

Zapatista corn: A case study in biocultural innovation

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Abstract

In November 2001, *Nature* published a letter in which University of California Berkeley's biologists claimed to have found evidence of genetically modified (GM) DNA in regional varieties of maize in Oaxaca, even though the Mexican government had banned transgenic corn agriculture in 1998. While urban protesters marched against the genetic 'contamination' of Mexican corn by US-based agricultural biotech firms, rural indigenous communities needed a framework for understanding concepts such as GM before they could take action. This article analyzes how the indigenous organization, the Zapatistas, mobilized a program to address this novel entity. Their anti-GM project entailed educating local farmers about genetics, importing genetic testing kits, seed-banking landrace corn and sending seeds to 'solidarity growers' around the world. This article explores material-semiotic translations to explain one of the central aspects of this project, the definition and circulation of Zapatista corn – an entity defined not only through cultural geography, but also technological means. Through its circulation, Zapatista corn serves to perform a biocultural engagement with Zapatista's political project of resistance to neoliberalism. While much has been written about both regulatory policy and consumer activism against GM in the Global North, Zapatista corn also provides a case study in indigenous, anti-GM activism founded on biocultural innovation and the creation of alternative networks for circulating corn.

Keywords

biocultural innovation, corn, genetically modified organisms, indigenous people, material-semiotics, seed banking, social movements, Zapatistas

Introduction

In November 2001, the prestigious scientific journal *Nature* published a letter by two University of California, Berkeley biologists that quickly became one of the most

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controversial they had ever published. The scientists, David Quist and Ignacio Chapela, claimed to have found evidence of a gene called CaMV 35S in several landrace varieties of maize in Oaxaca, Mexico (Quist and Chapela, 2001). Because CaMV 35S is a part of the cauliflower mosaic virus that is used as a promoter sequence to drive the activity of genes newly inserted into DNA during genetic modification (GM), the authors believed its presence was evidence of transgenic introgression into Mexican corn. The Mexican government had banned GM corn agriculture in 1998, but not its import from the United States in the form of food and feed (Carlsen, 2000; Kaufman, 2002). However, the material form of corn makes the flow of its genetic material difficult to regulate: corn is shipped whole-kernel to keep it from going bad, the edible kernels are also viable seeds, and the plant is open pollinating.¹ In early 2002, Quist and Chapela's findings made the front page of all major newspapers in Mexico. They incited public outrage because Mexico is the 'heartland of maize diversity', and therefore, the place where such transgenic introgression potentially could have the most damage on biodiversity (Mann, 2002). Protesters marched in the streets to demonstrate their anger at the genetic 'contamination' of Mexican corn.

In this article, I consider how the Zapatistas, a self-governing indigenous organization in southern Mexico, responded to the reports of transgenic introgression of landrace maize. My case study is the Mother Seeds in Resistance from the Land of Chiapas Project (hereafter Mother Seeds) and its mission of defining and distributing seeds of Zapatista corn. Mother Seeds is a collaboration, formed with the goal of saving landrace corn from transgenic contamination, between the Zapatistas and the San Diego-based non-profit organization Schools for Chiapas. The project, which has included a seed bank, a genetic testing program, and a seed distribution program, provides a valuable case study in biocultural innovation as a response to this perceived threat.

Agricultural biotechnologies like genetically modified organisms (GMOs) are often aligned with altruistic progress narratives.² Mother Seeds does not reject 'progress' but rather articulates another future – one that requires the strategic adoption of certain technologies and redefinition of old ones as 'weapons of the weak' (Scott, 1985). The story of Zapatista corn is not only the story of an artifact or product; it is a story about understandings of neoliberalism and efforts to create an alternative. While neoliberalism is often broadly construed as a political economic philosophy oriented toward the freedom of corporations to make profit, the Zapatistas specifically understand it as the collaborative effort of multinational corporations and national governments to exploit indigenous people, steal their land, and in so doing push the commodification of traditionally non-market domains. One cannot understand the practices of this anti-GM movement without taking into account this aspect of Zapatista's political project. Their bioculture cannot be reduced to indigenous cultural practice because it also stems from their political goals of autonomy and opposition to neoliberalism. Sheila Jasanoff (2005) has shown that specific cultures' visions of the natural and social order shape their responses to GMOs, and are reflected in their regulatory policy. Analyzing Zapatistas' responses to GMOs provides a lens through which we can interpret the practical dimensions of their cultural politics.

This article contributes to conversations about both resistance to GMOs in Science and Technology Studies (STS) and the indigenous response to new technologies in

post-colonial STS by providing an exemplar of biocultural innovation. How did Zapatista corn come into existence? To answer this question, I use material-semiotic tools articulated by Donna Haraway (e.g. 1992) and actor-network theory (ANT) scholars (Callon, 1986; Latour, 2005b; Law, 2009; Law and Mol, 2008) to analyze the translational processes, relationships, and material qualities through which indigenous farmers, activists, scientists, biotechnology firms, solidarity growers, maize plants and their seeds, genetic markers, seed-banking tools, and genetic test kits acquire meanings. As a non-human actor, the role of corn itself and the ways that its form shapes the kinds of relationships it can enter into is essential to explaining the biocultural innovation of Zapatista corn. To paraphrase Haraway (1992), we must attend to the active role of the object of knowledge in the apparatus of production. Therefore, to explain how Zapatista corn came into being, we must consider corn itself.

A key concept for analyzing Zapatista corn as a site of biocultural innovation is translation, the process through which things are made equivalent in their circulation. Many prominent studies in the STS literature have followed efforts to translate technoscientific objects from modern, urban centers to the rural, developing periphery.³ Post-colonial STS scholarship asks us to complicate this center/periphery model by attending to indigenous epistemologies and alternative constructions of modernity outside of nation-building projects (Anderson, 2002; Jasanoff, 2002) – for example, by studying how indigenous groups have responded to bioprospecting on their land (Harvey, 2001; Hayden, 2003) and the use of their genetic materials from their bodies (Garrouette, 1999; Hayden, 2007; Kowal et al., 2013; Martello, 2008; Reardon, 2001). However, compared to the extensive STS literature on GMOs in the Global North, little attention has been paid to indigenous responses to GMOs.⁴ In this study, I show how indigenous Zapatista communities developed a unique response to GMOs: the biocultural translation and global circulation of Zapatista corn. Mother Seeds demonstrates that translation *by* indigenous social movements is an important area of study for postcolonial STS.⁵

The Zapatista corn project's goal is not only to distribute indigenous Mexican products, but also to create new semiotic relationships for corn in ways that perform Zapatista political ideology. This entails creating 'another world' than that envisioned in what they see as neoliberal models of modernity (De Angelis, 2000; Slater, 2004). While modern science has been understood as a process of purification, transgenic introgression and the unintended hybrids it produces illustrate the kinds of 'monsters' that can be created when not only genes, but cultural forms, including intellectual property, become so deeply entangled (Haraway, 1992; Latour, 1993). Mother Seeds should be understood as an alternative to modern purification projects: its goal is not to separate nature and culture, but rather to demonstrate how deeply imbricated they are – Zapatista corn performs the biocultural link between Zapatistas' political project and their maize plants. By creating alternative networks for corn circulation, the project allows international recipients to participate in Zapatistas' political bioculture, that is, to relate to seeds as potential food or plants that are deeply inflected with the values of promoting self-sufficiency and resisting governmental and economic dependence.⁶ Relationships bring worlds into being; ontology is a political achievement.

