
Felipe Otondo

Department of Music
University of York
York YO10 5DD United Kingdom
<http://music.york.ac.uk/>
fo500@york.ac.uk

Natasha Barrett is a freelance composer who currently lives in Norway. Her compositional output consists of works for instruments and live electronics, sound installations, dance, theatre, and animation projects, but all her energy seems to stem from her acousmatic composition. In 2006, she received the Nordic Council Music Prize—the most prestigious recognition for a Nordic composer. She has also received awards from the Bourges International Electroacoustic Music Competition (1995, 1998, 2004), Concurso Internacional de Música Electroacústica de São Paulo (2001), the International Rostrum for Electroacoustic Music (2002), and the Noroit Electroacoustic Music Competition in France (1998, 2002), among others. Barrett's projects are frequently commissioned by international organizations, and her music is available on the Empreintes DIGITALes, Cultures électroniques/Mnemosyne Musique Media, Centaur, Computer Music Journal Sound Anthology, Prix Noroit, and Aurora labels.

Her studies include a master's degree at Birmingham University with Jonty Harrison and a doctoral degree supervised by Denis Smalley at City University, London. Table 1 provides a list of her compositions.

This interview took place at the International Computer Music Conference in Barcelona, Spain, on 8 September 2005, and was focused primarily on the composer's thoughts on spatialization. Since this interview took place, the transcription has been augmented with additional information in subsequent communication with Ms. Barrett.

The Listening Space

Felipe Otondo: You have been dealing with spatial design for quite some time. What is your approach toward the use of space in electroacoustic music?

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Creating Sonic Spaces: An Interview with Natasha Barrett

Natasha Barrett: It depends on your listening space. If for now you think about space away from the context of the listener—for example, if you are alone in the studio—I think you can compose a three-dimensional impression of space, even when you manipulate phantom images with two loudspeakers. In stereo, you can then create a great deal of depth—you can work with many degrees of middle-, fore-, and background. This sense of space is often captured through a careful recording technique. But then, of course, as soon as you leave that private listening space, your composed space may collapse because you are no longer in control of your environment. At this point, I find that spatial information suggesting simple room acoustics can be quite stable, whereas other types of spatial information that create, for example, a sense of perspective, occupation, or embodiment, are fragile.

So then you need to think, “How is my space going to function?”—and you might like to try alternative spatialization techniques. Furthermore, you need to decide whether you are aiming at home or concert listeners, in which case I think you need to approach these situations in different ways. One way in which I have found common ground for concert and home listening has been with surround and ambisonics spatialization.

Otondo: Don't you see a contradiction there—a problem that many people don't seem to be aware of—a conflict between this space you can create in the studio and this open space in a concert?

Barrett: Well, as soon as you take your stereo work into a concert, you can make it sound multichannel and occupy the room. I expect other people you have interviewed have said the same thing. Often, when I talk to someone outside our field, they ask how many channels I have in the source. They don't believe me when I say it is stereo. If the loudspeakers are set up correctly, if you have the right space and you know what you are doing, then you can

