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Culturing Food: Bioart and In Vitro Meat

Allison Carruth

In a 1961 essay, Roland Barthes argues that a central feature of modernity is the proliferation of ‘social situations’ in which food serves not just to nourish bodies but to communicate identities and ideas – from everyday leisure activities (consider both the farmers’ market and fast food court) to spaces of work (think of the Google café).¹ Today, food is, indeed, *everywhere*. Where one eats serves to mark one’s class, profession, political affiliation, notion of community and relationship both to tradition and to innovation. In turn, contemporary food culture embodies several dimensions of postindustrial society: the commodification of experiences along with products, the simultaneous development of global markets and subculture niches and, finally, the conspicuousness of consumption (to invoke Thorstein Veblen, who no doubt would have been intrigued by the cultural phenomenon known as ‘food porn’).² This argument speaks to the current ubiquity of food as a topic of conversation, site of political protest, field of research and engine of imaginative literature and art practice. That ubiquity stems, as I argue elsewhere,³ from how fully contemporary food culture at once embodies and contests modernity as well as from the power that nation-states, multinational corporations and science and technology institutions have gained in a postindustrial era via agriculture – or what the *Harvard Business Review* termed in 1955 agribusiness.⁴

Monsanto is arguably one icon of that power as the life science corporation that owns GMO patents too numerous to count, from the growth hormone rBGH to the transgenic seed *Bt* corn.⁵ Over the last two decades, a number of social movements and cultural practices have taken shape in opposition to Monsanto in particular and agribusiness in general. In the United States, the so-called locavore movement to re-connect consumers with food producers and to promote 100-mile-radius diets has been particularly effective in capturing popular and political attention. This farm-to-table alternative to agribusiness has, on the one hand, been charged with elitism and, on the other, proven vulnerable to cooptation, as evident in fast food marketing campaigns that tap into the popularity of the locavore by inviting consumers to track the origins of their meals through bar code technology and interactive mapping tools. Chipotle offers a striking instance of this marketing strategy with its *Back to the Start* commercial (an animated short that imagines a return to preindustrial agriculture) and its cagey pledge to source ‘at least 50% of at least one produce item from local farms when it is seasonally available’.⁶ Such a pledge draws into relief how dominant the system of industrially farmed and globally distributed

foodstuffs remains. Despite that dominance, the multiple movements for food system change – whether invested in artisanal foods or anti-globalization politics – continue to gain steam.

On a provocative parallel track to both agribusiness and these social movements is the cultural field of bioart, a moniker coined in 1997⁷ to describe the diverse practices of visual artists, avant-garde writers and tactical media groups who experiment with what Joanna Zylińska terms the ‘soft technologies’ of biology.⁸ Among the most famous of bioart projects is Eduardo Kac’s 1999 work *Genesis*, a technically virtuosic yet playfully interactive piece that ‘translates’ *Genesis 1.26* first into Morse code and then, via a conversion formula, into a DNA sequence termed ‘the artist’s gene’. With the help of biomedical researchers, Kac had the genetic sequence inserted into *E. coli* bacteria through plasmid molecules containing a fluorescent protein. He then installed the mutated bacteria population in a gallery space under protective glass, a video projector and a UV light that viewers could control to produce further mutations.⁹ In a recent account of the many forms that bioart takes, critic Robert Mitchell distinguishes ‘prophylactic’ projects, which represent biotechnology and the problems associated with it in other media, from what he terms vitalist bioart, which immerses its audiences in the media of biology and biotechnology and which delineates the work of artists ranging from polymath Natalie Jeremijenko (co-creator of *The Biotech Hobbyist* and *Creative Biotechnology: A User’s Guide*) to the tactical media collective Critical Art Ensemble (CAE).¹⁰ Jennifer Willet defines bioart in similar terms as interactive and immersive.¹¹ Even as bioartists employing ‘soft technologies’ often work with or within science labs, they in many cases promote what Beatriz da Costa calls ‘public amateurism’.¹² Contra Zylińska’s contention that bioartists tend either to ‘excessively didactic’ critiques of science or to uncritical ‘techno-hype,’ Da Costa argues that bioartists aspire less to achieve ‘expert status within the sciences’ as to foster ‘hobbyism and do-it-yourself home recipes’.¹³

This culinary metaphor recurs in bioart primers – a pattern that invites us to ask whether cultural histories of alchemy, cookery and eating in public may be as important to bioart as emergent life science research methods and biotechnological media. If a company like Monsanto venerates technological R&D as the means to meet world hunger while a nonprofit organization such as Slow Food International promotes artisanal cuisines and heirloom seed stocks, many bioartists envision food to be both *biological material* and *conceptual fodder*. At stake in several of these projects, moreover, is a deliberately playful intervention in the commercial structure of twenty-first-century agriculture and cuisine. From CAE’s *Free Range Grain* project (a kind of mobile lab for testing foods from your pantry for GMOs) to Oron Catts and Ionat Zurr’s *Disembodied Cuisine* (which uses techniques of tissue culturing to create meat in vitro), bioartists are mixing artistic and scientific experimentation with the DIY ethos of home chefs and backyard gardeners. Culturing foods in lab settings and then bringing these novelties into the public spaces of galleries, exhibition halls and even cooking demonstrations, such projects muddy the boundaries between synthetic and organic and animal and plant. These experiments in *food culturing*, which are also experiments in re-culturing how, what and where we eat, resonate with feminist STS scholarship on technology and embodiment.¹⁴ In particular,