I begin the story of Zapatista corn by providing historical and cultural context, focusing on the North American Free Trade Agreement (NAFTA) and the *Nature* GM

contamination controversy of 2001 as two key shaping events for the object. Second, I explain a key component of Zapatista's political culture – the strategic adoption of technologies in the service of political autonomy – and show how these are mediated through both cultural formations and the contingencies of international solidarity relationships, such as that with Schools for Chiapas. Third, I describe the collective biocultural translation efforts of Schools for Chiapas and the Zapatistas communities to establish seed banks, and why they ultimately failed. Fourth, I look at Zapatistas' anti-GM agricultural policies to show how productive tensions between maintaining indigenous identity and strategically adopting new technologies have created new cultural practices. Finally, I analyze the multiple discourses that accompany Zapatista corn as it travels in alternative circulation networks to consider how these communicate and enact Zapatista political ideology.

The analysis draws on 4 years of data collection and several forms of data. In the summer of 2010, I traveled to Zapatista communities in southern Mexico with a Schools for Chiapas delegation dedicated to Mayan corn and agriculture. There I was able to talk with agroecology promoters and members of the local government in Oventik and Morelia, two of the five Zapatista administrative and cultural centers called *caracoles*. In San Diego, I participated in events run by Schools for Chiapas – including Zapatista corn planting, harvest events, and fundraisers – and conducted interviews with members of the organization. In addition, Schools for Chiapas director Peter Brown provided chapters from his unpublished memoir describing his experiences during the development of the Mother Seeds project (Brown, 2005). I also collected promotional materials for Zapatista corn produced in collaboration with Schools for Chiapas, and I did field research in both Mexico and the United States. I analyzed my field notes, interviews, and promotional materials using a grounded theory methodology.

Corn and indigenous resistance

The *Nature* corn controversy hit Mexico during a time when corn had already become an especially contentious political issue and a powerful material-semiotic actor in the indigenous struggle against neoliberalism (McAfee, 2003). During the 1980s, Mexican peasant farmers began organizing against the economic reform that made it increasingly difficult for them to maintain enough land to feed their families. For example, in March 1992, hundreds of people marched to Mexico City to protest the reform of Article 27 of the Mexican Constitution by President Carlos Salinas de Gortari. This act dismantled much of the land reform that had begun during the Mexican Revolution (1910–1920), including encouraging the privatization of cooperative farmlands called *ejidos* (Hansen and Civil, 2001; Stephen, 2002). The protest coincided with ongoing debates over the 500th anniversary of Columbus' arrival in the 'New World' – an event, critics argued, that inaugurated five centuries of disease, displacement, and oppression of indigenous people (Jung, 2003).

Of these protests, the most globally visible was the Zapatista protest of NAFTA. On 1 January 1994, NAFTA's inauguration date, thousands of armed indigenous people stormed and occupied seven major urban centers and many ranches throughout eastern Chiapas (Collier, 2005: 1; Hansen and Civil, 2001: 447; Stephen, 2002: xxv–xxvi).

Drawing inspiration from Emiliano Zapata, 'a hero of Mexican Revolution and legendary champion of peasants' land rights', they marched under the banner of the Zapatista National Liberation Army (EZLN; Hayden, 2003: 99).⁷ With a battle cry of 'Ya Basta!' – 'enough!' – the EZLN declared that the past 500 years of Mexican history, from Cortez's conquest of the New World to Salinas' land reform, was a story of invaders becoming rich through the displacement and exploitation of indigenous peoples (EZLN General Command, 1993). NAFTA, they declared, would be the final nail in the coffin for them, Mexico's peasant farmers. Seeking an end to the oppression and political invisibility of indigenous people, the Zapatistas demanded 'work, land, housing, food, health care, education, independence, freedom, democracy, justice and peace' for all (Jung, 2003: 454). To these ends, they sought the right to autonomous self-governance within the constitutional framework, demanding both freedom from unwanted interference by the Mexican government and military, and governmental support in enacting policies that they deemed best to achieve their own self-determined goals (Harvey, 2001).

While anti-globalization activists often hold up *Zapatismo* as an ideological critique of neoliberalism, much less attention has been paid to the centrality of autonomous food production as a material dimension of the project. While the militarized EZLN retreated from their urban occupations, the political branch of the movement made their most significant material victory in ousting large landowners and setting up permanent occupations. Compared with the poor soils of the steep highlands and dangerous jungles onto which indigenous people had been increasingly pushed by land reform, occupations on former cattle ranch lands are on idyllic terrain where corn grows tall and strong (Saavedra and Viqueira, 2010).

Several farmers I spoke with reiterated the importance of the success of their corn crops to their political struggle for autonomy. Zapatista families generally do not – and could not afford to – buy corn flour from the two large companies, Gruma and Olé, to make tortillas, their staple food. This choice is both economic and political, as expressed by one farmer who told me that the government would prefer it if his community had to go to the grocery store to buy food, which would signify both dependence on the global economy and a loss of political autonomy. Corn production remains a deeply personal aspect of life in Zapatista communities. Although they have attempted several kinds of collectivized production projects in order to earn money, neither corn production nor storage has been collectivized to create an economy of scale. Most corn is grown, stored, and consumed at the family level. Many of the community leaders with whom I spoke saw the low levels of outward migration among young Zapatistas compared with other indigenous Mexicans as a result of the meaningful, sustaining existence afforded by corn agriculture and collective action.

The centrality of corn to Zapatista notions of autonomy and resistance is also reflected in their visual culture, such as in the murals that decorate the buildings in Oventik. In one such mural, the dozens of kernels that make up an ear of corn are each painted with a face in a characteristic ski mask (Figure 1). In others, revolutionaries wield corn stalks like rifles (Figure 2).

Researchers have shown that NAFTA was designed to promote large-scale farming and has indeed proven detrimental to small-scale peasant farmers. In 2003, political scientist Courtney Jung argued that corn cultivation and distribution 'has been the single

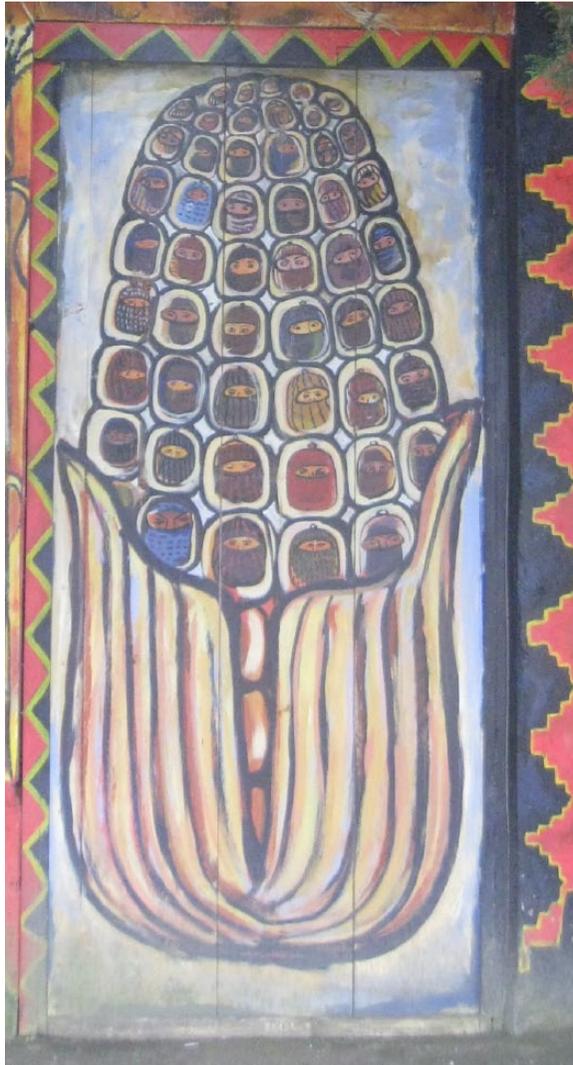


Figure 1. A mural in Oventik in which the dozens of kernels that make up an ear of corn each contain a face wearing the Zapatistas' characteristic ski mask.