Table 1. Compositions by Natasha Barrett

<i>Title</i>	<i>Instrumentation/Medium</i>	<i>Year</i>
<i>Crack Process</i>	Percussion, trumpet, electric guitar, and computer (ambisonics and conventional multichannel)	2006
<i>Deep Sea Creatures</i>	Acousmatic (stereo, 5.1, 12-ch, or 16-ch) (ambisonics and conventional multichannel)	2006
<i>Mobilis in Mobili</i>	Acousmatic (stereo, 5.1, 12-ch, or 16-ch) (ambisonics and conventional multichannel)	2006
<i>Trade Winds</i>	Acousmatic (stereo, 5.1, 12-ch, or 16-ch) (ambisonics and conventional multichannel)	2006
<i>Hommage à Parmerud</i>	Acousmatic (stereo and 5.1)	2005
<i>Abemolpas (Avoid being eaten by mimicking other less palatable species)</i>	Acousmatic (5.1, ambisonics, and conventional multichannel)	2004
<i>Where shadows pass for bodies stand</i>	Classical guitar and computer (stereo)	2004
<i>Exploratio Invisibilis</i>	Acousmatic (ambisonics and stereo)	2003
<i>Symbiosis</i>	Cello and computer (stereo)	2002
<i>Prince Prospero's Party</i>	Acousmatic (ambisonics and stereo)	2002
<i>Angels @ Devils</i>	Acousmatic (stereo)	2002
<i>... fetters of a dream ... (Fetters)</i>	Acousmatic (stereo and 5.1)	2002
<i>Agora</i>	Electroacoustic Theatre (16-ch acousmatic, sound-making installation, and soprano)	2002
<i>Push-me-Pull-me</i>	Cello, violin and computer (stereo)	2001
<i>Industrial Revelations</i>	Acousmatic (stereo)	2001
<i>Displaced : Replaced</i>	Installation (ambisonics cubic array)	2000
<i>Rain Forest Cycle</i>	Installation (triangular pyramid array)	2000
<i>RAS</i>	Percussion quartet and computer (stereo)	2000
<i>Utility of Space</i>	Acousmatic (ambisonics and stereo)	2000
<i>Liquid Crystal</i>	Clarinet and computer (stereo and multichannel)	2000
<i>Three Fictions</i>	Acousmatic (stereo)	2000
<i>Circadian Cycles</i>	Sinfonietta and computer (stereo and multichannel)	1999
<i>Viva la Selva!</i>	Acousmatic (stereo)	1999
<i>Diabolus</i>	Percussion, voice, computer (stereo)	1999
<i>Outspan</i>	Acousmatic (stereo)	1999
<i>Mimetic Dynamics</i>	Installation (quadraphonic)	1999
<i>Microclimate II: Red Snow</i>	Acousmatic (stereo)	1998
<i>Microclimate I: Snow @ Instability</i>	Double bass, alto flute, percussion, and computer (stereo)	1998
<i>Buoyant Charm</i>	Acousmatic (stereo)	1997/2001
<i>Little Animals</i>	Acousmatic (stereo)	1997
<i>Surf</i>	For two classical guitars and computer (stereo)	1997
<i>St Paul's Descending into the Autumn mist</i>	Acousmatic (stereo)	1997
<i>Racing Unseen</i>	Acousmatic (stereo)	1996
<i>Racing Through, Racing Unseen</i>	Acousmatic (stereo)	1996
<i>Earth Haze</i>	Acousmatic (stereo)	1995
<i>Swaying to See</i>	Acousmatic (stereo)	1995
<i>Imago</i>	Clarinets and computer (stereo)	1995
<i>Puzzle Wood</i>	Acousmatic (stereo)	1994

make a good diffusion performance sound extremely multichannel and multilayered.

Otondo: You are good at diffusion performance.

Barrett: I started in Birmingham during a master's degree supervised by Jonty Harrison and have been practicing ever since. I can play okay—I enjoy it and I know that I can project the right thing in the music.

Otondo: But it was not enough for you? Why did you feel you needed more?

Barrett: There are some limits to sound diffusion in the concert. Yet there are also some advantages. Sound diffusion is a performance practice involving interpretation, and you can tailor the spatialization to work within the space of the concert hall. Some compositions demand a specific diffusion performance for the musical structure to be clear. Other music gives the performer a greater degree of interpretation. But whatever the intentions from the compositional side, you cannot project the simultaneous spatialization of different sound streams, do things that are impossible to do with one pair of hands, work with the idea of spatialization as a structuring method reliant on details a performer may miss, and so forth.

The last point is maybe most important for me. If the diffusion interpretation does not convey the composed spatial intentions, then you could say that the spatial musical structure becomes a bit less accurate and takes a direction other than that intended. Not surprisingly, I have experienced this scenario mostly at events where diffusion as a performance practice is a rarity, even though the performer may have an understanding of the music. However, with ambisonics, because you can accurately compose the spatial information, you gain tighter control over the spatial musical structure and therefore allow it to play a more important role. With sound diffusion performance, you really have to accept some chance.

