Food Opera:

Transforming the Restaurant Soundscape

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Abstract

Music has become a ubiquitous element of the restaurant soundscape, one that even in the most calculated dining environments is commonly relegated to the role of a background mood enhancer. In a series of events that I call "food operas," I have explored ways to pair food and sound more overtly, using techniques adapted from my work in the video game industry to synchronize music with different courses, to conform to the indeterminate durations of dining room states, and to provide variation over the extended length of a multi-course meal. This paper describes the challenges of building a sound deployment system for a restaurant that delivers and coordinates a customized soundtrack for each diner, while also examining the expressive potential of this new genre.

Keywords: food opera, audio-gustatory, multi-channel, responsive systems, phonography, generative music, video game music

1. Introduction

The art world has been taking increasing notice of the culinary world in recent years, in a development that in some ways mirrors its appropriation of sound in the twentieth century; examples include Ferran Adrià's G Pavilion at Documenta 12 (2007), Marina Abramović's *Volcano Flambé* (2011), and Natalie Jeremijenko and Mihir Desai's Cross[x] Species Adventure Club (2010). At the same time, modern chefs have been increasingly interested in synchronizing sound and visual information with dishes, as in Heston Blumenthal's iconic dish *Sound of the Sea* (2007), Paul Pairet's high-tech and immersive restaurant Ultraviolet (opened in 2012), and El Celler de Can Roca's "GastrOpera" *El Somni* (2013).

In any aesthetic presentation that merges sound and food, questions of acoustic ecology must be addressed. Background music while dining has become a ubiquitous component of the urban soundscape, while at the same time, the murmuring of conversation is considered a fundamental and inalienable accompaniment to any shared meal. The social institution of communal dining brings with it a host of assumptions and conventions that must be carefully negotiated.

In a recent series of events, I, along with a team that includes producer and designer JuttaFriedrichs and sound artist Stephan Moore, have collaborated with acclaimed chef Jason Bond of Bondir restaurant in Cambridge, MA, USA, to present an immersive, evening-length, audio-gustatory experience that we have termed "food opera." In these events we explore dining as a communicative medium towards a number of different expressive ends, including using the format of a meal coupled with sound to tell the story of sustainable food practices and the emerging "locavore" movement.

2. Observations on the State of the Restaurant Soundscape

It is a rare phenomenon, the restaurant without music. That a public meal should be accompanied by music has gone seemingly without question, at least since sound recording and playback technology made the deployment of music in restaurant spaces convenient and inexpensive.

In a restaurant context, music serves several functions. It entices customers to enter the restaurant, perhaps first by attracting them with desirable sounds, and also by giving the impression of activity, which is often an indicator of a successful restaurant. Once inside the restaurant, music raises the noise floor to mask undesirable sonic by-products of food consumption and preparation, as well as to provide a measure of privacy for diners' conversations.

Choice of music conspires with interior design, restaurant name and logo, and other signifiers to establish a restaurant's identity. For restaurants specializing in a certain regional cuisine, it is common to present a corresponding musical tradition, for example, mariachi music in a Mexican restaurant. For other restaurants, music may be chosen primarily based on the demographic the restaurant is trying to lure. Conventions vary by locale; when I was living in China, a small playlist of Western hits was inescapable ("Hotel California," "Another Day in Paradise," "Right Here Waiting," "My Heart Will Go On"), and now that I live in Spain, the default restaurant soundtrack seems to belight jazz covers of old pop hits from the 80's and 90's (even at as fine a restaurant at El Club Allard in Madrid).

Most music in restaurants is recorded and delivered to diners via a sound playback system, and there is typically one soundtrack for the entire restaurant, deployed from speakers positioned unobtrusively throughout the space. By increasing the number of speakers, the sound may be more evenly distributed. As most recorded music is distributed in a stereo format, a sound system for a large restaurant must incorporate a solution for deploying two channels of sound across more than two speakers.

When live music is incorporated, it is usually presented in such a way that it is transmitted to the whole restaurant at once, typically on a stage, although even when performers move from table to table, the sound is usually audible throughout the space. Live music is therefore not synchronized with any of the events of an individual meal in a typical dining environment (in which each party dines asynchronously), and in fact it can detract from appreciation of the food, as diners stop their eating and conversations to listen to the music and accord the live musicians their due.

Certainly, music is but one determinant of the overall restaurant soundscape, and poor acoustics may be more deleterious to a fine dining experience than poor music. The size of a restaurant, and thus the number of diners it can accommodate, has an effect on the noise floor. But I have thus far limited my investigations to music curation and deployment, trusting that my architect and acoustician colleagues have succeeded in their work.