most sensitive tenet of the NAFTA agreement' (Jung, 2003: 439), because as she and others (e.g. Collier, 2005; Fitting, 2011; Stephen, 2002) have shown, under free trade it is nearly impossible for small-scale peasant farmers to compete for urban Mexican markets with either the large-scale industrial producers in northern Mexico or their US counterparts. Capital generated from selling part of each harvest in urban markets has long been a source of cash that peasant farmers use to purchase food grown elsewhere in the state at the end of local growing cycles, as well as cash for commodities they cannot



Figure 2. A Zapatista mural in Oventik depicting revolutionaries wielding corn stalks.

produce themselves, such as medicine and, increasingly, cell phones. This has always been difficult, but due to the drop in maize prices in the post-NAFTA era, it is nearly impossible for these farmers to make enough cash off their harvest to sustain themselves throughout the year. Making use of technological and geographical advantages, as well as federal farm subsidies, the United States not only produces 20 times as much corn as Mexico, but can actually sell it at prices lower than it costs to produce it (Collier, 2005).⁸ Anthropologist Elizabeth Fitting (2011) has shown that even though US corn was supposed to be imported only for cattle feed, the effects on the Mexican economy extended far beyond this market. Mexican policymakers have viewed small-scale farmers as

inefficient producers who grow low-yield maize varieties, and would better serve the economy elsewhere, such as maquiladora labor. Their policies therefore disincentivize small-scale corn farming as a way of life, in part by turning a blind eye to the broader circulation of imported hybrid and transgenic corn.

Although it has at various times been demonized as backward and unhealthy, corn cultivation has always been significant to the bioculture of indigenous life in Mexico (Fitting, 2011). For the millions of small-scale farmers in Mexico, 'not only is there no alternative work they could productively move on to, but corn, and farming, is at the center of the communal life, not just the livelihood, of Mexico's rural population' (Jung, 2003: 440). Corn is foundational to Mayan culture – to which most indigenous Mexican groups participating in the Zapatista movement trace their ancestry – and is the basis for social structure, religion, and daily life; some have even argued that corn agriculture led the Mayans to develop their precise calendar (Bonfil Batalla, 1996; see also Fischer, 2001). In Mayan cosmology, human beings were literally formed out of corn.

Whether in terms of politics, culture, or economics, issues of land and peasants in Mexico always concern corn. Corn farming, therefore, has been an important site for negotiating the adoption of new technologies in Zapatista communities. In their original demands, the EZLN had sought access to farm equipment, such as tractors and pesticides, which the government subsidized for large ranches (Stephen, 2002: 155). Within a couple of years, the EZLN dropped these demands entirely, as it began to see these technologies as unnecessary tools that created dependence: tractors created dependence on gasoline and chemical pesticides created dependence on industrial fertilizers by encouraging monoculture and eventually making soil unproductive. This led to an alternative path for agricultural innovation. While large-scale farms in both the United States and northern Mexico employ monoculture agricultural practices that maximize the efficiency of corn production, Zapatista communities are working to promote *milpa* agriculture among their members, an indigenous cultivation method designed to maximize the nutritional complexity of plots of land. *Milpa* agriculture places corn within a complex growing ecology in which one plot of land grows squash (ground cover), beans (nitrogen fixing), and chilies, and frequently mushrooms, fruits, and other vegetables. This ecologically complex form of farming stands in strong contrast to the monoculture of high-yield hybrid and GM varieties that characterize industrial agriculture. These modes of production also vary in degree of genetic variation. Collectively, southern Mexico and Guatemala are known as the 'cradle of corn', and maintain a wider genetic diversity of corn than anywhere else in the world (Kaufman, 2002). While only a handful of varieties are grown for export in the United States, each peasant family in Mexico maintains a stock of several heirloom varieties, differing in color, texture, taste, and height, and adapted to diverse growing conditions ranging from the cloud forest of the highlands to the coast.

Contemporary Zapatista communities see *milpa* agriculture as based on Mayan knowledge that was nearly lost in the wake of the Green Revolution projects of the 1960s and 1970s, as peasant farmers attempted to increase their yields on shrinking land plots by adopting industrial farming practices. Many of the Zapatistas I met saw the adoption of old methods as a foundation for sustainable agroecology. They see the

productiveness and versatility of the *milpa* as providing a material and cultural basis for their pursuit of autonomy by enabling self-sufficiency. As anthropologist George Collier (2005) explains, 'Peasants considered – and still consider – the land their basis for survival' (p. 109).

Obviously, the importing of modernized US corn is not the only threat to Zapatista farmers. Living on occupied land, the farmers I spoke with live in constant concern about numerous factors that can compromise their settlements. While I was in Chiapas, rumor was circulating that helicopter-based surveys had found oil in an occupied part of the administrative region called Roberto Barrios. The juntas were also concerned about new government initiatives to seize land for palm oil plantations and new highways. Threats to the security and autonomy of Zapatista communities are also posed by the Mexican military, as well as by paramilitaries, ecological activism and ecotourism, and rival indigenous groups. However, the introduction of transgenics posed new kinds of unfamiliar threat to the communities. While biotech critics had raised concerns about the possible threat that transgenic introgression could pose to biodiversity, another important reason that the Berkeley scientists' letter signaled a crisis for farmers was because CaMV 35S genes were the property of the biotech firm Monsanto. While the movement of such markers through pollen could have suggested that they had no value in marking plants as intellectual property, Monsanto's highly publicized lawsuit against Canadian farmer Percy Schmeiser that began in 1997 had brought to light the potential litigation that could take place if pollen carried these markers into farmers' crops. The case, which Monsanto won in 2004, concluded that farmers could not save and replant seeds from knowingly contaminated plants without paying a licensing fee. For Zapatistas occupying lands that the Mexican government already did not want them on, the threat of such fines and litigation would be devastating.

Monsanto's litigious behavior in the United States and Canada as well as the unknown possible health and environmental effects created a great concern in Mexican civil society (Kinchy, 2012). While the editors of *Nature* withdrew their support for the Berkeley paper due to controversy over the scientists' testing methods,⁹ coalitions like In Defense of Maize and No País Sin Maíz (No Country without Maize) formed to protest and spread information about transgenics (Delborne, 2008; Fitting, 2011; Kinchy, 2012). The Zapatistas sent representatives to participate in these meetings. In all, 21 indigenous communities in Oaxaca requested that NAFTA examine the potential effects of GM flow into Mexico (Clapp, 2006). It soon became clear, though, that the Mexican government was more concerned with maintaining stable trade relations with the United States than with addressing these concerns. In 2002, members of the Mexican government even pushed to lift the ban, suggesting that there may be benefits to transgenic introgression, and by 2003, Mexico signed an agreement with the other NAFTA members to allow the import of maize shipments that were up to 5 percent GM. The following years saw many more studies and the relaxation of laws regulating the import and labeling of GM corn (Clapp, 2006; McAfee, 2003). This trend did not slow until September 2013, when, citing 'the risk of imminent harm to the environment', federal judge Jaime Eduardo Verdugo ordered the government to 'suspend all activities involving the planting of transgenic corn in the country and end the granting of permission for experimental and pilot commercial plantings' (Peña, 2013).