Otondo: And then the performer plays a big part in it, giving a unique interpretation of the piece with whatever style or assumption is desired.

Barrett: Exactly, and this performance can make a “not-so-good” piece sound fantastic, but it can destroy a great piece if it goes against the spatial musi-

cal structure present in the music. So when you want to go further than spatial generalizations—if you want to work with spatial hierarchy where tiny movements in space and spatial relationships contribute to sound identity—you need a technique that is not going to break in performance. This is the point where I started to move into ambisonics. Ambisonics can also result in a concert disaster, but that is a technical rather than a performance interpretation issue. It has, however, meant that since my sudden burst of ambisonics compositions in 2000–2003, I am now more selective when I choose to use the technique.

Otondo: Can you explain a little more about ambisonics?

Barrett: I'll try to give an easy introduction. At the moment there are two main ways to create and manipulate a virtual three-dimensional sound field, or a sound field that mimics the properties of our real acoustic sound field: ambisonics and wavefield synthesis. Each involves quite different methods, but in a perfect world would produce the same result. To capture or encode the spatial information in the first place, we have two choices: either we can attempt to capture the real sound field via recording, such as by using a Soundfield microphone, or we can synthesize the spatial information using the math of either ambisonics or wavefield synthesis. With ambisonics, higher-order representations present a more accurate description, where each order corresponds to an order of spherical harmonics.

Otondo: Can you explain a little more about the higher-order representations?

Barrett: You can make a comparison to spectral representation, where if you try to represent a complex sound with one sine tone you don't get very far. But the more harmonics you add, the closer your representation will be to the original. The same goes for capturing the three-dimensionality of sound using spherical harmonics. The Soundfield microphone can capture a first-order representation, otherwise known as B-format. This is not a very accurate description of the sound field compared to higher-order representations. Therefore I choose to work more with the latter.



Otondo: So once you have captured or encoded the spatial information, what next?

Barrett: Then we need to reproduce, or decode, the soundfield information over our chosen speaker arrangements. It is here that more compromise is needed. The higher the order of the encoding, the more loudspeakers we need in the decoding. But a nice compromise is to use a third-order encoding, which in the horizontal axis requires a minimum of eight loudspeakers and fits quite nicely into a small concert situation.

Working practically with compromise is the nice thing about ambisonics over wavefield synthesis. For wavefield synthesis to recreate a soundfield, little compromise is possible, and large numbers of adjacent loudspeakers are required. Other compromises involve considering our perceptual interpretation. How much accuracy of spatial information is perceptually relevant? How can we treat the sound material to enhance the perception of spatial cues through filtering, loudness, and pitch changes? In many situations I begin with stereo sources and then relocate the sound image within my composed ambisonics soundfield. This sometimes involves splitting the sound into different frequency layers, each located in a slightly different spatial position.

Creating Spaces

Otondo: Listening to your music, one gets the feeling that you are quite concerned with the issue of creating spaces. You are very good at making the listener perceive both tiny and large spaces; sometimes with small objects you can create a huge space. Is this related to the idea of allusion that you wrote about in articles (Barrett 1999, 2002), working with the material as a way to create space?

Barrett: Creating spaces is strongly connected to the experience of our surroundings, and in this respect, spatial mimicry made possible with ambisonics can be a useful approach. But you are correct, it is also very much connected with the idea of allusion. When you consider very tiny sounds building up an impression of space, then you can begin to imply a space within which these sounds should live. If you use abstract sound material, it can be difficult for the listener to find the spatial context. If you don't want to use reverberation, you don't have a clear spatial context to start off with, either. But gradually, as the sound material unfolds, its behavior, its motion behavior—the relation between many things happening at once—imply space, even though you are not using reverberation or clear sound identities. This is something I find very interesting because I don't like using reverb. When I do, I try to calculate a realistic room model using ambisonics reflections.

Otondo: How does that work?

Barrett: I calculate the early reflections as ambisonics reflections in the virtual space. But, as I said, I try not to use reverberation. I prefer to use convolution in a way that doesn't explicitly say "this is a small room" or "this is a big room." I find normal reverberation distracts too much from something else you might be trying to do.