3. The Genesis of the Food Opera

I first articulated my vision for what I now refer to as "food opera" back in 2006. I had long been an aficionado of creative and experimental cuisine, as I felt that unusual juxtapositions and methods of presentation encourage greater observation and engagement from diners. It evokes an experience similar to hearing a piece of new, unfamiliar music, requiring a diner to parse and organize sensory information over time to understand the full range of what is being expressed, without necessarily assuming some historical or cultural context.

By 2006 I had already been working as a composer and sound designer in the video game industry for ten years, and I was passionately exploring solutions to the challenges of non-linear, real-time audio deployment that the medium poses. Simply summarized, these challenges are to find ways to respond to unpredictable, user-generated game events, and to find ways for music to continue indefinitely between these events. To address these challenges, I had been drawing on my background in classical music, including the aleatoric works of John Cage, Earle Brown, and Karlheinz Stockhausen, as well as the algorithmic works of Paul Lansky, Barry Truax, and Curtis Roads. By this time, I had already begun work on the video game *Tom Clancy's EndWar* (2008) for my employer at the time, Ubisoft, and I had begun prototyping the cell-based music deployment system that would be the game's primary audio innovation.

My epiphany was to realize that the indeterminate events of the dining room—which dish a diner chooses, how long a diner takes to finish a course, or when the next course arrives—posed exactly the same challenges that I was facing in my video game work. I began to formulate a plan to use video game music techniques to score a meal.

In my observation, music and cuisine share the quality of being inherently abstract, which makes them well suited for pairing. Generally, they convey meaning through internal relationships and references, but it's difficult for either to be "about" anything else (excepting, of course, music that sets text, which is an incorporation of another art form, or music that involves sampling technology in some guise). I remember commiserating once with a composer friend over a meal at an Ethiopian restaurant about how the only thing worse than a bad music review was a bad restaurant review, and I believe this illustrates how far the world of the senses of hearing and taste is from the world of words.In a way, my entire project is predicated on the notion of using one sense to describe another sense, bypassing words completely.

I eventually settled on the term "food opera" because of opera's multimedia associations; this word choice sometimes confounds those who associate opera primarily with the voice. Opera is one of the most multimedia art forms in Western civilization (a characteristic it happens to share with video games), combining music, dramaturgy, literature, choreography, visual art, sculpture, and architecture. My primary innovation has been to find a way to combine two media that have historically been problematic to couple, and so I thought "opera" an appropriate term, to draw attention to this unconventional union, and also to situate my efforts in the discourse of multimedia drama.

This project wended a slow road to realization. The first tangible evidence was a private workshop I conducted with friends in Shanghai in 2010, during which I wrote some music for woodwind trio inspired by a menu I developed with my friend, the accomplished chef Caroline Steger. After much additional work, I eventually collaborated with chef Jason Bond, of Bondir restaurant in Cambridge, MA, to bring *Food Opera: Four Asparagus Compositions* to an invited audience at the 40K Curatorial Space at Harvard's Graduate School of Design on May 22, 2012. We presented two subsequent events at Bondir: *Sensing Terroir: A Harvest Food Opera* on November 13, 2012, and *Beside the White Chickens: A Summer Food Opera* on July 30, 2013.

4. Objectives, Goals, and Parameters

To link sound to a dining experience is to enter into a social environment that is already full of expectations and conventions. In order to aesthetically situate the scope of these food operas, I determined a set of requirements and objectives:

The sound must be deployed and coordinated and real-time. Synchronizing music to a meal with any degree of precision is a problematic proposal, but by using a computer to control the music and trigger changes in real-time, tight synchronization can be achieved.

The sound must be able to continue indefinitely. Each course may last an indeterminate amount of time, and an indefinite amount of time may elapse between courses, so the music must be able to continue indefinitely in a steady state without resorting to repetitive loops that would fatigue diners.

The sound must be electronically mediated, or acousmatic. In my conception of food opera, the plate is the stage; live musicians circulating throughout the restaurant or positioned on a stage somewhere in the restaurant would present an undesired intrusion into the dining experience, which is focused on the food, the table, and the people around it. (Although one could imagine the sound of live musicians being piped in as is done in some current Broadway productions, as a way to bring the spontaneity of live performance to the food opera experience.)