bioartists who work with food put into practice Jane Bennett's idea that the edible world is best understood as an assemblage (a 'hustle and flow') of bodies and beings.¹⁵ In this vein, those bioartists who culture food are taking up a key premise of agribusiness: that profit inheres in intellectual property and, hence, in demarcating the boundaries between every gene, every organism and every manufactured product. Such taxonomies are crucial to the postindustrial structure of the food system in that differences in kind – for example, between Monsanto's *Bt* corn and corn-fed beef or between an Idaho Russet and a purple fingerling potato – are what make food simultaneously commodifiable and culturally meaningful. The art-science labs and tactical media groups that this essay examines are disrupting these biological and social taxonomies. In the process, I argue, they are cultivating an open-source bioculture¹⁶ as an oppositional alternative to the privatized and instrumentalist paradigm of agribusiness.

Free Range Grain and the Genetic Public Sphere

In 2006, *Seed* magazine published an op-ed that may have had bioart in mind in its call to unseat science as the 'sole mediator' of knowledge, a status that 'depends upon one unstated assumption: While art cycles with the fashions, scientific knowledge is a linear ascent. The history of science is supposed to obey a simple equation: Time plus data equals understanding. One day, we believe, science will solve everything'.¹⁷ The columnist goes on to envision a 'fourth culture' of art-science collaboration that works to posit new research questions and to create a 'positive feedback loop' between artistic and scientific experimentation, thus alluding to C. P. Snow's 1959 lament about the cultural division between scientific research and creative production and to literary agent John Brockman's more recent proposal that scientists who write accessible nonfiction can foster a 'third culture' bridge between expert and non-expert communities.¹⁸ Although the *Seed* article rejects this very distinction between the scientific expert and the layperson, it ultimately paints too rosy a picture of art-science in glossing over how institutions of funding and research constrain the role and artists. In response, I would draw a distinction between art-science labs, which have popped up across Europe, Australia and the Americas, and bioart practice, which tends to exceed the institutional parameters of both science and art. Nicole Anderson makes a kindred observation in her argument that projects such as Jeremijenko's *Knowledge Virus Research Station* reject the divisions between 'scientist and the general public, the art exhibit and the larger world, the artist and the viewer'.¹⁹ Although bioart builds on avant-garde art practices, it unravels their anthropocentric conventions by working on the scale of tissues, cells and molecules to cultivate not research to be turned into technologies for human use nor aesthetic translations of that research but rather prototypes that test out 'alternate living structures and environments'.²⁰ Thierry Bardini contends that bioart makes the 'cyborg' and 'artificial' bodies populating gallery environments (like the genetic mutation in Kac's *Genesis*) 'invisible to the piece's audience'.²¹ However, when we examine bioart that engages with the culturing of food we find that not only the microscopic and computational structure of genes is at stake but also the porous and unstable nature of ecosystems – or what

Donna Haraway, in her definition of companion species, calls the ‘contact zones of the fleshy practices of eating together’.²²

Bioartists who work with edible matter make visible both the ecosystems and the technologies that agribusiness renders profitable in churning out trademarked products (Roundup Ready™ soy beans and Tofuti™ frozen novelties, for example). Consider CAE’s 2003–2004 project *Free Range Grain*. Responding to the wide dispersion of GMOs since the early nineties, *Free Range Grain* mixed tactical media with science education in a portable lab where participants could test foods from their pantries for traces of recombinant DNA. The installation, in short, turned consumers of food commodities into biotech hobbyists. With an eye toward breaking up the corporate monopoly on both agricultural information and agricultural inputs, *Free Range Grain* spurred the creation of a genetic public sphere in which technical expertise could morph into experiential know-how: ‘We want[ed] to bring the routinized processes of science to the public – let them see them and act within them. [...] The non-specialist public does not have to leave the manufacture of the discourse and policies surrounding issues of biotechnology to the experts’.²³ As Mitchell observes, *Free Range Grain* thus promoted an open flow of information about GMOs that disrupted the economics of the modern food system by redirecting ‘flows of commercial food products, such as vegetables and breakfast cereals, into the gallery space and then link[ing] these commodities with biological research lab tools such as polymerase chain reaction (PCR) unit’ as well as with participant-viewers.²⁴

The group’s commitments to educating the public in the methods of genetic engineering and to liberating GMOs from the confines of private labs and licensed farms landed them, not surprisingly, in political hot water. *Free Range Grain* ran aground when the group was preparing to install the exhibit in the United States at Mass MoCA. In May 2004, the FBI arrested Kurtz and his geneticist collaborator Robert Ferrell for alleged bioterrorism after they learned that Kurtz had biological samples in his home studio.²⁵ Although the charges against Kurtz were first downgraded to mail fraud and eventually dismissed, the initial bioterrorism allegation and protracted trial demonstrated how radical *Free Range Grain* was in the United States, where life science companies like Monsanto exert political power to prevent the labeling of foods containing GMOs and to protect the value of patented biotechnologies. The mail fraud charge, as Lisa Lynch points out, stood in ‘for a government indictment of scientific amateurism’ in that it indicted Ferrell for mailing biological research materials to a non-scientist (or in more technical terms, a person who was not a registered and card-carrying member of the American Type Culture Collection).²⁶ Lynch explains that scientists, who in the past had been critical of CAE for dabbling with genetics, rallied around Kurtz during the trial to protest ‘what they saw as a crackdown on both artists and scientists’.²⁷ The case highlighted, that is, the difference between art-science, which has been well funded by private foundations and government funding agencies, and bioart, which moves scientific methods and technologies outside of the lab and into cultural and artistic spaces. It is this re-location of science into public, interactive and hobbyist contexts that arguably made the work of CAE threatening enough to inspire bioterrorism charges.²⁸ The case of *Free Range Grain* thus highlights the potential of bioart to radically contest the institutions governing how both biological and biotechnolo-

gical bodies circulate. The political conflict at the heart of Kurtz's trial was accordingly about both physical flows of living material and cultural flows of information and knowledge.