Otondo: Has this to do with the idea of putting a room inside another room as Dennis Smalley (Austin 2000) suggests?

Barrett: That's one part of it, the problem of combining the listener's space with the space in the music. But I think it also has to do with the fact that a

clear reverberation effect can dominate what you are doing. It blurs spectral detail and “messes up” textural information. It can distract the ear from something more important, such as the indirect implication of space. For me, it is at that moment of implication and ambiguity that music starts to come through. The listeners start to use their imagination and their own experience to find a place in the music.

Ambisonics and the Hybrid Approach

Otondo: Going further into ambisonics, do you think that aside from the advantages of three-dimensional sound, these systems are still restrictive for most composers? They can be complex and quite expensive . . . you need very specific studio software and hardware.

Barrett: First of all, ambisonics is not expensive, and, for the user, it is not technically challenging. Provided you don’t want to program the math, it is not technically challenging at all. The software I use is free, and there are in fact quite a few computer music centers working with ambisonics, but maybe not so many full-time composers. There are, however, problems with the stability of the ambisonics sound field that I touched on. Because ambisonics is an encoding and decoding system where you encode the spatial information and decode the result for the locations of your loudspeakers, this means that if you decode in advance, you have to place your speakers in the exact locations for which you decoded. Unless the hall is completely flat and of correct geometry, it is very difficult to place the loudspeakers correctly.

Now, with ambisonics, the nice thing is that you can decode your encoded information for (theoretically) any loudspeaker geometry, and so you might think it would be easy to decode on site. But in practice, that doesn’t always work, because the decoding algorithms currently do not cope well with asymmetry in loudspeaker placements and loudspeaker responses. So as soon as you change a circle to an oval—just that compression along one axis—the decoding algorithms will not work as well.

Otondo: What happens then?

Barrett: When loudspeakers are different distances from the central point, you have to think about phase problems throughout the spectrum and volume differences. The sound field will be distorted and will break down. In practice, when listening, this can result in an uneven sound distribution, front-back reversal, or simply a feeling of spatial mono or spatial “meaninglessness.” In my successful ambisonics concerts, I’ve carefully set up the loudspeakers just for this music. However, if you setup a diffusion rig in the standard European diffusion format, such as the BEAST format (Harrison 1998), stereo diffusion will work much better than ambisonics. Currently, I normally only set up an ambisonics concert array if I am playing only ambisonics works, or if the project is an installation where I can exactly locate the equipment. Despite my faith in soundfield recreation techniques, I also need to be realistic about my demands!

Otondo: But it does fit well with 5.1 surround?

Barrett: Yes. Even though 5.1 is asymmetric, the loudspeakers are the same distance from the center point, which makes decoding easier than, for example, for an oval. When composing for a fixed speaker array such as 5.1, I sometimes use normal panning as well. One of the great things about ambisonics is that it is easy to make a feeling of space and to make clear trajectories. But when a sound is stationary, then the location is not quite as clear, and it is better to place the sound in a conventional way. Straightforward 5.1 for home listening is not a problem, but I don’t think 5.1 works that well in the concert where the listener is not sitting in the perfect location. In concerts where it has been necessary to play from a 5.1 source, I have used at least two 5.0 configurations—one 5.0 configuration close and one distant or one elevated, and manually diffused between the two with careful control over the subwoofer channel.

Otondo: So you create the piece in ambisonics and then you do the mix again in 5.1?

Barrett: Actually, I first create the piece in quad or stereo while listening in the perfect position. With my first ambisonics piece (*The Utility of Space*), I worked in a second-order, nine-channel ambisonics

Figure 2. Dodecahedron setup from the ambisonics version of Exploratio Invisibilis.

format from the beginning, and my computer was not fast enough to do all the multichannel mixing and decoding in real time. I had to encode and then decode out of real time and then mix and listen. It was a big piece that took too long sitting and waiting for the computer to complete the task. Now machines are faster, and software has changed. With many of my ambisonics pieces, I spatialize maybe 20 simultaneous items, which still puts a strain on the computer if also simulating air absorption, the Doppler effect, and maybe a few early reflections.

