives, attempt to persuade corporate executives to develop these alternatives, attempt to persuade scientists to research these alternatives, and attempt to persuade activists, advocates, and philanthropists to support all of the above.

As I have been indicating throughout this paper, part of why collective incremental progress is likely to be promising with plant-based and cultured meat than with other alternatives is that plant-based meat and cultured meat are better positioned to be acceptable to a critical mass of relevant stakeholders. Compare this with the following: when animal activists have worked with food companies to implement new, more humane housing or killing systems, critics have claimed that these improvements do at least as much harm than good, since they humanewash and greenwash industrial animal agriculture at least as much as

they mitigate its harms. Critics have also predicted that this strategy of incremental reform will lead to a dead end, since food companies will stop working with food activists as soon as they stop identifying mutually advantageous reforms (and any reform that makes a real difference for humans, nonhumans, or the environment will likely not be mutually advantageous) (Francione and Garner, 2010). But even if we share this concern about incremental reform in general, we might see incremental reform concerning plant-based and cultured meat in particular as a partial exception. That is, we might see plant-based and cultured meat as the rare kind of innovation that, if developed and promoted in the right kind of way, could allow for mutually beneficial moderate change in the short term as well as mutually beneficial radical change in the long run. As a result, these products have the potential to be acceptable to many relevant parties in the short term as well as in the long run, including activists who are normally wary of changes that companies see as acceptable and companies who are normally wary of changes that activists see as acceptable.

Does that mean that food activists, food companies, and other stakeholders should think of plant-based and cultured meat as part of the ideal food system they should be aiming for in the long run? Maybe, maybe not. It might be that everyone would find such a food system acceptable, or it might be that at some point, a point that such a food system might help make possible, people would choose to transition to a fully (or mostly) meatless food system. Either way, plant-based and cultured meat appear to represent a rare opportunity to bring everyone to the table so that they can work together to transition away from conventional meat. If food companies can sell the same kind of product at an (eventually) lower price, they can rationally choose to support this technology. Then politicians might do the same. Then the general public might do the same. And vice versa.<sup>22</sup>

#### 5.4. Moral questions

Finally, plant-based and cultured meat will provoke moral questions, which are related to all of the above questions. In short, all of the above questions are primarily about how to effectively promote plant-based and cultured meat in spite of obstacles that may stand in the way. However, supporters also face questions about whether or not plant-based meat and cultured meat are morally permissible in the first place. Moreover, many of these questions will come from precisely the people who most want to bring an end to industrial animal agriculture: animal and environmental ethicists, activists, and advocates. Many of their concerns are reasonable, and their support will be important. So, in addition to asking pragmatic questions about how to promote these products, supporters should also be asking principled questions about the ethics of these products.

One moral concern that many people have is that, as we have seen with GMOs, plant-based meat and cultured meat are “unnatural.” Why are people concerned about this? They could be drawing from the idea that human intervention in the

natural order is wrong in itself, and/or from the idea that human intervention in the natural order does more harm than good. Insofar as they are drawing from the former idea, then the question we should be asking is, Why think that human intervention in the natural order is wrong in itself? After all, as Mill (1904) argues, human activity is either natural or not. If human activity is natural, then it is never an intervention in the natural order, and so is never wrong on this view. If human activity is not natural, then it is always an intervention in the natural order, and so is always wrong on this view. Either way, this is not an especially useful guide to action. In contrast, insofar as the people making this argument are drawing from the idea that human intervention in the natural order does more harm than good, then the question we should be asking is, Why think that human intervention will do more harm than good in this case? After all, realistically, the choice in this case is between two kinds of human intervention in the natural order: (1) conventional meat and (2) plant-based/cultured meat. And one might add that while we do not know what every impact of plant-based meat and cultured meat will be, it is hard to imagine that they could have anything approaching the negative impact that conventional meat has.<sup>23</sup>