Disembodied Cuisine and Cultured Meat

Scholars have tended to emphasize those bioartists like Kurtz and Kac whose work orbits around molecular biology and who seek to hack the biotech industry and the multinational corporations that dominate it. Several scholars have suggested the importance of this strain within bioart to the history and theory of new media, from Rita Raley's analysis of CAE in *Tactical Media* to Cary Wolfe's discussion of Kac and the challenge his transgenic work poses to anthropocentric representations of the natural world.²⁹ Equally important to an account of bioart, however, are those practitioners who counter the cult of code in a postindustrial and post-genomic era by working at the scale not of genes but of cells, tissues, organisms and ecosystems. Case in point is the work of Catts and Zurr, who have written and spoken extensively about their self-termed practice of 'wet biology art'. This 'messy' practice works on a 'totally different level' from that of an artist like Kac in that Catts and Zurr have developed an extended body of in vitro and in vivo organisms. This avant-garde biology accommodates, in their words, the 'bits of life that are living around us isolated from their original host' and hence challenges the very category of species that is so central to both evolutionary biology and molecular genetics.³⁰ The duo's unconventional professional backgrounds speak to their iconoclastic relationship to both life science research and bioart. Catts got his start in green design, where he became interested in harnessing biology to make living things, while Zurr trained in both media studies and landscape architecture.³¹ The principle investigators and lead artists for the Tissue Culture and Art Project at SymbioticA in Western Australia, Catts and Zurr flout the 'view of life as determined solely by the DNA code' in seeking to revive early twentieth-century cell biology for its 'emphasis on communal interrelationships'.³² As Susan McHugh explains, 'Catts and Zurr redeploy biotechnology in the realm of art' by inventing organisms 'that escape the present taxonomies of the life sciences'.³³ The ideas and practices that underlie wet biology art thus speak to feminist STS scholar Evelyn Fox Keller's critique of molecular genetics for having eclipsed cell biology and for having effectively cornered the market in how life is 'configured'.³⁴ In short, Catts and Zurr see their work as offering a 'new palate of manipulation' via tissue culturing experiments that blur the boundaries between cultivating, cooking and engineering food.³⁵

They characterize their best-known work as an experiment with the idea (and sensory experience) of 'foul food'.³⁶ Installed in 2003 at a bioart exhibition in France, *Disembodied Cuisine* first originated as a research project funded by the Tissue Engineering and Organ Fabrication Program at Harvard Medical School.³⁷ It began, more precisely, with the pair's work in culturing natal skeletal muscle to make meat in the early 2000s, a moment when several research teams around the world began similar experiments. (This wider area of in vitro meat research made headlines nearly a decade later, in 2011, with high-profile stories that ran in *The New*

Yorker and on National Public Radio.³⁸) McHugh's term of 'real artificial meat' proves to be an apt descriptor for this experimental food source.³⁹ In the case of Catts and Zurr's experiments, the small portion of in vitro meat they initially cultured was formed by scaffolding the animal muscle cells onto biodegradable polymer discs – a process that 'mess[es] with' both the biological and cultural definitions of meat as flesh from the body of a whole animal, whether hunted or raised for that purpose.⁴⁰ Transforming medical research into food cultivation, the experiment transgressed the bounds of the grant that first funded the project:

Disembodied Cuisine grows experimental meat from a biopsy taken from an animal, which is left in the paddock alive and healthy. As the cells from the biopsy proliferate, the 'steak' continues to grow and expand in vitro, while the source, the animal from which the cells were taken is healing. [...] On the ethical level, the project addresses the most common zone of interaction between humans and the living world and also probes the apparent uneasiness people feel when someone 'messes' with their food. The project offers a form of 'victimless' meat consumption.⁴¹

Excerpted from Zurr's 2008 dissertation, *Growing Semi-Living Art*, this statement raises a number of thorny questions about the scientific, artistic and ethical objectives of *Disembodied Cuisine*. First and foremost, what does it mean to grow meat? Second, to what extent does the cultivation of meat from tissue cultures break with or otherwise reformulate established cultural practices of breeding, raising, slaughtering and butchering animals for food? Third, can any food be 'victimless'? And, finally, what is most at stake in a project that sets out to grow, rather than slaughter, meat?

The various statements about *Disembodied Cuisine* that Catts and Zurr have published suggest that the project aims to move meat out of the strict category of 'animal' and into an emergent category of 'semi-living,' a category that skirts the edges of the animal, plant, microbial and synthetic worlds.⁴² On the one hand, this effort is one of scientific experimentation and technical labor. Although McHugh contends that Catts and Zurr 'challenge scientific authority,' they also work very much within the life sciences (particularly as compared to a group like Critical Art Ensemble).⁴³ To this point, they are cited in the scientific literature on in vitro meat as one of the leading research teams working on the problem of how to culture in vitro meat at scales other than the miniscule quantities labs have been able to produce thus far.⁴⁴ On the other hand, what makes their work biological *art* is the public life of their experiments, evident in the installations, exhibitions and demonstrations they have developed about in vitro meat research and prototypes.