Otondo: So, what do you do then?

Barrett: Then I use scripting software that allows me to script as many simultaneous objects as I want, but as a non-real-time process. Then we are back to first working in stereo or quad, getting a good sense of potentially three-dimensional information, and—when all other aspects of the composition are correct—implementing spatial ideas that I could only plan or imagine in the earlier stages.

You could say that I render the high-quality version at the end once I've got the composition "right." To some people, it may sound strange that I compose first in stereo or normal quad and then realize the ambisonics version once the materials, the timing, the counterpoint, and the flow are correct. Things do change when you compose the ambisonics field, obviously—when calculating Doppler shifts and filtering, pitch and volume changes! Then you have to go back and change the material—but to do most of the composition first in the more traditional format makes the complete process manageable.

Otondo: So you have developed a sort of hybrid approach . . .

Barrett: Yes, I have from the compositional point of view, because the technical aspects of ambisonics were starting to get in the way of the compositional process.

Otondo: This allows you to work with more traditional spatial formats. I guess you spend some time doing all this.

Barrett: Well, it's quicker now because software is easier to use and more accommodating to multichannel formats.



Otondo: How do you compensate in ambisonics for the size and the acoustics of the hall?

Barrett: If it is a very reverberant space, you don't use ambisonics. In a large-room acoustic, the music needs care to bring out the detail. In that case, I would go for diffusion, and I would go for the diffusion of stereo rather than multichannel. This is because you can control the piece better and adjust for the changes that happen due to the sound moving in a big acoustic with a strange coloration. In a very reverberant room, the only reason I would use a multichannel version is if the piece were to be divided into layers that I would diffuse simultaneously, and not as, for example, eight fixed channels. You could call it multiple-stereo diffusion.

Multichannel and 5.1 Surround

Otondo: Just about that, what is your opinion about the conventional approach of multichannel diffusion? Have you made pieces that are just multichannel?

Barrett: Not multichannel in a conventional sense. My first multichannel piece was in fact an ambisonics work (*The Utility of Space*), and was later mixed to stereo for practical reasons.

Otondo: Do you think purely multichannel composition is restrictive?

Barrett: It depends how you work. For example, Barry Truax has worked in a way where his compositional approach is partly dependent on the multichannel setup (Truax 1999). So, it depends on the kind of music and the approach that you have, and my approach is not like that. It would therefore be inappropriate for me to start that way.

Otondo: It is very difficult to monitor with eight speakers in a conventional studio.

Barrett: That's right, it is difficult. I think Annette Vande Gorne has a studio where they monitor in eight. I remember it's very nice there. I sometimes monitor in an octagonal setup, but only in the last stages of the composition. If you are not working with speakers as independent voices, then there is less reason to monitor over eight speakers—at least in the horizontal axis. As long as you are sitting in the perfect position, four speakers are enough. In that respect, I have composed directly into quad for some parts of a piece, and then converted the mix to eight channels or multiples thereof, or separate near and far layers, and near and far multichannel mixes.

Otondo: Don't you think one could combine both multichannel techniques? Maybe surround 5.1 is a good example of that.

Barrett: Of course, you can combine any technique—there is no limit. It just depends on the music and your intention. In a way, 5.1 surround is a hybrid combining the idea of the center speaker as a voice with normal phantom images.

Otondo: I have been working a bit with surround 5.1 trying to get an idea of the transition from the living room or studio situation to the concert hall situation, and I have found that it is a very complex transition in terms of spatial experience for the listener (Otondo 2005). What is your approach towards surround 5.1? Do you think it is something fashionable that will disappear in some time?