In response to this claim, one might argue that we have more alternatives available to us than plant-based and cultured meat: we also, notwithstanding the concerns raised above, have plant-based foods that in no way, shape, or form resemble meat. One might then argue that, while plant-based meat and cultured meat might do more good than harm in the short term, they will do more harm than good in the long run relative to fully “meatless” alternatives. Why? It is because, insofar as plant-based meat and cultured meat resemble conventional meat, they will support the idea of animals as in the “category of the edible” (Gruen, 2011, p. 101-104) as well as the idea of corporate control over the means of food production.<sup>24</sup> Of course, people disagree about these predictions, and they also disagree about what follows from these predictions for the ethics of plant-based and cultured meat. Ultimately, this is an extension of the debate considered above, about whether plant-based meat and cultured meat risk greenwashing and humanewashing harmful systems and leading to a dead end. However, whereas we were previously considering these questions at the level of particular industries, we are now considering them at a broader and deeper level. In particular, the concern here is that, if we pursue the end of animal agriculture in the wrong way (i.e., in a way that supports rather than disrupts oppressive ideologies and systems), then we will neither reach our goal (because we will still reach a dead end) nor be praiseworthy for however far we get (because we will still be supporting oppressive ideologies and systems as a means to our end).

I think that this kind of concern is reasonable. However, I also think that it would be a mistake to reject plant-based and/or cultured meat on the basis of this kind of concern. Instead, I think that people should support these products as part of the solution but not as the full solution. On this view, some people should be promoting moderate change within the relevant ideologies and systems (e.g., by promoting plant-based and cultured meat) and other people should be promot-

ing radical change to the relevant ideologies and systems (e.g., by challenging the ideas of human supremacy and of corporate control over the means of food production). Plausibly, many people should be doing both. Granted, this kind of pluralistic approach will likely produce conflict and disagreement within the animal and environmental movements. But it will also allow these movements to do more good overall than they would otherwise be able to do. For example, advocacy for radical change can make adoption of plant-based and cultured meat seem more reasonable in the short term (since plant-based and cultured meat can be framed as a moderate approach to addressing the concerns being raised). And then adoption of plant-based and cultured meat can make radical change seem more reasonable in the long run (since the more people achieve independence from harmful systems, the more people are willing to see those systems for what they are).

This point is related to tensions that I have been discussing throughout this paper. In particular, with respect to all of the challenges that we considered, there is a tension between (a) pursuing continuity with current systems where this is useful and (b) pursuing disruption to current systems where this is useful. For example, with respect to conceptual issues, there is a tension between showing that plant-based and cultured meat is compatible with current discourse and challenging this discourse.<sup>25</sup> With respect to social issues, there is a tension between showing that plant-based and cultured meat is compatible with current practices and challenging these practices. And with respect to political issues, there is a tension between showing that plant-based and cultured meat is compatible with current systems and challenging these systems. It is hard to find and strike the right balance in different situations, but I think that this is ultimately what we should be trying to do. (Of course, this is not to say that we should never advocate for extreme views too, since this kind of advocacy might be an important part of a division of labour that allows for the animal and environmental movements to find and strike the right kind of balance overall.)

There is one moral issue worth mentioning here, which is that at least some ways of producing plant-based and cultured meat still make use of nonhuman animals as part of the research process (e.g., some plant-based-meat producers currently test products on animals) as well as part of the production process (e.g., cultured-meat researchers currently use nonhuman fetal serum as a growth medium). Granted, even if these practices continued, plant-based- and cultured-meat producers would still not be causing nearly as much harm as conventional-meat producers, but they would still be causing substantial harm. As a result, some animal activists may object to some plant-based- and cultured-meat production on the grounds that it harms animals as mere means to our ends. But we can offer two responses to this objection. First, if producers can replace these methods of research and production with others, then these concerns will disappear (and they may well be able to do that soon). Second, we should keep in mind that no food system is harmless. Even plant-based farming harms wild animals in many ways. As a result, our goal should not be to do no harm at all through food production. Our goal should rather be to do as little harm as possible through

food production. And I think that if we develop and promote plant-based and cultured meat in the right kind of way, these products can be part of the food system that can accomplish this aim, at least in the short term.