It is here – in the public staging of their work – that they interrogate the ethics of culturing meat by exploring the conceptual relationships between the lab and the kitchen and between growing meat in vitro and raising plants and animals through agriculture. These conceptual explorations dovetail with an advocacy of scientific amateurism that is kindred to that of Critical Art Ensemble. Catts and collaborator Gary Cass describe, for example, a 5-day SymbioticA-sponsored workshop that

introduces participants (most of who do not have advanced science backgrounds) to the methods of molecular and cell biology and then asks them to produce their own edible tissue cultures. In articulating the aims of the workshop, Catts and Cass observe, 'We hope to help in the formation of a community of hobbyists and to share an open source ethos of biological research'.⁴⁵ Even as they here invoke the DIY culture of new media and digital technology, they also correlate wet biology art with cooking by suggesting that the two fields share commitments to vernacular knowledge, trial-and-error and the open exchange of techniques and materials. Just as recipes are difficult to copyright and invite both sharing and tinkering, so too does tissue culturing (which can be done, they further note, with simple implements 'found in the kitchen').⁴⁶ Culinary and agricultural language similarly pervades Catts and Zurr's writings on both *Disembodied Cuisine* and their earlier 'living sculptures': all of which are experiments, they claim, in *scavenging, growing, cooking, feeding and palate altering*.⁴⁷

Despite the evident contemporaneity of wet biology art, the work of Catts and Zurr links up to early-twentieth-century discourses of and research on tissue culturing. As early as the 1930s, Winston Churchill envisioned a future in which microbes would be, to cite Warren Belasco, 'enlisted to convert nitrogen directly into protein' and in which 'headless, wingless chicken' would be engineered for maximum protein and minimum waste.⁴⁸ In the same period, Aldous Huxley's dystopian novel *Brave New World* depicted the application of 'the principle of mass production [...] to biology,' a strikingly apt descriptor of tissue culturing.⁴⁹ Building on the work of embryologist Ross Harrison, medical researcher Alexis Carrel coined the term 'tissue culture' two decades prior, in 1910, to describe the research that his team was conducting on cell regeneration and organ transplants. Publishing this research in the *Journal of the American Medical Association*, Carrel described a 'generalized method for the cultivation of all kinds of tissues, embryonic and adult, amphibian, mammalian and human, normal and pathological'.⁵⁰ As sociologist Hannah Landecker explains, Carrel thus announced the autonomy of cells by introducing 'the idea of continuous culture – [the process of] making new cultures from old ones, without returning to the body of the animal for new cultures'.⁵¹ Landecker further argues that, since Carrel's early experiments, the science of culturing tissues has contributed to a century long 'desire to fit complex beings into the same easily manipulable experimental spaces as their simple single-celled counterparts, bacteria'.⁵² By the Cold War, scientists connected the mass production of cells, tissues and cloned organisms explicitly to the industrialization of agriculture: a striking analogy, Landecker writes, in that it linked 'the industrialization of cultivation and harvesting of food with the industrialization of the life sciences'.⁵³ Of course, that connection has been more than analogical given the increasing role of life science research over the twentieth century in the development of both seeds and livestock breeds.

Landecker's history of tissue culturing (subtitled *How Cells Became Technologies*) calls into question Catts and Zurr's sense of wet biology as a 'messy' foil to molecular genetics in that it highlights the tendency in both cell biology and molecular biology to compartmentalize and, as Catts himself acknowledges, commodify life.⁵⁴ The commercial value of tissue samples and cell lines and the ramifications of that value for medical ethics has come into the spotlight recently with the publication of

science writer Rebecca Skloot's book *The Immortal Life of Henrietta Lacks*. However, tissue culturing also offers important terrain for environmental ethics and, in particular, for the question of how culturing food might redress the environmental impacts of industrial agriculture and the conditions under which the many creatures imbricated in the modern food system live and die. With in vitro meat, the principle of growing meat without, as Landecker puts it about Carrel's early-twentieth-century research, 'returning to the body of an animal' informs Catts and Zurr's idea of 'victimless' food.⁵⁵ Both the secondary literature on in vitro meat (e.g., sociologist Neil Stephens' account of this field of research)⁵⁶ and the high-profile cash prize that the People for the Ethical Treatment of Animals (PETA) announced in 2008 for the first research team to make in vitro meat commercially viable endorse the idea that cultured meat represents an ethical alternative to the suffering and slaughtering of animals.

The idea of victimless meat turns on the new kind of organism that Zurr and Catts are testing out: the 'semi-living' being that, as they articulated in a 2002 symposium on the *Aesthetics of Care*, is at once a living creature and a technological object. This being grows and changes but also requires constant care from a community of actors that includes scientists, technicians, farmers and artists.⁵⁷ The 'semi-living' has much in common with what cultural studies scholar Julie Sze terms, in a piece about the hormone DES, the 'hybrid of bodies' that forms through the interactions of technological, biological and environmental systems.⁵⁸ Building on Haraway's theory of the cyborg,⁵⁹ Sze recuperates an idea of 'technologically-polluted bodies' that clarifies the significance of Catts and Zurr's 'semi-living' organism.⁶⁰ Fox Keller shows that the very concept of 'organism' has its roots in Enlightenment distinctions between the capacity for self-organization in animate beings and the assumed lack of that capacity in inanimate objects, tools and technologies – a division that the science of cybernetics and the theory of cyborgs began to disrupt in the latter half of the twentieth century.⁶¹ *Disembodied Cuisine* extends this disruption by showing just how fuzzy the boundary between living organisms and manufactured products is in the context of the postindustrial food system.