Barrett: No, I don't think it will disappear at home, because in a way it is a practical setup. Some home-audio consumers don't listen in 5.1—they listen in

quad and drop the center channel or pan it center front. But, if I am thinking in a practical way, then I have to understand that most people who buy a 5.1 setup are not audio experts—they have a home cinema system. The 5.1 layout does not fit into all living rooms, but it can, if you reorient furniture and change your life a little bit! But to contradict myself, playing ambisonics goes “out the window” when the 5.1 system consists of three unknown and different types of loudspeakers.

Otondo: But what happens with 5.1 in the concert hall?

Barrett: In the concert hall there are two problems with 5.1—maybe more than two problems, but two main problems. The first problem is that in a large concert hall, the five speakers are far away from the audience, so you lose a sense of intimacy. With diffusion, of course, you place speakers at different distances to the audience, whereas in concert playback of 5.1, because the speakers are far away, the reverberant field blurs the direct source early on, and there is nothing you can do about it.

The second problem has simply to do with five speakers not being enough for a large space. If you are not sitting in the center, then you get a biased sound picture, and of course all the big cinemas use more than just five loudspeakers. Often there will be a large array at the front, and then extra loudspeakers at the sides and back. This doesn't solve the loss of intimacy, but as large cinemas are rather dry, reverberation does not cause so much of a problem. As I mentioned earlier, my own solution is to work with multiple 5.0 configurations and diffuse among them.

Otondo: So you also have this problem when you go from ambisonics in a 5.1-channel arrangement in the studio and you play it in a 5.1-channel system in a concert hall?

Barrett: Same problems—interference from reverberation and not enough speakers to fill in the space.

Otondo: Let's pretend I am a millionaire, and I will give you the chance to play your music in a perfect environment. What would you want?

Figure 3. Sound-making elements from the installation part of Barrett's work *Agora*.

Barrett: Well, then I would tell you to build a concert hall! Well, to be realistic, then I would say to buy some good loudspeakers.

Otondo: How many speakers would you use then?

Barrett: Depends on the size of the space.

Otondo: A normal concert hall.

Barrett: A normal concert hall for ambisonics? Sixteen would be good. Maybe another sixteen for elevation. And then you could probably create a good sound field. But again, you need to have the right kind of speakers.

Otondo: Do you need the same type of speakers?

Barrett: For ambisonics, yes. If not, different speaker colorations and diffusion angles will distort the recreation of the sound field.

Space and Composers

Otondo: Now I'd like to get into something more general. Do you think there has been a change in the approach toward space lately by electroacoustic music composers due to cheaper and more sophisticated equipment?

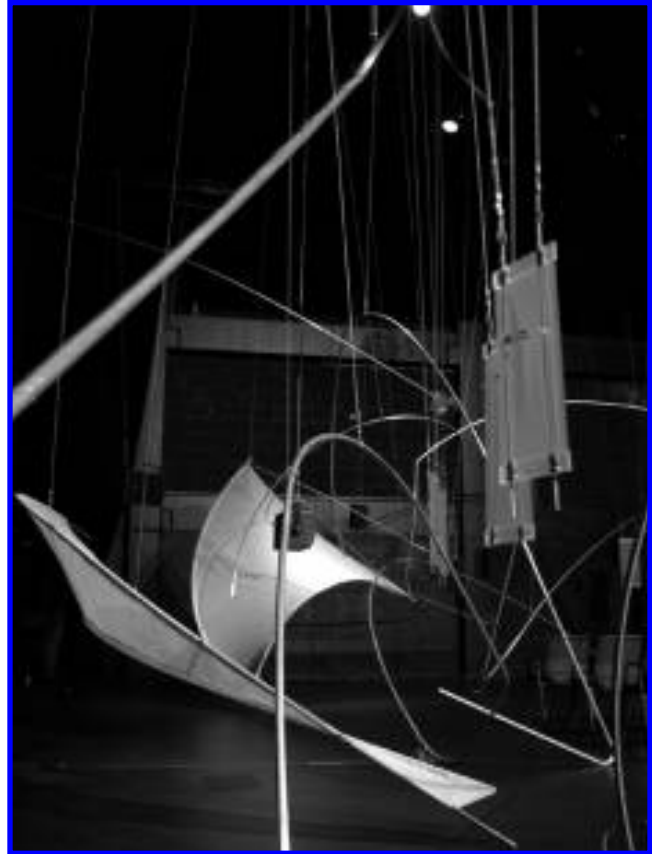
Barrett: [Laughs] Depends what country you are in.