The sound must be multichannel, with one speaker per diner. While one could imagine a situation in which all diners were receiving exactly the same course at the same time, requiring only one sonic accompaniment to be deployed throughout the whole restaurant, there is a fantastic intimacy cultivated in having one's own unique culinary soundtrack, while at the same time, being part of a space in which other diners are experiencing different pieces of music creates a sense of connectivity through shared experience, as the whole restaurant is transformed into a kind of sound installation.

The sound must be spatially deployed. Critical to my notion of food opera is to support the traditional social institution of communal dining. I do not want to sequester diners with headphones, but to allow them to freely converse during the meal. The audio should not impinge on the agency of diners to act, converse, and interact. Filling the restaurant with speakers for each individual place setting means that the volume of each speaker can be relatively low, providing a high degree of spatial precision for diners.

I might make a fine distinction between the objectives listed above, which define my notion of food opera, and the objectives that follow, which represent my somewhat more subjective aesthetic stance as applied to our first three food opera events:

To meet the objectives stated above, the music must be algorithmically configured to some extent. This is necessary for smooth transitions (e.g., a note-based algorithmic deployment system can provide smoother transitions than simple crossfades) and for allowing the music to continue indefinitely without looping. This is also important for variation; the restaurant soundscape is enriched by having each instance of the same dish's accompaniment be a unique, algorithmic reconfiguration of basic sonic elements, just as the same dish must be created anew in the kitchen for each diner. Most critically, since diners will be able to overhear the music of other diners throughout the restaurant, the music must be coordinated in harmony and rhythm to avoid cacophony; with music algorithmically deployed in real-time from a single computer or network of computers, this can be easily achieved.

The music should conform to each dish's culinary contour. When food is consumed, there is a necessary reduction in culinary information over the course of each course; we

start with a full plate and end with an empty plate, or at least a less full plate. Since my music made use of real-time algorithms, I was able to program my musical textures to provide-control over the musical density of each dish's accompaniment, so that I could begin each course with high density music (when diners' attention is focused on experiencing a new dish), gradually evolving into less dense music (as diners become accustomed to the dish, and food disappears from the plate). This mirrors a kind of crossfade I have observed during a course, which begins with all attention on the food but gradually shifts from eating to conversation. How this generic density parameter was mapped onto musical parameters varied from course to course, but it typically affected parameters such as how many musical layers are playing, how long the musical phrasesare, how long the pauses between phraseslast, and in what pitch range the phrases are sounding.

The meal should avoid well-known dishes. In encouraging diners to explore the links between sound and food, it is helpful to present them with unconventional preparations and combinations, rather than well-known dishes with which they may already have sonic associations, to encourage them to evaluate every element of the experience without relying on easily recognized culinary tropes.

The music should be based on manipulations of acoustic instruments. This is the most subjective criterion, but for these first three food operas, I felt that by basing the music on recordings of traditional instruments, I could mirror the alchemy that happens in the kitchen when familiar ingredients are transformed into new dishes. This also helped to situate the project aesthetically in the discourse of multimedia spectacles involving music (akin to dance, theater, film, and video games).

These objectives differentiate the notion of food opera as I've elaborated it from similar forays into merging food and sound. For example, Heston Blumenthal's famous *Sound of the Sea* (2007) from his Fat Duck restaurant in Bray, England, requires diners to don headphones. I have not experienced this dish, but I have experienced Marina Abromović's collaboration with chef Kevin Lasko, *Volcano Flambé* (2011), at Park Avenue Winter in New York City, which also required headphones, and the disadvantages were numerous: I was cut off from the friends who had accompanied me, who also wanted to try my dish and interact with me while I was experiencing it; I was isolated from the restaurant itself, marooning this dish from the context of the rest of the meal; the recording was brief, about three minutes, far shorter than the time it took to consume the dish, and when it was complete, it simply looped, and of course the experience of hearing something for the second (or third or fourth) time is different from the experience of hearing something for the first time; donning the apparatus presented a minor but noticeable physical encumbrance; and the presence of this

small digital device felt at odds with the rest of the very carefully appointed design elements of the restaurant. (This is not to mention the content of the recording, which consisted of the artist's unaccompanied voice describing the dish, beginning with her intoning "This is an experiment," and ending [the recording, not the course] by thanking diners for "eating with awareness," which presumes that this is not the way we normally eat.)

5. Technical Infrastructure of a Food Opera

What follows is a description of the technical set-up we installed for our second and third food operas at Bondir restaurant in Cambridge:

Bondir seats twenty-six diners at a time, so we installed a speaker at each seat in a custom table centerpiece designed by the artist JuttaFriedrichs (who also produced the event). The speakers were small and passive, connected with long speaker wires to a control table near the entrance of the restaurant. Here they were connected to some inexpensive amplifiers, which were connected to three multichannel MOTU audio interfaces.