The significance of Catts and Zurr's 'semi-living' creations inheres in the shift from *whole* organisms raised on terra firma and at massive scales (such as herds of cattle in feedlots) to *parts* of living matter that are mixed with polymers and cultured into food (those 'bits of life' that wet biology art takes as its media). The installation of *Disembodied Cuisine* at the 2003 *L'Art Biotech* show in Nantes, France brought this new form of food out of the lab and into a public art context where viewers' interactions with both bits of in vitro meat and the bodies of living 'donor' animals worked at once to unsettle and delight their notions of food. Zurr explains these dimensions of the show as follows: 'Semi-living frog steaks were grown, thus poking fun at French taste and their resentment toward engineered food [...] Frog skeletal muscle was grown over biopolymer for potential food consumption, while the healthy frogs lived alongside as part of the installation. In the last day of the show, the steak was cooked and eaten in a Nouvelle Cuisine style dinner and the four frogs that were rescued from the farm were released to a beautiful pond in the local botanical gardens'.⁶² The sensory environment that Catts and Zurr created for the installation – with its interactive and participatory structure – worked in two opposing directions. The diorama where the frogs lived and the long dining table where the participants

dined on the semi-living steak grounded *Disembodied Cuisine* in familiar spaces of gardening and eating. With the pastoral scene of chirping frogs in a verdant garden, the installation suggested that in vitro meat is closer to cultivating edible plants than to raising and slaughtering livestock. At the same time, that the dining table was hermetically sealed in a plastic bubble bearing the biohazard symbol made the biotechnological nature of in vitro meat a tactile part of the installation.

Both in the 2003 installation and in more recent events – such as the *ArtMeatFlesh* event held at the 2012 Dutch Electronic Arts Festival in Rotterdam – Catts and Zurr have put cultured meat to the test of being cooked, served and tasted. These interactive events work to sensitize us to this otherwise futuristic food. By *upsetting* our palate and perhaps our stomach (that is, by disgusting us), they bring the public into an ethical debate around both the status quo and the cutting edge of food production. At *ArtMeatFlesh*, co-organized with Zach Denfeld of the Center for Genomic Gastronomy, a cooking demonstration took the form of an Iron Chef contest between two teams tasked with integrating an array of unconventional proteins (from the perspective of Western cuisine) into experimental dishes. The effect, as I can attest from having been in the audience, was a mix of delight and disgust. With the earlier *Disembodied Cuisine*, Catts and Zurr worked similarly to please participants' palates – for example by marinating the in vitro meat in honey and garlic and then serving it as part of a 'nouvelle cuisine' dinner – while also provoking repulsion. In her analysis of speculative fictions that feature 'real artificial meat', McHugh suggests that this affect of disgust functions to illuminate that which is disgusting about the existing system of meat production and animal husbandry while exploring the potential consequences of new food technologies.⁶³ Catts and Zurr keep disgust in check, however, by employing 'light satire' and 'comic ambience' to ensure that their audiences stay engaged in the project of first trying out and then debating the ramifications of in vitro meat.⁶⁴

Both Stephens and McHugh emphasize the gap between the aspirations for and the realities of in vitro meat. Although projects like *Disembodied Cuisine* aim to reduce the suffering of animals that industrialized meat production causes, Stephens contends that, 'the definition or categorization of in vitro meat – what it *is* – remains unclear'.⁶⁵ Contra Catts and Zurr's vision of 'victimless' meat, the experimental practice of culturing animal muscle tissue relies, for now at least, on serum from living animals, and this practice in turn exposes 'the complex multi-species agricultural and laboratory systems underpinning' the culturing of food in vitro.⁶⁶ In 'The Ethics of Experiential Engagement with the Manipulation of Life,' Catts and Zurr estimate that to grow 10 grams of tissue using current techniques requires 'serum from a whole calf'.⁶⁷ As Zurr acknowledges, 'the relations between biological artists and animal welfare groups are [thus] at best strained'.⁶⁸ Moreover, the current technical problem of culturing 'complex meats' that look, feel and taste like meat as we know it requires scientists to 'emulate the in vivo structure of the tissues much more closely' by producing 'tissue types beyond the muscle itself, including fat, blood vessels and connective tissues'.⁶⁹ In other words, the project of integrating 'bits of life' into a piece of meat continues to take the *whole animal* as its model organism.

Both as scientific experiment and as interactive art installation, *Disembodied Cuisine* questions whether existing frameworks – from animal rights to sustainable agriculture – are adequate to assessing the technical, ethical and cultural upshot of in vitro meat. We can understand CAE's *Free Range Grain* as a tactical media project that makes the pervasiveness of GMOs in our *existing* food supply legible to the public. In contrast, *Disembodied Cuisine* works to re-make the edible world. Unsettling the boundary between the organic and the synthetic, Catts and Zurr serve up what they term 'natural-ish' foods.⁷⁰ As we have seen, this project of culturing meat injects a comic strain into what has been an alternately utopian and dystopian discourse of 'real artificial meat'. We can understand their work, moreover, as an instance of what Belasco terms recombinant food culture: a mixing of the comfortably familiar and the unsettlingly novel as a tactic to make foods of the future 'less threatening'.⁷¹ While we may find our stomach turned by the thought (or taste) of in vitro meat, Catts and Zurr do seek to enlist our participation as eaters in making cultured food 'less threatening'.