Otondo: In general.

Barrett: Not as much change as there could have been. The main difference is that composers are using better reverberation effects. But the understanding of spatial issues, at least among composers, is still not so advanced.

Otondo: Don't you think that cheaper sound cards and the spatial possibilities of programs like Max/MSP, pd, Spat, and others have opened new possibilities for spatial design?

Barrett: Well, many people are working with multichannel music. The problem is that some appear unclear as to why they are doing it. Maybe they work with multichannel because it is "the thing to do." I have, however, unfortunately been seated in bad listening positions in many multichannel concerts—



stuck on an end with one loudspeaker pointed at my ear. I have experienced stereo diffusion that sounds more "multichannel" than some real multichannel pieces. One assumes that with multichannel you can easily play with independent spatial trajectories, but getting that to function in the concert space is difficult once the music is fixed to maybe eight channels. When the sound just gets stuck at the back due to the room acoustics, speaker characteristics, or inaccurate speaker placement, there is little that can be done. In part I think the spatialization equipment and technology have become readily available, but the users haven't caught up.

Otondo: Why? Because it is difficult?

Barrett: I would not say it is difficult, only that it requires a level of understanding, as all skills do. When you first begin, the temptation to swing sounds around the room is enormous! It feels physi-

cal and immediate. But spatialization is about so much more than that.

Otondo: So new means imply new complexities, but people are not really aware of it, they are just using and abusing this technology?

Barrett: That is what I sometimes hear.

Instrumental Pieces

Otondo: I have listened to your piece *Symbiosis* for cello and live electronics in one of the listening rooms here at the ICMC and wanted to ask you, what is the difference in the spatial approach when you work with instruments compared to those purely electroacoustic works that you mostly write?

Barrett: Well, I think my opinion is the traditional one. When a performer is on stage, the visual aspect means you hear in a different way. And so in *Symbiosis*, you see the cellist on stage. She is not just sitting there playing—she is moving around a little bit and using her voice. It is a dynamic piece, and so her whole physical presence is quite spectacular. What you are seeing ties you down; it provides a constant reference point regardless of whether the sound is moving through the space. One has to take advantage of this fact and not experience it as a problem. Although the electroacoustic part of *Symbiosis* contains some spatially relevant non-cello sound material, the cello is the center of that sound world, and the performer is articulating the structure, visually emphasizing the aural totality. In particular, sound propagates from the performer and away throughout the space.

Otondo: So you take a completely different spatial approach than with the purely electroacoustic pieces—you try to understand things from a performance perspective.

Barrett: The thing is that in reality, when you compose a piece for a performer, normally the performer has commissioned the work and therefore you should write something that is good to be performed, something that takes full advantage of that performer's skills. Often you may have a musical

agenda that is not the same as the performer's agenda, especially coming from an acousmatic point of view, and you need to balance these agendas and find things that work.

Otondo: You have different goals you want to achieve with the piece?

Barrett: Sometimes. For example, unless I am composing a purely theatrical work, my initial agenda is sound, whereas the performers' primary agenda is performance, and they are not necessarily the same thing. This is, of course, not always the case, but either way we need to integrate the demands of both performance and sound. For example, in *Symbiosis*, there is—toward the end—a stretch of three minutes for solo computer.

Otondo: There are also parts where it is almost purely instrumental.

Barrett: Exactly, and in *Symbiosis*, this is one way in which I balance the elements: to give both parts solos and to have both coming together at important meeting points. In those three minutes of solo computer, the performer has to find a way to “compose” herself. Everybody is looking at her, and she is a performer having to listen. In that section the theater emerges as she demonstrates the act of listening and not just sitting there waiting for the next thing to happen. You see a string quartet play a piece with computer or tape, particularly when they play with a click track, and they look like they are thinking, “When do I come in next? What time is it?”