## **6. CONCLUSION**

We are currently at a crossroads. With industrial animal agriculture, we created a food system that causes an unimaginable amount of harm in the world, and this amount of harm is rising with each passing year. We also, for the first time in a long time, have a possible way out—a way out that, at present, does not yet have a reputation, good or bad, with the general public, business leaders, or political leaders. In ten years, that might not be the case. So, what we do over the next decade in terms of developing plant-based meat and cultured meat, labeling and marketing them, and introducing them to all the stakeholders discussed here may well determine whether or not we are able to right this wrong before a global pandemic or global ecological collapse forces our hand.

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## NOTES

- <sup>1</sup> For more on the nonhuman impacts of industrial animal agriculture, see Pew Commission, 2008; Schlottmann and Sebo, 2018; and Singer, 2009. For an estimate of the total number of humans who have ever lived throughout history, see <https://www.prb.org/howmanypeople-haveeverlivedonearth/>.
- <sup>2</sup> For more on these issues involving production and consumption, see sections 11 and 12 in Barnhill, Budolfson, and Doggett, 2017.
- <sup>3</sup> For more, see Foer, 2010; Pew Commission, 2008; and Schlottmann and Sebo, 2018.
- <sup>4</sup> For more, see Pew Commission, 2008; Schlottmann and Sebo, 2018; and Steinfeld, 2006.
- <sup>5</sup> See McWilliams, 2009, and Stănescu, 2016, for more on these issues.
- <sup>6</sup> I am using “vegan” instead of “vegetarian” since, while this paper is primarily about production and consumption of meat, many of the considerations I discuss extend to production and consumption of dairy, eggs, and other animal products as well.
- <sup>7</sup> See Henning, 2016, for more on these issues.
- <sup>8</sup> Mattick et al., 2015, argue that these estimates are optimistic, and they may be correct. However, even if they are, cultured meat would still likely consume much less land and water and produce much less greenhouse gas than conventional meat.
- <sup>9</sup> For more on the relative impacts of conventional meat and cultured meat, see Rorheim et al., 2016.
- <sup>10</sup> For more on the past and future of GMOs, see McWilliams, 2009.
- <sup>11</sup> For more on these cultural and religious issues, see Foer, 2010; Cochrane, 2012.
- <sup>12</sup> See Patrick-Goudreau and Shapiro, 2017, for more on the semantics of meat.
- <sup>13</sup> See Kühn and Gallinat, 2013, for more on the relationship between brand perception and taste experience.
- <sup>14</sup> See Rozin, 2006, for discussion of the psychology of judgments about naturalness regarding food.
- <sup>15</sup> See Young, 2001, for discussion of the limits of rational discourse in this kind of context.
- <sup>16</sup> See Tian et al., 2016, for discussion of recent meat-consumption trends in China, and see Bajželj and Bothra, 2016, for discussion of recent meat-consumption trends in India.
- <sup>17</sup> For discussion of the ethics of multi-issue food activism, see Holt-Giménez, 2011; and Sebo, 2018. For organizations that promote diversity, equity, and inclusion within animal advocacy, see Critical Diversity Solutions and Encompass.
- <sup>18</sup> One complication here is that, as Marder, 2016, discusses, the word that people have for meat in some languages, such as English, is less connected to the substance and origin of meat than the word that people have for meat in other languages, such as French.
- <sup>19</sup> For more on political support for industrial animal agriculture, see Foer, 2010, p. 149-200.
- <sup>20</sup> For more on these economic trends, see Hoffman, 2013.
- <sup>21</sup> For more on these technical issues, see Weele and Tramper, 2014.
- <sup>22</sup> See McMullen, 2016, for more on these issues.
- <sup>23</sup> See also Gruen, 2011; and Schlottmann and Sebo, 2018.
- <sup>24</sup> See Miller, 2012; and Milburn, 2016, for discussion of this kind of critique.
- <sup>25</sup> As Brianna Donaldson puts the point, “Is there a way to overconform to the language of ‘meat’ that simultaneously repurposes the term to make real changes for animals, human health and the environment while still challenging historically racist, nationalist, speciesist and sexist narratives attached to meat consumption? This effort is unfolding before us” (Donaldson, 2016, p. 195).