We controlled all of the sound from a bank of three computers, networked together, each connected to one of the MOTU audio interfaces. The computers were running custom software that I developed in Max/MSP. Each computer controlled about one third of the sound in the restaurant. Three computers were required for reasons of processing power and also for ease in connecting to multichannel audio interfaces. The computers were networked together to ensure that all of the sound could be coordinated in harmony and rhythm.

In addition to the twenty-six speakers at each seat in the restaurant, there were six additional speakers providing an ambient background drone, compensating for the lack of low frequency response in the table speakers, while also connecting the sound of each place setting to the rest of the environment. We tapped into the restaurant's existing speaker system (four speakers, one in each corner of the restaurant, designed to split a stereo signal into four channels). And on two log stools in the middle of the room, we featured two of sound artist Stephan Moore's custom-designed hemispherical speaker arrays.

Stephan also helped me operate the software during the event. The software controlled the musical textures associated with each dish. When an order was placed, a server would

inform us, and we would input diners' choices into the system. As each dish arrived, we would push the corresponding button in the software, and the appropriate piece of music would play from the appropriate speaker. As mentioned earlier, each piece of music was algorithmically deployed, allowing real-time control over duration, density, harmony, and rhythm. Harmony was particularly important, as the key of the music varied slowly over the course of the evening to provide musical variation.

6. The Content of a Food Opera

Our first food opera focused on the phenomenological links between the senses, which is a rich area of exploration on its own. As examples of the kind of cross-sensory reinforcement I explored, I linked wind chimes to foam, a woodwind trio to caramelized asparagus, a slowly undulating marimba ostinato to a creamy soup, and a detuned triangle to Sichuan pepper. The process was intuitive and fairly arbitrary; I would taste something (or often just think of a taste) and then imagine a corresponding sound (in terms of timbre, register and morphology as well as theme or gesture), and then set about replicating it some way, within my self-imposed constraint to use manipulated instrumental sounds. It's a scoring approach, composing appropriate sounds to support food, just as I would apply to a video game or choreography.

But because the sound in a food opera is electronically mediated, any recorded sound can be incorporated, and I became curious to explore other modes of expression, although I should stress that I do not feel that the approach of using purely instrumental sounds and exploring abstract sensorial connections is in any way deficient.

So for our second and third food operas, we decided to use sound to bring diners closer to the farms and farmers that produce the ingredients for meals at Bondir, exposing the entire chain of events that brings food to their tables at the restaurant, and by extension, their homes. Chef Jason Bond is passionately committed to local farmers and sustainable food practices. He makes everything in the restaurant from scratch, and he creates a new menu every day, based on what's fresh and available. So, along with project producer JuttaFriedrichs, I visited the farms that provide some of his ingredients, including Sparrow Arc

Farms in Maine, Red Fire Farm in Western Massachusetts, and Pete and Jen's Backyard Birds in Concord, MA, to collect field recordings from the farms and conduct interviews with the farmers.

These recordings were incorporated alongside purely instrumental textures, such as I developed for the first food opera, to close the distance between the farm and the restaurant; diners could hear the ambient sounds of the farms, the clucking of chickens, the jokes of farmers harvesting potatoes, alongside interviews with the farmers describing the challenges they face, their histories, their goals and dreams. Our second food opera was entitled "Sensing Terroir: A Harvest Food Opera" and took place on November 13, 2012; the harvest theme dovetailed nicely with the approach of the American holiday of Thanksgiving, as we sought to give diners a heightened appreciation for all of the people involved in providing their food.

Our third food opera built on the phenomenological and documentary strategies of our first two food operas, while linking courses through a poetic framework. Chef Jason Bond suggested showcasing his poultry providers Pete and Jen's Backyard birds and featuring chicken as the primary ingredient for our third event. At first I wasn't sure how to treat the topic of chicken in music, but revelation came in the form of William Carlos Williams' poem "The Red Wheelbarrow" (1923). Our requests to obtain permission to use the poem in our food opera went unanswered, so while it provided the inspiration, we did not use the words; nonetheless, sous-chef Rachel Miller constructed a series of dishes around the four sections of the poem, with the fifth, dessert course (involving chicken foot syrup) serving as a kind of coda, and we entitled our event, "Beside the White Chickens: A Summer Food Opera."

7. The Form of a Food Opera

The form of a food opera is complex and emergent, closer in many ways to the genre of sound installation than a traditional music concert or theatrical presentation. However it is unique in that, unlike many sound installations, users remain in a fixed position for an extended period of time.