They do so, I would argue, by inviting us to care for and about the semi-living and hence to extend our capacity of caring to all those bits and bodies that make up the human food chain. *Disembodied Cuisine* here intervenes in the instrumentalism that informs the factory farm environment, which, as Haraway poignantly points out in *When Species Meet*, engineers both animals and feedlots to produce staggering quantities of meat (approximately 10 billion chickens a year in the United States alone).⁷² It is precisely the jettisoning of *engineering* for *culturing* that makes the wider work of the Tissue Culture and Art Project significant. In this, Catts and Zurr adopt what Fox Keller has defined as a feminist practice of science and science studies: the departure from an Enlightenment paradigm of 'working with things [...] working autonomously [...] working with reason not feeling'.⁷³ At the core of their idea of victimless meat is their investment in a sense of hospitality toward both eaters and eaten that resonates with Derrida's philosophical claim that 'one never eats entirely alone'.⁷⁴ Indeed, it is Derrida's deconstruction of the animal as a category in Western thought – as a 'singularity' that does violence in denying the multiplicity of living creatures and their shared if manifold experiences of suffering (or what Cary Wolfe helpfully terms the vulnerability of 'embodied beings') – that a project like *Disembodied Cuisine* puts into practice.⁷⁵ Through their transfers of experimental biotechnologies from the lab to the gallery and on to the kitchen, Catts and Zurr not only are producing multimedia art but also are working, often in grandiose ways, to create new social contexts within which we interface with, inhabit and ingest the edible world.

Notes

¹ Roland Barthes, 'Toward a Psychosociology of Contemporary Food Consumption', in *Food and Culture: A Reader*, ed. Carol Counihan and Penny Van Esterik (London: Routledge, 2008), p.33.

² Thorstein Veblen, *Theory of the Leisure Class* (New York: Penguin Books, 1994).

³ Allison Carruth, *Global Appetites: American Power and the Literature of Food* (Cambridge and New York: Cambridge University Press, 2013).

⁴ 'Agribusiness, N.', in *Oxford English Dictionary Online* (Oxford and New York: Oxford University Press, 1989, 2012).

⁵ Andrew Pollack, 'A Gap between the Lab and the Dining Table', *The New York Times*, 14 February 2006; Brian Tokar, 'Monsanto: A Checkered History', *The Ecologist* (1998), <<http://www.mindfully.org/Industry/Monsanto-Checkered-HistoryOct98.htm>> [21/09/2012];

Peter Whoriskey, 'Monsanto's Dominance Draws Antitrust Inquiry', *The Washington Post*, 29 November 2009.

⁶ Chipotle, 'Food with Integrity', <<http://www.chipotle.com/en-US/fwi/environment/environment.asp>> [21/09/2012].

⁷ Eduardo Kac, *Time Capsule*, 1997. Event-installation, Casa das Rosas Cultural Center.

⁸ Joanna Zylińska, *Bioethics in the Age of New Media* (Cambridge, MA: The MIT Press, 2009), p.149. See also Nicole Anderson's definition of bioart as a set of practices that work to 'reconceptualize traditional art by adopting biological and scientific laboratory techniques'. Nicole Anderson, '(Auto) Immunity: The Deconstruction and Politics of "Bio-Art" and Criticism', *parallax*, 16.4 (2010), p.101.

⁹ For Kac, *Genesis* is 'a transgenic artwork that explores the intricate relationship between biology, belief systems, information technology, dialogical interaction, ethics and the Internet'. See Anderson, '(Auto)Immunity', p.101.

¹⁰ Although focused on the significance of bioart for media theory, Mitchell highlights the 'generative' quality of bioart, observing that the practice 'points us toward a *generative* sense of media - a sense of medium that moves beyond concepts of storage and communication and toward concepts of emergences'. Robert Mitchell, *Bioart and the Vitality of Media* (Seattle: University of Washington Press, 2010), pp.27–28, 32, 92.

¹¹ Jennifer Willet, 'Bodies in Biotechnology: Embodied Models for Understanding Biotechnology in Contemporary Art', *Leonardo Electronic Almanac* 14.7–8 (2006), p.30.

¹² Beatriz da Costa, 'Reaching the Limit: When Art Becomes Science', in *Tactical Biopolitics: Art, Activism and Technoscience*, ed. Beatriz da Costa and Kavita Philip (Cambridge, MA: The MIT Press, 2008), p.372.

¹³ da Costa, 'Reaching the Limit', p.373 (emphasis mine).

¹⁴ Evelyn Fox Keller, 'Feminist Perspectives on Science Studies', *Science, Technology and Human Values*, 13.3–4 (1988); *Refiguring Life: Metaphors of Twentieth-Century Biology* (New York: Columbia University Press, 1995); Donna J. Haraway, *When Species Meet* (Minneapolis: University of Minnesota Press, 2007); N. Katherine Hayles, 'Refiguring the Posthuman', *Comparative Literature Studies* 41.3 (2004); *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature and Informatics* (Chicago: University of Chicago Press, 1999).