## REFERENCES

Adams, Carol, *The Sexual Politics of Meat: A Feminist-Vegetarian Critical Theory*, New York, Bloomsbury, 1990.

———, “Ethical Spectacles and Seitan-Making: Beyond the Sexual Politics of Meat—A Response to Sinclair,” in Brianne Donaldson and Christopher Carter (eds.), *The Future of Meat without Animals*, London, Rowman & Littlefield International, 2016, p. 249-256.

Bajželj, Ana and Shivani Bothra, “The Rise of Non-Veg: Meat and Egg Consumption and Production in Contemporary India,” in Brianne Donaldson and Christopher Carter (eds.), *The Future of Meat without Animals*, London, Rowman & Littlefield International, 2016, p. 67-86.

Benjaminson, M. A., J. A. Gilchrist, and M. Lorenz, “In Vitro Edible Muscle Protein Production System (MPPS): Stage 1, Fish,” *Acta Astronaut*, vol. 51, no. 12, 2002, p. 879-889.

Bhumitra, Jaya and Bruce Friedrich, “The Future of Animals, the Future of Food: Two Organizations Endeavour to Change Public Attitudes and Appetites,” in Brianne Donaldson and Christopher Carter (eds.), *The Future of Meat without Animals*, London, Rowman & Littlefield International, 2016, p. 111-120.

Brown, Ethan, “Beyond Meat,” in Brianne Donaldson and Christopher Carter (eds.), *The Future of Meat without Animals*, London, Rowman & Littlefield International, 2016, p. 1-3.

Calarco, Matthew, “Altermobilities: Animals, Mobility and the Future of Meat,” in Brianne Donaldson and Christopher Carter (eds.), *The Future of Meat without Animals*, London, Rowman & Littlefield International, 2016, p. 267-276.

Carter, Christopher, “Vegan Soul: Moving beyond (Animal) Meat in Black Communities,” in Brianne Donaldson and Christopher Carter (eds.), *The Future of Meat without Animals*, London, Rowman & Littlefield International, 2016, p. 217-228.

Cochrane, Alasdair, *Animal Rights without Liberation: Applied Ethics and Human Obligations*, New York, Columbia University Press, 2012.

Datar, Isha and Daan Luining, “Mark Post’s Cultured Beef,” *New Harvest*, 2015, Accessed October 15 2017: [http://www.new-harvest.org/mark\\_post\\_cultured\\_beef](http://www.new-harvest.org/mark_post_cultured_beef)

Datar, Isha, Erin Kim and Gilonne d’Origny, “New Harvest: Building the Cellular Agriculture Economy,” in Brianne Donaldson and Christopher Carter (eds.), *The Future of Meat without Animals*, London, Rowman & Littlefield International, 2016, p. 121-132.

Donaldson, Brianne and Christopher Carter (eds.), *The Future of Meat without Animals*, London, Rowman & Littlefield International, 2016.

Donaldson, Brianne, “Exploiting Fantasy: Overconformity in Animal Agriculture, Meatless Meat and Animal Ethics,” in Brianne Donaldson and Christopher Carter (eds.), *The Future of Meat without Animals*, London, Rowman & Littlefield International, 2016, p. 177-200.

Ferrari, Arianna, “Envisioning the Future of Animals through In Vitro Meat,” in I. Anna S. Olsson, Sofia M. Araújo, and M. Fátima Vieira (eds.), *Food futures: Ethics, Science and Culture*, conference proceedings, 2016, p. 265-270.

Ferrari, Arianna and Andreas Lösch, "How Smart Grid Meets In Vitro Meat: On Visions as Socio-Epistemic Practices," *Nanoethics*, vol. 11, 2017, p. 75-91.

Foer, Jonathan Safran, *Eating Animals*, New York, Back Bay Books, 2010.

Francione, Gary and Robert Garner, *The Animal Rights Debate: Abolition or Regulation?*, New York, Columbia University Press, 2010.