Otondo: It looks like they are really uncomfortable.

Barrett: That's right, so one trick is to find a way for both parties to feel comfortable when the other is soloing. For me, it is the potential in the sound that makes the integration of the reality of the performance and the reality of the sound possible.

Otondo: When you play a piece like this one live, are you concerned with the issue of the balance of the reproduced sound and the radiated sound from the instrument? I feel that most live-electronics and instrument-plus-tape pieces that I have listened to in concerts have a problem in this respect. The listener gets a very fragmented spatial experience with

the sound radiated from the instrument coming directly from the center and the sound coming from the speakers from the sides. It is hard to integrate everything spatially.

Barrett: Yes—well, integration is a two-fold problem. There is the issue of composition, where you have to consider spectra, gesture, and articulation, and there is the issue of concert loudspeaker setup—placing the equipment correctly in relation to the performer and the space. You could refer to some well-known pieces by Dennis Smalley, and you can say they demonstrate a spectromorphological unity. But then when it comes to the concert, if you use speakers in one part of the hall and place the performers elsewhere, this will result in a detachment of sound sources. There is the practical aspect of setting up the speaker rig so that these two layers of acoustic and electroacoustic elements—of composition and performance—function. For this, it is normal to place a pair of speakers quite close to the performers on stage as the primary projection of the amplified acoustic sound (if this sound is amplified at all), or for the primary projection of live sound transformation.

Over these speakers, we can also balance some of the pre-made electroacoustic sound material. As more speakers are spread around the hall, then I distribute a little of the acoustic or live transformation along with more of the other types of sound—such as non-instrumental sound material or material that if heard toward the back or in the surroundings won't feel detached from the performance. This means we can build a sound world where the instrumental sounds come from the direction of the performers, unless the conceptual aspect of the composition demands otherwise.

Otondo: But don't you think that is the easiest thing to do—most composers detach the transformed sound from the instrument's sound. Like most of the pieces we have listened to here at the ICMC in Barcelona, we have sounds totally detached from the radiated sound of the instruments. Don't you think that the hard thing to do is to try to integrate the sound spatially and at a level of timbre? It is hard to find pieces where it is done properly.

Barrett: I think we are looking at a difference in aesthetic. In performance I often find that the North American style is somewhat different from the European style. Yet on a recording, I suppose it's the luxury of studio editing that maybe blurs these differences in aesthetic.

Otondo: You are quite skeptical about this.

Barrett: Not at all. It's a matter of taste. The style that I hear at this ICMC uses the tape and computer parts as if they were two separate "acoustic" instruments. The electroacoustic part contains articulations and sounds which are strongly instrumental in character. This type of material allows you to spatially detach the electroacoustic from the live part in that the electroacoustic becomes an "invisible acoustic" performer. Whereas a conjunction of textures and sound fields, of articulations and trajectories, I believe, stems from a different aesthetic and a different compositional approach. Although my personal taste is with the latter (probably stemming from my admiration of Varèse), I can definitely appreciate a good piece of music working with the former aesthetic. After all, it's the music that counts.

References

- Austin, L. 2000. "Sound Diffusion in Composition and Performance: An Interview with Denis Smalley." *Computer Music Journal* 24(2):10–21.
- Barrett, N. 1999. "Little Animals." *Computer Music Journal* 21(3):13–15.
- Barrett, N. 2002. "Spatio-Musical Compositional Strategies." *Organised Sound* 7(3):313–323.
- Harrison, J. 1998. "Sound, Space, Sculpture: Some Thoughts on the 'What,' 'How,' and (Most Importantly) 'Why' of Diffusion . . . and Related Topics." *Journal of Electroacoustic Music* 11:12–20.
- Otondo, F. 2005. "Some Considerations for Spatial Design and Concert Projection with Surround 5.1." Paper presented at the 2005 Digital Music Research Network Summer Conference, 21 December, Glasgow.
- Truax, B. 1999. "Composition and Diffusion: Space in Sound in Space." *Organised Sound* 3(2):141–146.