Strategic technology adoption and international solidarity

Zapatista's rejection of transgenics was not an inevitable component of their project of indigenous autonomy, but rather the result of a practice of strategic technology adoption mediated through contact with allies and solidarity organizations like Schools for Chiapas. These allies and non-governmental organization (NGOs) work to translate such technologies to local contexts. For example, much attention has been paid to the Zapatistas' strategic use of the Internet to build international solidarity (Garrido and Halavais, 2003; Martínez-Torres, 2001; Ronfeldt et al., 1998; Russell, 2005; Turner, 2005). Their collected political efforts are often referred to as the world's first 'postmodern revolutionary movement' because of their pioneering use of new media technology to create global attention for a cause not covered in conventional media outlets (Navarro, 2005). However, during the years after the insurrection, EZLN materials were initially prepared as written communiqués for the mass media and were handed to reporters or to friends from NGOs to give to reporters. Such material then had to be typed or scanned into electronic format for distribution on the Internet (Clever, 1998: 628; Russell, 2005; Turner, 2005). The most visible Zapatista web entities, *chiapas-l* and the Zapatista National Liberation Front list *fzln-l*, were started not by the indigenous people of Chiapas, but by their supporters in more technologically developed locales (Clever, 1998). Only through these mediated practices did the Zapatista governments come to see the Internet as vital to their movement. Likewise, as I will show, Schools for Chiapas has been critical to the formation for the Mother Seeds project and Zapatista corn.

The Quist-Chapela controversy 'made public' a thing – transgenic corn – that might not have otherwise become visible to the remote and impoverished Zapatista communities of the Chiapas highlands (Latour, 2005a). Records of the early conversations that led to the formation of the Mother Seeds project suggest that transgenic introgression was often spoken about in the language of 'infection' and mapped onto the plagues brought by the conquistadors. Drawing on their cultural identity as 'people made of corn', members of Zapatista communities described the transgenic contamination as an instrument of oppression invaders used to destroy the people by destroying their corn (Anonymous Zapatista Representatives, 2002). A health promoter I interviewed saw GM as similar to fertilizers and pesticides that create dependence while threatening agricultural fertility by changing the quality of plants and soil:

They [the government and multinational corporations] say [GM crops] are improved but we can see they are contaminated and are going to contaminate our earth. For that reason the government has tried to develop these more, to dominate our production. In potatoes, what we use now isn't what we had from our parents. They need fertilizer and insecticide or they will die. You didn't need any of that before. (Personal interview)

Despite years of agroecological promotion, it now seemed that just the kind of technoscientific product the Zapatistas had worked actively to reject was entering the communities without their consent.

But while the controversy made GM corn into an issue and the semiotic mapping onto colonial history made it meaningful, its mysterious materiality created a problem of knowledge deficiency: the Zapatistas did not know actually what either GM corn or

transgenic introgression looked like. Could their corn be contaminated, and if so, how could they find out? Was there anything they could do about it? In order to answer these questions they turned to friends in their international solidarity network, in search of others with experience of transgenics who would share knowledge with them about responses to the threat of invasion by this novel technoscientific entity.

Brown, founder and director of Schools for Chiapas, was in Chiapas during the height of the *Nature* controversy. He has been working with the Zapatistas since 1995, mainly on health and education projects in the *caracoles*. The *caracoles* are critical sites for technoscientific information exchange. Named after the Spanish word for ‘snail’, since 2003 they have served as the public face of the Zapatistas. They are places where outsiders, including NGOs, members of the Church, civil society, and other indigenous groups can come to meet with and learn about the Zapatistas.¹⁰ There are currently six *caracoles*, five that divide up the state of Chiapas as well as one in Oaxaca. These sites house the Juntas of Good Government – the democratically elected leadership boards of the communities – as well as clinics, schools, offices of weaving collectives, and agro-ecology offices, and sometimes other buildings as well. Schools for Chiapas has two private buildings in Oventik that they built to house themselves and volunteers during their first major school-building project in the mid-1990s. The NGO is unique in this regard, as no other organizations have established permanent structures in the *caracoles*. In spite of this fact, like any other visitor, Brown must present his passport and wait at the gate for permission from the junta in order to enter Oventik. Entrance is never guaranteed, and during my stay, there were times when we waited for permission outside the gate for hours, if not most of the day. The fact that the NGO’s buildings remain intact is a testament to Brown’s ongoing labor in maintaining positive relationships with the community and to the widely held perception among leadership that Schools for Chiapas represents their interests and makes valuable contributions to their cause.

Although the only one with a headquarters in a *caracol*, schools from Chiapas is one of many international visitor organizations bringing medical, engineering, and agricultural knowledge to share that the juntas have welcomed. But new technoscientific practices are only accepted after long meetings wherein community members discuss their value in supporting the community’s goals of autonomous governance. For example, the medical clinic in Oventik features an ultrasound machine, vaccine storage units, and a modern pharmacy. Although they require labor and resources for upkeep, the Zapatistas see these technologies as allowing them to meet the medical needs of their communities without government aid. A handful of *caracoles* have access to their own computers, digital media equipment, and Internet connections, and now use media centers to create and disseminate media messages, as well as to research and exchange information. Rather than signifying the pursuit of a Western lifestyle, in the Zapatista communities, the adoption of new technologies is intended to help the community to maintain their agrarian lifestyle and political autonomy.

On New Year’s Day, 2002, Brown was invited to a meeting in Oventik to discuss the controversy over transgenic contamination and share any knowledge he might have (Brown, 2013). He recounted that the communities did not understand what transgenic contamination was, ‘but they knew something bad was happening’ because of the coverage of public response to the controversy in newspapers (personal interview). The

meeting marked a new direction for the non-profit. At the time, no members of Schools for Chiapas had expertise in genetic science, but Brown was in contact with someone who did. Martin Taylor, an ecologist working at the Center for Biological Diversity in Tucson, Arizona, had done fundraising for Schools for Chiapas in the late 1990s. Brown contacted Taylor for information.

Even though transgenic contamination was highly contested in the first months after the *Nature* letter's publication, Taylor told Brown he agreed with Quist and Chapela. He suggested that the Zapatistas take action to protect their corn by starting a seed bank. As a pro-biodiversity activist scientist, Taylor had the right combination of scientific expertise and political clout to have his idea taken seriously. He also was willing to use his own money to set up the seed bank (Brown, 2013). The Zapatistas invited Taylor to share his knowledge of plant genetics and seed banking with them. In early 2002, he drove to Chiapas in a pick-up truck to take up residence in Oventik and begin the seed bank project.

Brown's decision to speak to a biologist rather than a lawyer, and Taylor's suggestion to create a seed bank are both important historical contingencies in the story of Zapatista corn. Instead of creating a seed bank, they might instead have aligned with legal allies to fight the validity of genetic markers, accepting transgenic introgression as the fate of their corn. Taylor could have suggested that they send corn samples away for sequencing and patenting, therefore defining the many specific varieties of corn grown in the communities. Neither of these forms of resistance would have led to the Zapatista corn project.

Biocultural translation: The case of the Zapatista seed bank

The seed bank's implementation hinged on a variety of biocultural translation practices. In Oventik, Taylor began to set up a seed bank for the Zapatistas, but to do so he would need their help. Michel Callon's (1986) outline of four moments of translation provides a useful framework for analyzing Taylor's efforts to bring this technology to southern Mexico. Translation work entails defining a problem (*problematization*), interesting others in a proposed solution (*interesement*), and defining and coordinating the interrelated roles involved in the project for achieving that solution (*enrollment*). These first three moments establish the actor-network that entails a technoscientific program. The final one – *dissidence* – describes the moment when the network falls apart.