Gross, Aaron, "Making Meaning without Meat: A How-To Guide," in Brianne Donaldson and Christopher Carter (eds.), *The Future of Meat without Animals*, London, Rowman & Littlefield International, 2016, p. 257-266.

Henning, Brian, "Towards 2050: The Projected Costs of and Possible Alternatives to Industrial Livestock Production," in Brianne Donaldson and Christopher Carter (eds.), *The Future of Meat without Animals*, London, Rowman & Littlefield International, 2016, p. 7-35.

Hoffman, Beth, "Behind the Brands: Food Justice and the 'Big 10' Food and Beverage Companies," Oxfam, 2013. Accessed October 10 2017: <https://www.behindthebrands.org/images/media/Download-files/bp166-behind-brands-260213-en.pdf>

Holt-Giménez, Eric (ed.), *Food Movements Unite!*, Oakland, CA, Food First Books, 2011.

Koba, Mark, "Fake Meat Sales Are Growing, But Is it Really Better For You?," *Fortune*, 2015. Accessed June 1 2017: <http://fortune.com/2015/05/11/meatless-meat-sales/>

Kühn, Simone and Jürgen Gallinat, "Does Taste Matter? How Anticipation of Cola Brands Influences Gustatory Processing in the Brain," *PLoS ONE*, vol. 8, no. 4, 2013, e61569.

Marder, Michael, "Meat without Flesh," in Brianne Donaldson and Christopher Carter (eds.), *The Future of Meat without Animals*, London, Rowman & Littlefield International, 2016, p. 101-110.

Mattick, Carolyn, Amy Landis, Braden Allenby, and Nicholas Genovese, "Anticipatory Life Cycle Analysis of In Vitro Biomass Cultivation for Cultured Meat Production in the United States," *Environ. Sci. Technol.*, vol. 49, no. 19, 2015, p. 11941-11949.

McMullen, Steve, "An Ethical Consumer Capitalism," in Brianne Donaldson and Christopher Carter (eds.), *The Future of Meat without Animals*, London, Rowman & Littlefield International, 2016, p. 35-49.

McWilliams, James, *Just Food: Where Locavores Get It Wrong and How We Can Truly Eat Responsibly*, New York, Hachette Book Group, 2009.

Milburn, Josh, "Chewing Over In Vitro Meat: Animal Ethics, Cannibalism and Social Progress," *Res Publica*, vol. 22, no. 3, 2016, p. 249-265.

Mill, John Stuart, 1904, "On Nature," at [http://www.lancs.ac.uk/users/philosophy/texts/mill\\_on.htm](http://www.lancs.ac.uk/users/philosophy/texts/mill_on.htm)

Miller, John, "In Vitro Meat: Power, Authenticity, and Vegetarianism," *Journal for Critical Animal Studies*, vol. 10, no. 4, 2012, p. 41-63.

Pachirat, Timothy, *Every Twelve Seconds: Industrialized Slaughter and the Politics of Sight*, New Haven, Yale University Press, 2013.



Patrick-Goudreau, Colleen and Paul Shapiro, "The Semantics of Meat," Animalogy Podcast, 2017. Accessed June 1 2017: <https://www.colleenpatrickgoudreau.com/the-semantics-of-meat-with-paul-shapiro/>

Pew Commission on Industrial Farm Animal Production, *Putting Meat on the Table*, 2008. Accessed December 15, 2016. <http://www.pewtrusts.org/en/research-and-analysis/reports/2008/04/29/putting-meat-on-the-table-industrial-farm-animal-production-in-america>

Rorheim, A., A. Mannino, T. Baumann, and L. Caviola, "Cultured Meat: An Ethical Alternative to Industrial Animal Farming," *Sentience Politics*, 2016, p. 1-14.

Ross, Russell, "The Smooth Muscle Cell," *J Cell Biol*, vol. 50, no. 1, 1971, p. 172-186.

Rowland, Michael, "Clean Meat: A Bold Prediction May Finally Come True," *Forbes*, 2017. Accessed August 15 2017: <https://www.forbes.com/sites/michaelpellmanrowland/2017/06/12/clean-meat-a-bold-prediction/#471748166659>

Rozin, Paul, "Naturalness Judgments by Lay Americans: Process Dominates Content in Judgments of Food or Water Acceptability and Naturalness," *Judgment and Decision Making*, vol. 1, no. 2, 2006, p. 91-97.