The form of a food opera experience for each diner is as follows. When a table is vacant, a default, ambient sound plays; at our second and third food operas, this was ambient sound from one of the farms that provide Bondir's ingredients, reconfigured in real-time to continue indefinitely. When the first dish arrives, the accompanying music plays, and when the plate is taken away, the music is replaced by an interstitial sound, a rhythmic behavior based on footstep sounds (drawing on video game techniques, as footsteps are such a staple of video game audio), incorporating footsteps recorded at the farms, suggesting not only the farm landscape activated by walking, but also the idea of traveling to the destination of the next course. Then the next dish would arrive and its corresponding music would play, and the process would continue until the last dish was removed, and the ambient sound present at the beginning resumes until the next diner is seated at that table. While the sequence of events is fixed, the time between each transition will vary for each diner, and the specific music for each course will vary depending on the dishes chosen.

When this relatively simple sequence of sonic behaviors is multiplied across twenty-six seats, the ambient texture of the restaurant becomes quite rich. The coordinating techniques mentioned above ensure that the resultant sound is not cacophonous, but that all of the music in the restaurant plays in the same key and the same tempo. This in itself might not be sufficient to prevent an undesirably dense sonic texture, if not for the spatial deployment of each piece of music at each place setting throughout the restaurant. In effect, this ensures that for each diner, the sound designed to accompany that diner's meal will be most prominent, emanating from the speaker positioned at that diner's place setting. Simply due to the nature of sound propagation in space, the sound designed to accompany the meals of neighboring diners will be less prominent, taking on more of an accompanimental role. And sound deployed from speakers on the other side of the restaurant will blend into the general restaurant ambience, along with the drone described earlier.

Since diners are being seated throughout the evening, a unique kind of nonlinear exposition and recapitulation emerges. A diner may overhear a dish from a future course at a nearby table and glean something of its character, or later in the meal, a new party may be seated at an adjacent table and receive their first course as a diner is on her or his fourth course, and the music may trigger sensory memories from earlier in the meal that affect the diner's experience of the current course.

Recall that these musical textures are not static in terms of musical density; when a new musical texture starts, it is programmed to start at a high level of musical density, and over a certain amount of time to drop to a low level of intensity, which is then maintained until the plate is taken away. This means that each course starts with a sudden increase in intensity,

followed by a gradual denouement. To have these sudden changes happening periodically throughout the restaurant results in an interesting spatial pointillism and keeps the soundscape of the restaurant in constant flux.

In a nonintrusive way, the music reinforces an awareness of other diners, heightening the sense of a shared, communal experience; each new dish that arrives becomes a small celebration, shared by the community. Each of the twenty-six speakers at each seat in the restaurant indicates a unique person, and that uniqueness is enhanced by the choice of dishes; the music emanating from each place setting does not impinge on diners' privacy, but it still allows diners to be aware of each other's presence. In fact, a full appreciation of the event depends on the presence of other diners, to achieve the fullest sonic texture, and this interdependency can be thought of as representing our shared social responsibility in caring for the environment and making healthy and sustainable food choices.

8 Conclusions, Observations, and Directions for Future Work

I have come to feel that, with these food operas, we are establishing a new genre for audio-gustatory expression, something that has never been possible before, due to the technological requirements, and something that presents tremendous communicative and expressive potential. The feedback from diners who have experienced our food operas has been extremely positive, which further encourages me in continuing to explore this line of inquiry.

Avenues for future development include additional sensing and control systems, allowing certain elements of the music to be affected directly by diners, not only through their choices and pace of consumption, but perhaps by individual bites, sips, or biofeedback measurements. The deployment system could be enhanced by allowing servers to input diners' choices directly into the computer system via a custom app and to indicate themselves when a new dish has been delivered. There is potential for increased visual counterpoint as well, including incorporating responsive lighting systems or subtle video to match each dish.

But more exciting is the potential for new kinds of narratives, abstract or otherwise. Our focus so far has started with the purely sensorial (which, incidentally, mirrors a major strand of sound art practice) and has grown to encompass the documentary, or what might be better classified as a form of sensory ethnography. In our third food opera, we sought to provide a poetic framework for the meal, and this is the direction I envision for the immediate future, incorporating poetic text not as a descriptor, but as a third element in cognitive counterpoint with the music and the meal.

By pairing food and music, there is tremendous opportunity to increase diners' awareness of both. Perhaps more importantly, this new, communicative genre of food opera has the potential to investigate the relationships among diners, and between diners, food producers, and the wider environment.

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