Technology cannot simply be transferred from a high-tech laboratory to an indigenous community. Though seed-saving is an ancient technology, and critical to the Zapatistas' self-sufficient agricultural cultural practices, the seed bank project would be different. Not only would it require different technologies in order to save seeds for much longer – in local agriculture, seeds are rarely saved for more than 3 years – but the concept of 'saving' seeds also needed to take on a new meaning: to be successfully adopted by the Zapatistas as a tool of autonomy, saving seeds for planting also needed to be seen as saving them from contamination.

Taylor's translation work began with teaching classes on genetics and seed banking to the Zapatistas and Schools for Chiapas volunteers in the *caracoles*. In this context, he established that the question of concern was how to keep Zapatista's corn safe from

transgenic contamination and that the answer was to create a seed bank where pure, uncontaminated seeds could be made safe. As the only available expert in seed banking, this made him indispensable to the project. The seed bank project defined a network of relations: corn was defined as a genetic resource that required saving (in both senses), the Zapatistas were defined as owners of these resources, and the students and international volunteers in the classes were defined as laboratory assistants who would do the work of gathering and preserving the corn. The classes provided Taylor with a context for enrolling Zapatista students and volunteers in his seed-banking project. During harvests in 2002, students in Oventik collected 61 varieties of seeds from the surrounding communities (AScribe Newswire, 2002).

The seed bank project required the coordination of diverse human labor across disparate communities, and therefore a communication infrastructure. Despite the mythical image of spokesman Subcommandante Marcos sitting in the jungle uploading communiqués from his laptop, the reality is that most Zapatistas have a mediated relationship to communications technologies. While some community members now have cell phones, most are poor and often cut off not only from computer communications but also from the necessary electricity and telephone systems; they get news by visiting *caracoles*, by listening to the EZLN radio station – which broadcasts news, political speeches, folk music, and service announcements throughout Chiapas and parts of Oaxaca – or through promoters. ‘Promoters’ or *formadores* are outreach workers who specialize in areas of practical knowledge such as education, health care, and ecological agriculture. Walking or catching a ride in a flatbed truck, they travel to the villages of the surrounding communities in order to learn about their needs and work with the villagers on reform plans shaped during meetings in the *caracoles*. They enter the role as young teenagers by training with more experienced promoters and develop their store of knowledge through a combination of research with indigenous community elders, international information exchange, and hands-on experience. They act as conduits between the ‘outsider’ information gathered at the *caracol* and the ‘insider’ members of the small, dispersed communities surrounding it. Many Zapatista communities are small rural villages that have existed for less than two decades, having been formed during the episode of land reoccupation that began in the aftermath of the 1994 uprising. Promoters serve a necessary communications role for these communities, many of which are distant from the *caracoles* and populated by individuals who themselves were only teenagers when they moved there. Promoters played a central role in coordinating the seed bank project and communicating its goals to the communities.

Seed banking also requires the availability and compliance of many non-human actants, and it was clear from the outset that this would be a challenge. To set up the bank, Taylor required the materials of his trade, including genetic test kits to make sure the seeds were not already contaminated, foil and supplies for bagging and cataloging, and even a freezer for storage. The freezer had to be delivered by truck to the highlands from the state capital, Tuxtla Gutiérrez, some 3 hours away. Not all the technologies they used were imported. In the absence of laboratory chemicals and sterile glass containers, collected seeds were dried, mixed with ash and lime to combat humidity, as well as with eucalyptus leaves that act as an insect repellent, and were then stored in handmade earthenware pots bought at a Sunday market (Brown, 2005).

When the freezer arrived, education promoters set up their laboratory in the newly built school. The seed banking was completed by teams working together, one team shuttling pots to another that sifted seed out of the lime and ash, while another acted as bookkeepers, writing down registration numbers and collection dates on foil and plastic storage bags as well as in the central corn seed registry. In his memoir of this time period, Brown (2005) captures a remarkable moment in local translation of scientific knowledge practices that highlights how important the materiality of the corn itself was in the success of the seed-banking project: he describes how, upon walking into the school, he encountered several education promoters sitting on the floor of a classroom, hitting seeds with carpenter's tools used in the construction of the school. 'If the seed mashes when we hit it with the hammer that proves the water content is above the six percent we need', a young woman explains, holding a hammer in one hand and balancing a baby on her hip with the other:

If the seed shatters when I hit it, then the seed is dry enough to be sealed in these foil bags and placed in the freezer. There it will be safe for many years from insects as well as infections by genetically modified pollen.

In the absence of instruments for testing dryness, the difference between mashing and shattering became a significant scientific indicator in the *caracol* laboratory. This example demonstrates how the materiality of corn, which conveniently shatters at the level of moisture content needed for seed banking, facilitated the local translation of this practice.

Genetic testing also required translation on several levels: contextual, linguistic, and material. The genetic testing kits they used had been created by companies like Envirologix, which advertise their products as tools for biotechnology companies to enforce their patents on agricultural products by allowing those companies to check crops for markers. Kits provide the basis for copyright infringement lawsuits against farmers found growing crops containing the markers without a license to do so. But in this case, the kits would be subverted as weapons of the weak that would allow them to know if such markers were present in their crops and remove the offending plants if markers were found. But in order to make the genetic testing kits usable by agroecology promoters, a Schools for Chiapas volunteer translated¹¹ the instructions for the genetic test kits provided by their American manufacturers. They translated not only the language, but also the actual instructions, to the local context. For example, because of the difficulty of measuring precise weights for samples, the translated instructions direct testers to use a five-peso piece as a guide to cut a circle of leaf and then to cut that into eighths using a machete (Brown, personal interview).

Taylor had instructed his Zapatista lab techs that

Before the seed can sleep for many years in the freezer, our laboratory must verify that the moisture content of the seed is below 6 percent; otherwise when the water inside the corn seed freezes it will expand and burst the cell membranes killing the seed. (Brown, 2013: 162)

The personification of the seed, evident in terms like 'sleep' and 'killing', should not be seen as a quaint method of explaining cryogenics and non-viability of seeds to indigenous

people, but rather as culturally appropriate meaning-making among indigenous Mexicans who draw discursive – if not literal – equivalence between people and corn.

This was the beginning of the Mother Seeds project. Mother seeds are fertile seed stock set aside for planting. The Tzotzil word for ‘resistance’ is a compound of the words for ‘withstand’ and ‘suffering’, a word suggesting a more stoic stance to opposing oppression than either its English or Spanish counterparts. Thus, in the language of one of the major indigenous groups working with the project, its name implies the protection of landrace corn from the ‘suffering’ caused by genetic ‘infection’ (Brown, 2013: 159).

For the 3 years Taylor stayed in Chiapas, the freezer stored the seeds of resistance under the watchful gaze of a Virgin of Guadalupe donning a balaclava, a potent symbol of transcultural collaboration to protect the Zapatista’s corn (Brown, 2013: 162). However, the Zapatistas quietly abandoned the seed bank not long after Taylor left Chiapas in 2004. While agricultural development critics might argue that seed banking was an inherently unsustainable and inappropriate technology, relying too much on laboratory technologies unavailable in the field, the Zapatistas’ history of strategically adopting new technologies in service of their autonomy demonstrates that such challenges are not insurmountable.