Schlottmann, Christopher and Jeff Sebo, *Food, Animals, and the Environment: An Ethical Approach*, New York, Routledge, 2018.

Sebo, Jeff, "Multi-Issue Food Activism," in Anne Barnhill, Mark Budolfson, and Tyler Doggett (eds.), *The Oxford Handbook of Food Ethics*, Oxford, Oxford University Press, 2018.

Shurtleff, William and Akiko Aoyagi, *History of Meat Alternatives (965 CE to 2014): Extensively Annotated Bibliography and Sourcebook*, Soyinfo Center, 2014.

Sinclair, Rebekah, "The Sexual Politics of Meatless Meat: (In)Edible Others and the Myth of Flesh without Sacrifice," in Brianna Donaldson and Christopher Carter (eds.), *The Future of Meat without Animals*, London, Rowman & Littlefield International, 2016, p. 229-248.

Singer, Peter, *Animal Liberation*, New York, Harper Perennial Modern Classics, 2009.

Smith, K. Annabelle, "The History of the Veggie Burger," Smithsonian.com, 2014. Accessed September 1, 2017: <https://www.smithsonianmag.com/arts-culture/history-veggie-burger-180950163/>

Stănescu, Vasile, "Beyond Happy Meat: The (Im)Possibilities of 'Humane,' 'Local' and 'Compassionate' Meat," in Brianna Donaldson and Christopher Carter (eds.), *The Future of Meat without Animals*, London, Rowman & Littlefield International, 2016, p. 133-154.

Steinfeld, Henning, *Livestock's Long Shadow*, Food and Agriculture Organization of the United Nations, 2006. Accessed December 15, 2016. <http://www.fao.org/docrep/010/a0701e/a0701e00.htm>

Stephens, N., Kramer, K., Denfeld, Z. and Strand, R., *What Is In Vitro Meat? Food Phreaking #2*, The Center for Genomic Gastronomy, 2015. Accessed June 1 2017: <http://bura.brunel.ac.uk/handle/2438/12562>

Tian, Song, Yao Wang, and Mo Zhao, "The 'Vegetable Basket Project': Tracking the Increase of Meat Production and Consumption in China since the 1980s," in Brianna Donaldson and

Christopher Carter (eds.), *The Future of Meat without Animals*, London, Rowman & Littlefield International, 2016, p. 49-66.

Tuminello, Joseph, "The Future of Industrial Agriculture: An Environmental Justice Perspective," in Brianne Donaldson and Christopher Carter (eds.), *The Future of Meat without Animals*, London, Rowman & Littlefield International, 2016, p. 155-177.

Tuomisto, Hanna L. and M. Joost Teixeira de Mattos, "Environmental Impacts of Cultured Meat Production," *Environ. Sci. Technol.*, vol. 45, no. 14, 2011, p. 6117-6123.

Vidal, John. "The Future of Food," *The Guardian*, 2012. Accessed June 1 2017: <https://www.theguardian.com/global-development/2012/jan/22/future-of-food-john-vidal>.

Weele, Cor van der and Johannes Tramper, "Cultured Meat: Every Village Its Own Factory?" *Trends in Biotechnology*, vol. 32, no. 6, 2014, p. 294-296.

Wolpa, Adam, "Seeing Meat without Animals: Attitudes for the Future," in Brianne Donaldson and Christopher Carter (eds.), *The Future of Meat without Animals*, London, Rowman & Littlefield International, 2016, p. 87-96.

Wurgaft, Benjamin Aldes, "But Will the Lab-Grown Meat be Kosher?," *The Revealer*, 2016. Accessed June 1 2017: <https://wp.nyu.edu/therevealer/2016/11/07/but-will-the-lab-grown-meat-be-kosher/>

Young, Iris, "Activist Challenges to Deliberative Democracy," *Political Theory*, vol. 29, no. 5, 2001, p. 670-690.