¹⁵ Jane Bennett, *Vibrant Matter: A Political Ecology of Things* (Durham, NC: Duke University Press, 2009), pp.39, 43.

¹⁶ I draw this term from Anne-Lise François's 2003 essay on GMOs and Romanticist ideas of

finitude and infinity as well as a 2007 special issue of *New Literary History*. Lennard J. Davis and David B. Morris, 'Biocultures Manifesto', *New Literary History*, 38.3 (2007); Anne-Lise François, "'O Happy Living Things": Frankenfoods and the Bounds of Wordsworthian Natural Piety', *diacritics*, 33.2 (2003).

¹⁷ Jonah Lehrer, 'The Future of Science... Is Art?', *SEED Magazine*, 6 October 2008.

¹⁸ John Brockman, *Third Culture: Beyond the Scientific Revolution* (New York: Touchstone, 1996); C. P. Snow, *The Two Cultures and the Scientific Revolution* (New York: Cambridge University Press, 1959).

¹⁹ Anderson, '(Auto)Immunity', p.105

²⁰ Zylińska, *Bioethics in the Age of New Media*, p.159.

²¹ Thierry Bardini, *Junkware*, ed. Cary Wolfe (Minneapolis: University of Minnesota Press, 2011), p.203.

²² Donna J. Haraway, 'Species Matters, Humane Advocacy: In the Promising Grip of Earthly Oxymorons', in *Species Matters: Humane Advocacy and Cultural Theory*, ed. Marianne DeKoven and Michael Lundblad (New York: Columbia University Press, 2012), pp.18–19.

²³ Critical Art Ensemble, Beatriz da Costa and Shyh-shiun Shyu, *Free Range Grain*, 2003–2004.

²⁴ Mitchell, *Bioart and the Vitality of Media*, p.64.

²⁵ da Costa, 'Reaching the Limit: When Art Becomes Science'; Lisa Lynch, 'Culturing the Pleebland: The Idea of the "Public" in Genetic Art', *Literature and Medicine*, 26.1 (2007).

²⁶ Lynch, 'Culturing the Pleebland', p.198.

²⁷ Lynch, 'Culturing the Pleebland', p.199.

²⁸ Lynch concludes, 'in the current political climate, anything that smacks of practicing science outside of the space of the laboratory has become potentially threatening to the United States government', p.182.

²⁹ Rita Raley, *Tactical Media*, ed. Katherine Hayles, Mark Poster and Samuel Weber (Minneapolis: University of Minnesota Press, 2009), p.44; Cary Wolfe, 'From *Dead Meat* to *Glow in the Dark Bunnies*: Seeing "the Animal Question in Contemporary Art"', *parallax* 12.1 (2006); *What Is Posthumanism?*, ed. Cary Wolfe (Minneapolis: University of Minnesota Press, 2010), pp.158–64. See also Eugene Thacker's book-length study of emerging techniques in both computer science and genetics that have collapsed, he suggests, the distinction between digital and biological media: Eugene Thacker, *Biomedea*, ed. Katherine Hayles, Mark Poster and Samuel Weber (Minneapolis: University of Minnesota Press, 2004).

³⁰ Suzanne Anker, 'Partial Life and the Semi-Living: The Aesthetics of Care', in *Bio-Blurb*

Show (2006) <<http://artonaire.org/show/partial-life-and-the-semi-living-the-aesthetics-of-care>> [21/09/2012].

³¹ Anker, 'Partial Life and the Semi-Living'.

³² Oron Catts and Ionat Zurr, 'The Ethics of Experiential Engagement with the Manipulation of Life', in *Tactical Biopolitics: Art, Activism and Technoscience*, ed. Beatriz da Costa and Kavita Philip (Cambridge, MA: The MIT Press, 2008), pp.135, 37.

³³ Susan McHugh, 'Real Artificial: Tissue-Cultured Meat, Genetically Modified Farm Animals and Fictions', *Configurations*, 18 (2010), p.190.

³⁴ Fox Keller explains that after Watson and Crick, molecular biology locked in the idea of the gene as 'a central command center', an idea that drew less from cybernetics (and its dynamic models of information, communication networks and machine intelligence) than from 'an older kind of mechanistic' model of machines that was 'unidirectional in its causality'. See Fox Keller, *Refiguring Life*, pp.87, 103.

³⁵ Oron Catts and Ionat Zurr, 'Semi-Living Art', in *Signs of Life: Bio Art and Beyond*, ed. Eduardo Kac (Cambridge, MA: The MIT Press, 2007), p.232.

³⁶ Anker, 'Partial Life and the Semi-Living'.

³⁷ Catts and Zurr, 'Semi-Living Art', p.243; McHugh, 'Real Artificial: Tissue-Cultured Meat, Genetically Modified Farm Animals and Fictions', p.189; Neil Stephens, 'In Vitro Meat: Zombies on the Menu?', *scripted*, 7.2 (2010), p.396.

³⁸ 'Burgers from a Lab: The World of in Vitro Meat', (NPR, 2011); Michael Specter, 'Test-Tube Burgers', *The New Yorker*, 23 May 2011 <http://www.newyorker.com/reporting/2011/05/23/110523fa_fact_specter> [21/09/2012].

³⁹ McHugh, 'Real Artificial: Tissue-Cultured Meat, Genetically Modified Farm Animals and Fictions'.