Zapatistas conduct much of their political decision making through long meetings that include members of the junta, promoters, and any other members of the community who are willing and interested in participating. This is a strategy for ensuring that the junta’s policies represent the views and desires of the communities so that, in turn, the junta can provide democratic leadership in arbitrating issues that are brought to them. In recounting his own experiences with the meetings that took place around the seed bank, Brown (2013: 166) has illustrated that while the seed bank project was welcomed because it offered a strategy for dealing with the shock and horror of the threat of transgenics – a strategy that the communities did not have on their own – it was nevertheless not one that all Zapatistas were entirely comfortable with.

One reason for discomfort was that the seed bank contained only 61 varieties of seed out of the hundreds grown in their communities. Another source of contention was the discourse and practice of ‘banking’, which raised associations with the profit-driven capitalist policies that the Zapatistas ideologically oppose. A speech given by an education promoter during the seed bank’s dedication illustrates this well:

We know that the bad governments and the multinational corporations have stolen the people’s corn seed and keep them frozen to be used to make money for the rich people. Our seed bank will be different. I don’t even like the term ‘bank’ because we will protect our seeds without thinking that it will make us rich. We will save the corn because the corn is us and we are the corn. (Brown, 2013: 159–160)

This quote illustrates the careful discursive work that justified the practice of seed banking, as well as the ambivalence the community felt toward the project. From his position in the communities, Brown felt that the seed bank ‘gave the Zapatistas the sense that they were being dragged into the commoditization of seed and all of its administrative and technical complexities’ (Brown, 2013: 166). STS scholars have similarly criticized seed

banking as a practice that often reduces the value of seeds to their genetic information, overlooking the value of their lived, biocultural entanglements as potential plants (see Van Dooren, 2009).

While the seed bank project had successfully translated certain biotechnological practices to the *material* conditions of the Zapatista communities, it had not succeeded in translating them to the community's cultural values. Nor had it led agroecology promoters to see themselves as competent seed bank technicians; those I spoke with told me that they felt that they did not have sufficient knowledge of how to run a seed bank properly in the long term. In the absence of an active mediator to maintain the network of relations necessary to maintain the seed bank, the project did not have the discursive, material, or epistemic resources to overcome these challenges.

Defining Zapatista corn

In many analyses of translation projects that bring modern scientific projects into peasant agrarian communities, the story ends with either the successful *interessement* or unsuccessful dissidence of members of the actor-network. Here, however, the epilogue overshadows the seed bank project's failure, which becomes merely the *prologue* of the story of Zapatista corn. Although Taylor's translation work did not create the long-term seed bank he had hoped would help solve the Zapatistas' problems with transgenics, this project provided the technocultural context for the creation of the material-semiotic object called Zapatista corn. First, it discursively defined Zapatista's corn as part of their cultural heritage that needed to be saved from neoliberal forces. Second, the genetic testing step of the seed-banking process materially produced Zapatista corn as seeds grown in Zapatista communities. In the afterlife of the seed bank, Zapatista communities worked with Schools for Chiapas to develop an ongoing genetic testing program to ensure that their corn remained free from transgenic contamination. As a result, not only corn but also Zapatista corn became an important part of Zapatista culture.

Not long after Taylor left Chiapas, the junta issued a new science policy – which bore the hopeful title 'The New Seed that is Going to Produce' – to be administered by Mother Seeds to supplement the then-precarious but not-yet-abandoned seed bank. Disseminated via EZLN radio and a team of agroecology promoters, the junta's policy called for the collection of corn leaves and seed from the communities. With the same kinds of techniques and genetic testing kits Taylor had taught them to use through the seed-banking project, agroecology promoters would test leaves from crops in each Zapatista community for the presence of GM markers; the seeds would become part of a new program of 'solidarity distribution'. That April, indigenous farmers brought leaves and seeds with them when they traveled to Oventik to celebrate religious ceremonies and dedicate the new school.

The genetic testing program was not intended to produce knowledge for the scientific community about transgenic contamination in Chiapas such as might be used to support Chapela and Quist's claims. As Bonneuil et al. (2014) have shown, such fieldwork, undertaken by other indigenous anti-GM groups like In Defense of Maize, was not granted significant epistemic authority in any case. Instead, the program's goals were local control and empowerment; its purpose was to identify any GM crops growing on

Zapatista lands and, if found, eliminate them. Agroecology promoters began conducting genetic testing as part of the community gatherings that are the cornerstone of public life in Zapatista communities; as such, anti-GM has become a part of existing cultural practices. Although the Mexican federal government lifted its moratorium on planting transgenic corn on 13 August 2003, throughout Chiapas the Zapatistas have continued to forbid it ('Transgenic Maize Called Threat to Mexico's Traditional Maize', 2004). According to the junta's policy, Zapatistas may only plant seeds of known origin. The policy dictates that all corn plants found containing GM markers will be pulled. If farmers have transgenics in their fields, promoters lecture them about the dangers of transgenics and give them seeds collected from non-contaminated *milpas*.

If farmers find contamination in their fields and are unable to replant that season, they may buy and eat corn meal, including brands that contain GMOs, as long as it is pre-ground so that it cannot be planted (Brown, interview). This policy sets the Zapatista anti-GM movement distinctly apart from consumer-based anti-GM movements wherein concerns over their unknown health risks take center stage (e.g. Jasanoff, 2005; Schurman, 2004; Willging, 2008).

By instituting policies that excluded genetic markers from crops grown on Zapatista farmers' *milpas*, it became possible to categorize the biodiverse varieties of corn grown on these lands under the banner of 'Zapatista Corn'. Rather than being defined through the specific genes, in the way that biotech companies use genes to mark products like Bt or Starlink corn as their intellectual property, Zapatista corn is a biocultural innovation, a material-semiotic assemblage defined through a combination of the new and old technological practices of seed-saving, genetic testing, and agroecology-based political education.

Indeed, the biodiversity of the corn is one of the justifications for protecting it. I asked a group of agroecology promoters what reasons they give the communities for genetic testing. One promoter stated that they explain that, 'transgenics are a risk to us and the richness of our culture'. They emphasize how such products threaten autonomy, especially because they have to be bought new each year. Genetic testing is a part of an effort 'to save what they have and not lose it'. Invoking Zapatista critiques of neoliberal economic policy, promoters also stress that the government wants to make people more dependent on them and on companies, which it does by spreading transgenics and selling agro-chemicals.

Although Schools for Chiapas has been a critical ally in helping to develop the infrastructure for the Mother Seeds project, their views on GM corn are not identical to those of many Zapatistas: during my fieldwork, the delegation leader from Schools for Chiapas would often pause in translating to correct the promoter's answers to my questions, such as whether eating GM corn causes health problems or if contamination makes visible changes in plants. But they find common ground in a shared belief that transgenics represent a significant threat to the Zapatistas' autonomy, a shared belief that provides a basis for grounding their shared practices in the biocultural project.

No form of genetic testing for transgenic introgression is foolproof. The affordable, transportable test kits that are currently available can only test for markers, not the active component of the gene. They also can only test leaves, and therefore might not detect seed fertilized with transgenic pollen in an uncontaminated plant. Brown and the

agroecology promoters I spoke with knew this, but nevertheless felt that genetic testing was useful because of its performative aspects – it provides a material practice around which they can open a conversation with communities about what can be done to address GMOs. Testing demonstrates that transgenics can be seen. This serves a therapeutic function, helping the communities to overcome the ‘horror of having manipulated corn around’ by giving them a sense of control over the otherwise invisible threat (Brown, interview). This in itself is empowering because it clears a psychological space to develop practical plans.

Alternative circulation networks for materials and meanings

The next stage in the biocultural translation process is the solidarity distribution of bio-diverse seeds donated by farmers. Agroecology promoters in each *caracol* maintain a stock of Zapatista corn for visitors, while Schools for Chiapas makes seeds available through their website and through social justice events such as the World Social Forum. While the seeds themselves are given free of charge, Schools for Chiapas requests donations between US\$7 and US\$60 on their website in exchange for the seeds, in order to contribute to the fund to buy genetic testing kits. When a member of Schools for Chiapas travels from the United States to Mexico, he or she will buy kits in bulk and bring them to the *caracoles* in their luggage.

Multiple discourses justify solidarity distribution, appealing to the variety of ways in which people are implicated in the circulation of GM corn, and offering, through the circulation of Zapatista corn, an alternative to many of these. The Zapatistas are not anti-internationalism, but rather are against government and corporate globalization practices that force people into dependency (De Angelis, 2000). One stated objective of this project was to provide an alternative to the freezer-based ‘sleeping’ seed bank by creating a ‘living seed bank’ through the participation of solidarity growers around the world and the help of Schools for Chiapas as distributors. Especially after the ban on growing GM was lifted in Mexico, the junta argued that the seed needed refuge among friends elsewhere. Evoking the biocultural link between the people and their corn, a member of the junta told Brown:

We want you to take our seeds to others far away who want to give it a safe new home. This will be another way for people to know the Zapatistas and it might help our corn to escape the dangers of transgenics which are coming into Chiapas because of the bad governments and the big corporations. (Brown, 2005)

Despite this request, the living seed bank project functions less to bank the seeds for later use than as a material-semiotic performance of international solidarity relationships. A living seed bank would not be able to prevent transgenic contamination of corn any more than corn being grown in Chiapas, given the widespread disbursement of GM corn. Additionally, Mother Seeds provides insufficient information about the seeds to enable plots to serve as banks of specific genetic material. Although recipients may choose from red, black, blue, white, and yellow seeds, Mother Seeds does not distinguish batches by

precise provenance or variety: it is all Zapatista corn. Its important ability is to circulate. By circulating, it enables alternative material-semiotic relationships to those produced through political and economic globalization. Through its travels Zapatista corn enacts the biocultural metonymy between the people and their corn, allowing recipients 'to know the Zapatistas' and participate in their survival.

The Zapatista corn promotional materials, including fliers and the Schools for Chiapas website, discursively structure the relationships between seeds, their recipients, and the Zapatistas' political ideology. Schools for Chiapas distribute seeds in a white envelope branded with the text 'GE-FREE ZAPATISTA CORN SEEDS', also declaring that, 'THIS IS A CORN IN RESISTANCE!'

The meaning of Zapatista corn as a 'corn in resistance' is structured through opposition to GM corn. GM corn is framed as causing both physical damage by destroying health and economic damage by creating dependence on capitalist forms of commodity distribution. Zapatistas believe that the indigenous people of the world have been oppressed through a loss and corruption of their original, healthy food. As one health promoter explained to me, true health comes from eating good food, and the base of all health problems comes from food. According to him, the Spanish introduction of new plants and animals to the Americas was a practice of domination that began to destroy the quality of food and brought diseases like cancer and diabetes. In contrast, Zapatista corn is a nutritious food that helps people to regain their self-sufficiency. Promotional materials use language such as 'good food', defined as 'pure' and 'natural', in opposition to 'big corporation' corn, which is 'contaminated' and unnatural, to make a moral distinction between the corn they circulate and GM corn.

The instructions on the package likewise blend agricultural advice and political ideology:

This strong Zapatista corn seed should be planted as soon as the soil begins to warm with three seeds in hills one full yard apart. Protect from wind – these plants will grow very tall! Growing with three plants per hill provides vital support; mound soil around the base of each plant to grow a stronger root system. Needs much water, rich soil, plus dignity, democracy, justice, and especially revolutionary love!

Promotional materials also promote communal values as central to food and agriculture, urging solidarity growers to create a better world by growing community *milpas*, throwing harvest parties, and eating together. They make a call for solidarity growers to learn about the Zapatistas by adopting, in some way, their corn agriculture practices. For Brown, seed distribution entails promoting international solidarity and awareness of the material basis of the Zapatista's fight for autonomy. Brown feels that Zapatista corn serves as a material refutation of anti-Zapatista propaganda that argues that the organization is causing ecological disaster through its occupations in the Lacandon jungle. It is evidence of the simple food they eat, their adherence to sustainable agriculture, and their low-consumption way of life.

Mother Seeds makes the corn available to anyone willing to sign the user-agreement ensuring their ethical commitment to providing 'sanctuary to the biological and cultural heritage of the Mayan peoples'. This agreement states, 'This corn is donated to Schools

for Chiapas by autonomous Zapatista farmers. I agree that I will never patent nor abuse the genetic material or life force of this seed'. This includes people living in highly developed parts of the world, like myself, who find the website or encounter fliers posted in health food stores and are interested in growing their own corn to eat, creating a plot of living seed bank, preparing the Zapatista corn to make tortillas, or just having a symbolic souvenir of their donation to the test kit fund.

While website distribution provides an important base for funding the genetic testing kits and creating solidarity with the Zapatista cause, just as important is their distribution to peasant farmers, which is usually mediated through Schools for Chiapas' attendance at the World Social Forum. Members of both the Zapatistas and Schools for Chiapas told me that it was important to make Zapatista corn available to people who had lost their seed, be it through contamination, Green Revolution programs, war, or natural disasters. An agroecology promoter told me that he believed that biotechnology firms provide humanitarian aid to countries during times of famine more to serve their corporate interests than to help people. He saw the distribution of Zapatista corn as providing an alternative for those in need, by allowing them to feed themselves rather than being reliant on aid from more developed countries.¹² Although the Zapatistas are materially poor, the distribution of their seeds allows them to support others they see as similarly oppressed by the legacy of colonialism and by neoliberalism.

The non-market distribution of Zapatista corn is significant for the project. For example, by stressing that those who order Zapatista corn are donating to the genetic testing kit fund – rather than outright purchasing – the act is figured as one of anti-capitalist activism. While the Zapatistas take cash donations and sell many items, such as coffee, honey, weaving, boots, and amber, the 'free' distribution of corn signifies the belief that access to basic foodstuffs should remain outside of global markets. (Farmers do, however, sell their corn in the nearest urban markets.) The goal of free distribution is to reduce the degree of economic alienation involved in the circulation process by emphasizing that Zapatista corn is a gift intended to help others enact worlds they want to live in.

It is important to note, however, that according to US law, School for Chiapas cannot legally distribute Zapatista corn as seed. They are able to circumvent this technicality because of the materiality of corn: because we eat the seed, it can be distributed as a food, which is legal, and which would not be the case for other plants common to the indigenous diet, like squash. This technicality is also believed to be responsible for the original presence of GM in Chiapas during the ban; it is likely that campesinos planted hybrid kernels approved for consumption but not planting either unintentionally or because they believed they would be superior. The messy category policing between seed and food illustrates the problems with the forms of circulation the Zapatistas and their allies are critiquing and the strategies they use to evade them.

While some discussion has surfaced in the Zapatista communities about tapping the Mexican market for organic corn, this has been a contentious issue because the national government oversees the process of certifying producers as 'organic'. The label only benefits consumers who have no personal relationship with the people who produce their food. The Zapatistas have a different local definition of organic, which was explained to me by a junta member in Oventik:

Our great grandparents didn't even know about chemicals. The land was fertile and strong with its own fertility. When the government brought chemicals it began killing the fertility of our soil. Many parcels don't grow without chemicals now. Organic is what our grandparents did. (Personal interview)

When the Zapatistas use the term 'organic' to describe their agriculture, they are expressing their commitment to agroecology and resistance to industrial agriculture. As they see it, only under systems of economic alienation would a food need to be labeled as 'organic'.