⁴⁰ Catts and Zurr, 'The Ethics of Experiential Engagement with the Manipulation of Life'; 'Semi-Living Art'.

⁴¹ Ionat Zurr, *Growing Semi-Living Art* (Perth: University of Western Australia, 2008), p.112.

⁴² Neal Stephens notes that a similar image of 'zombie' meat pervades the literature on in vitro meat, which, he claims, 'is best categorized as the 'dead-living', or perhaps the 'living-never-born' p.395.

⁴³ McHugh, 'Real Artificial: Tissue-Cultured Meat, Genetically Modified Farm Animals and Fictions', p.190.

⁴⁴ This research reaches back to 1999, when the first in vitro meat product was patented. In 2002, a team of NASA-funded scientists developed an edible protein source from culturing cells (goldfish muscle cells in particular).

⁴⁵ Catts and Cass, 'Labs Shut Open: A Biotech Hands-on Workshop for Artists', p.150.

⁴⁶ Catts and Cass, 'Labs Shut Open: A Biotech Hands-on Workshop for Artists', p.150.

⁴⁷ Catts and Zurr, 'Semi-Living Art', pp.232, 34, 37.

⁴⁸ Warren Belasco, *Meals to Come: A History of the Future of Food* (Berkeley: University of California Press, 2006), pp.178, 84.

⁴⁹ Warren Belasco, *Meals to Come*, p.178.

⁵⁰ Hannah Landecker, *Culturing Life: How Cells Became Technologies* (Cambridge, MA: Harvard University Press, 2007), p.53.

⁵¹ Landecker, *Culturing Life*.

⁵² Landecker concludes, 'in short, living matter is now assumed to be stuff that can be stopped and started at will. It is these changes that are at work in the production of novel cellular objects today'. See *Culturing Life*, pp.185, 233.

⁵³ Landecker, *Culturing Life*, p.130.

⁵⁴ So too does it complicate Fox Keller's categorization of cell and reproductive biology as not having fully adopted the molecular genetics 'credo' of simplicity. See *Refiguring Life*, p.103.

⁵⁵ Landecker, *Culturing Life*, p.53.

⁵⁶ Stephens contends, 'cultured meat is distinct from cloned meat. [...] With in vitro meat, there is never a whole animal to slaughter'; he goes on to explain that 'scientists take a small amount of cells from a living animal and culture it in medium to encourage the cells to proliferate into lumps of muscle tissue which could, in principle, be eaten. This meat was never born, has never been 'alive' in any usual way we would apply to an animal and has never been killed'. See Stevens, 'In Vitro Meat', p.395.

⁵⁷ Oron Catts and Ionat Zurr, 'An Emergence of the Semi-Living', in *The Aesthetics of Care?*, ed. Oron Catts (Perth: SymbioticA: The Art and Science Collaborative Research Laboratory, 2002), p.63.

⁵⁸ Julie Sze, 'Boundaries and Border Wars: DES, Technology and Environmental Justice', *American Quarterly*, 58.3 (2006), p.793.

⁵⁹ Sze, 'Boundaries and Border Wars'.

⁶⁰ Zurr, 'Growing Semi-Living Art', p.112.

⁶¹ Evelyn Fox Keller, 'Ecosystems organisms and Machines', *BioScience*, 55.12 (2005), pp.1069, 1070.

⁶² Zurr, 'Growing Semi-Living Art', pp.113–14.

⁶³ She goes on to say that writers and artists tend to challenge the idea that real artificial meat will be a panacea for the environmental impacts and animal as well as human injustices of industrial meat. See McHugh, 'Real Artificial: Tissue-Cultured Meat, Genetically Modified Farm Animals and Fictions', pp.182, 83.

⁶⁴ Zurr, 'Growing Semi-Living Art', p.114.

⁶⁵ Stephens, 'In Vitro Meat: Zombies on the Menu?', p.400.

⁶⁶ McHugh, 'Real Artificial', p.190.

⁶⁷ Catts and Zurr, 'The Ethics of Experiential Engagement with the Manipulation of Life', p.133.

⁶⁸ Zurr, 'Growing Semi-Living Art', p.114.

⁶⁹ Stephens, 'In Vitro Meat', p.398.

⁷⁰ Oron Catts, 'Preface' (paper presented at *The Aesthetics of Care?*, Perth, Australia, 5 August 2002); Catts and Zurr, 'An Emergence of the Semi-Living'.

⁷¹ Belasco, *Meals to Come*, p.219.

⁷² Haraway, *When Species Meet*, pp.279, 81.

⁷³ Fox Keller, 'Feminist Perspectives on Science Studies', p.238.

⁷⁴ Jacques Derrida, "'Eating Well", or the Calculation of the Subject: An Interview with Jacques Derrida', in *Who Comes after the Subject?*, ed. Eduardo Cadava, Peter Connor and Jean-Luc Nancy (New York and London: Routledge, 1991), p.115.

⁷⁵ *The Animal That Therefore I Am*, ed. John D. Caputo, trans. David Wills, Perspectives in Continental Philosophy (New York: Fordham University Press, 2008), pp.35, 41; Cary Wolfe, 'Humane Advocacy and the Humanities', in *Species Matters: Humane Advocacy and Cultural Theory*, ed. Marianne and Lundblad DeKoven, Michael (New York: Columbia University Press, 2012), p.31.

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