Conclusion: Performing another world

Jasanoff (2002) has argued that

It is time to invent other, more discursively open-ended concepts around which to crystallise our dreams and projects of human betterment. Not one modernity, but as many new modernities as the citizens of the earth can responsibly imagine should be the goal. We can only be led there through an energetic and unabashedly humanistic contemplation of alternative democratic futures. (p. 272)

When people march against Monsanto, as they did in the hundreds of thousands on 27 March 2013, they are trying to force the contemplation of an alternative democratic future in opposition to the political and economic forces creating a world they do not want to live in. They feel their agency compromised when they cannot buy food or plant a field without the risk of exposure to transgenics. When the world is despairing of the growing commodification of resources seen as once freely given by nature, what could counter our alienation better than seeds freely given by people who do not separate their need for food from their need for land and do not separate either from their politics?

Through solidarity distribution, the Mother Seeds project participants are working to define and circulate corn in a way that presents what they see as an alternative to the practices of neoliberal economics that brought GM-corn to Mexico. It provides a new pathway for the Zapatistas to support others and to materially create another world. Much as the genetic test kits make GMs visible to the Zapatistas; the GM-free label makes Zapatista corn visible to those elsewhere who are actively trying to resist agrotech companies like Monsanto. Zapatista corn offers the possibility of material participation in the enactment of a different kind of world. It is now being grown in hundreds of plots around the world, not only in countries such as India, Kenya, Canada, and Spain, but also in American cities such as Portland and San Diego. In these places, it performs a political bioculture: it demonstrates that not all corn is equivalent – either economically or culturally – and that as material-semiotic actors, plants can help us to create another world where individuals can resist forces much bigger than themselves.

The Mother Seeds Project is not an effort to return to an Edenic pure state of nature before GM. As a project of resistance and survival, it has both strategically adopted new technology and conducted its own biocultural innovation. Technoscience makes new objects that economic policies spread globally at a pace never seen before in history. By design, new objects, even helpful ones, disrupt existing ways of life. This case study

illustrates how a community faced the disruption presented by the encroachment of unwanted technoscientific objects by translating their own culture and resources to produce alternative, more desirable relationships. Zapatista corn is not a new product, like GM corn, but rather a new biocultural object produced through adaptive meaning-making practices and relations.

The definition and circulation of Zapatista corn was not an inevitable response to GMOs. Indeed, as I have shown, a seed bank and not Zapatista corn was the organization's initial response to the threat of GMOs, but it failed, I argue, because its basic orientation to seeds conflicted with the Zapatistas' political bioculture. The Zapatista corn project, in contrast, was more fluid. Marianne De Laet and Annemarie Mol (2000) describe fluid technologies as adaptable, flexible, and responsive to a variety of contexts of use. Rather than radically changing the practices and meanings of social life, the Zapatista corn project was situated within extant ones, including practices of promoting international solidarity.

Zapatista corn developed over time in response to specific available resources and sources and of expertise. I have analyzed six components of translation in the making of Zapatista corn: its historical context, the practices of strategic technology adoption of the community that produce it, the processes of knowledge-transfer enabling its recognition, local translation of technology in order to produce it, policies designed to adapt technoculture to include it, and the multiplicity of the object's meanings generated through its circulation across diverse communities. In each of these sections, I showed how Zapatista culture and political ideology shaped the Mother Seeds anti-GM movement, but also how this movement produced new biocultural forms.

I hope that analyzing this case of biocultural innovation allows us to better understand the many seeming contradictions of an anti-GM movement led by an indigenous anti-neoliberal organization, such as its engagement with seed-banking, genetic testing, and global distribution of corn. It is a step toward understanding the survival strategies of indigenous scientific activist movements as they struggle for autonomy in the brave new world we share.

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Notes

1. Its form makes GM maize difficult to regulate under international trade policies such as the Cartagena Protocol because it had such a high risk of being circulated in unapproved ways. This point was made apparent during the 2000 controversy in which a GM corn brand only

- approved for animal feed, StarLink, was found in human food products (Bingham, 2008; Clapp, 2006; Murphy et al., 2006).
2. In order to counter the biotech industry's claim that the technology is needed to address this population's agricultural output and feed a hungry world, many authors from a variety of fields have studied how genetically modified organisms (GMOs) hurt small-scale farmers in the developing world (e.g. Altieri, 2003, 2005; Clapp, 2006; Garcia and Altieri, 2005; McAfee, 2003; Martínez-Torres and Rosset, 2010; Rosset, 2005; Shiva, 2000).
 3. For example, Callon's (1986) St. Brieuc Bay scallops, Wynne's (1992) Cumbrian sheep herders, Akrich (1992) on electrification, and De Laet's and Mol (2000) Zimbabwe bush pump.
 4. For notable exceptions, see Clapp (2006), Bloomfield and Doolin (2011), Yamaguchi (2007), and Heller (2004).
 5. See Casas-Cortés et al. (2008) for a discussion of social movements as knowledge-making practices.
 6. In contrast, in July 2013, Italy announced it would ban Monsanto's MON810 GM corn in order to preserve their biodiversity and preserve the designation of 'organic' for their products. But this choice is couched in terms that still rely on the value system of global capitalism, with the goal being maintaining a share of the market.
 7. See Stephen (2002) for an ethnographic analysis of the indigenous movement's appropriation of the historical figure of Zapata.
 8. Both Oxfam and the Institute for Agriculture and Trade Policy calculated that the US export price of maize was significantly lower than the cost of production in the late 1990s and early 2000s (See Clapp, 2006).
 9. This was an unprecedented move by the journal. Almost immediately, scientists throughout North America denounced Chapela and Quist's findings. They contacted *Nature* as well as journalists, arguing that the polymerase chain reaction (PCR) tests that the Berkeley biologists had used frequently produced false positives (Kaufman, 2002; Mann, 2002). When Mexican researchers at the National Institute of Ecology and National Autonomous University of Mexico double-checked the results using 20 samples of corn from throughout Oaxaca, they found evidence of transgenic introgression in about 12 percent of the plants, but because they also used the PCR method, Chapela and Quist's original detractors remained unconvinced (Clapp, 2006; Kaufman, 2002; Mann, 2002). Nevertheless, 100 pro-GM scientists released a joint statement that not only accepted the possibility of transgenic introgression in landrace corn, but rather expressed the opinion that it was both 'inevitable and welcome' (See Clapp, 2006: 8). In spite of having to fight for tenure after University of California (UC) Berkeley initially denied his promotion in 2004, Chapela continued to act as a 'dissident scientist', speaking publicly about his critique of GMOs (Delborne, 2008; GM Watch Daily, 2004).
 10. Prior to August 2003, the *caracoles* were called Aguascalientes and were run by members of the military wing of the organization, the Zapatista National Liberation Army (EZLN). Their names were changed when administration was transferred to the new civilian *Juntas de Buen Gobierno*, the Good Government Boards (Brown, 2013).
 11. No one I interviewed remembered what language(s) the instructions were translated into, though it was most likely Spanish, which serves as the lingua franca of the region. Within their local communities, most Zapatistas primarily speak indigenous languages such as Chol, Tzotzil, and Tzeltal.
 12. In 2002, the US donated corn, including GM corn, to six southern African countries experiencing famine. This raised a red flag for political leaders both because of concerns about GM gene flow and the possible immune system reactions that people of their countries might have

due to HIV/AIDS (Clapp, 2006). Zambia refused all donations, while several other countries accepted only milled corn.

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