Conversation between Bill Fontana & Ben Borthwick

Borthwick: *Harmonic Bridge* has been commissioned by Platform for Art and is a simultaneous installation at Southwark Underground Station and the Turbine Hall at Tate Modern. We've been working on this for I think about 18 months, since we first met on the bridge and you played me some of the recordings you had made. Can you just sketch out how this project came about?

Fontana: Several years ago I was coming to London for different projects and every time I came to London I would spend some time on the Millennium Bridge with a portable recorder and some accelerometers and make test recordings of the bridge. I started to investigate the possibility of making an acoustic artwork out of the sounds of the bridge. Every time I made a recording I became more and more convinced and interested to me what that artwork could be. It became very clear to me at an early stage that the Turbine Hall in Tate Modern was one of the locations that I would like to have the work placed.

Borthwick: But why in the Turbine Hall?

Fontana: The nature of the sounds that were coming off the bridge - these very harmonic drones and oscillations with industrial, resonant, metallic qualities - fit really well within the architectural context of this space. I felt that with the resonance of the space the sounds would be quite musical in here. About 9 months ago Arup Acoustics did a simulation with some of my test recordings of the bridge in an acoustic model they had made of the Turbine Hall. So, I got to actually hear what this work may possibly have sounded like in this space.

Borthwick: Visiting the Arup Sound Lab is a fascinating experience. To give a bit of background, the Sound Lab is part of Arup Acoustics where they are able to create simulations of architectural spaces from the architectural plans. There is a small team who run the project, doing all of the intensive number crunching to simulate the spatiality of a given recording through a multichannel sound system in a specially designed room with a 'sweet spot' where you sit and can hear an exact replication of the acoustics of any given space. There are two different sets of operations. On the one hand the team document existing spaces such as concert halls. They also create simulations to test how as yet unbuilt structures will sound, for example how the materials and shapes of the interior of the concert hall will affect the acoustic properties of the space. This is where having the documentation of existing concert halls is so useful because you can use them as yardsticks against which to test the structure in advance of it being built. Arup came and mapped the Turbine Hall to capture the drone of the transformers and then took your recordings and processed them to give an exact simulation of how the sounds would be experienced within the space. It is very different when you listen to the recordings on headphones to how they actually are within the Turbine Hall itself.

Fontana: I think the interaction of the sounds with the Turbine Hall makes the sounds more musical. It really enhances the sounds.

Borthwick: I absolutely agree. And there's a dialogue between the tonalities of the Turbine Hall and the sounds of the Millennium Bridge. This is also true of Southwark underground station where the atrium in which the work is installed has a very particular sonority. It is a semi-done shape with glass panels which means that there is this very particular resonance. But the relationship it makes between these different structures is crucial. And that goes for Southwark as well actually. And all three of these projects were Millennium projects. As well as the acoustic element, I think there is a fascinating social marker that this project makes, identifying three completely new landmarks within the social and architectural geography of London. I am thinking about the musicality of the sounds of the bridge within the space. When we were listening to them on the headphones for the last 18 months there were certain sounds that were beguiling and that

were very ethereal and almost inexplicable but at a certain level they always seem to refer back to being on the bridge. Now that we are in the Turbine Hall playing it through this amazing Meyer sound system, the level of detail has pulled out a musicality which I don't think any of us heard beforehand. Can you talk a little bit about how you've mixed the piece down and how you have tuned both the bridge and the space?

Fontana: In creating a physical network of listening devices and accelerometers on the bridge there was a large amount of research and discussion with Arup, the builders of the bridge. We worked out eight ideal listening points in which to place the accelerometers: four of these are on the large support cables - called tension cables - that actually support the structure of the bridge; the other four were on the smaller balustrade cables. In the acoustic worlds of these two types of cables are a wide range of sounds. The tension cables each have a slightly different fundamental resonance which you can hear, almost like a continuous drone, in the Turbine Hall. You will hear the sounds of footsteps, luggage carts, bicycles, runners and so on. All these types of impact sounds along the deck of the bridge are picked up by these cables. The bridge becomes very excited if there are a lot of people on it or if it starts to get windy. The balustrade cables start to produce a rapid, pulsating, high-pitched sound that gets transferred to the tension cables. They sound almost like steel marbles rolling on some kind of glass surface. It is the journey of the balustrade cables vibrating very strongly in their part of the bridge echoing through the whole structure of the Millennium Bridge. When played in the Turbine Hall they generate flutter echoes which are very beautiful.

Borthwick: So what you are talking about is the way in which sounds are registered from one set of the sensors on the balustrade cables and continue to resonate and create vibrations throughout the rest of the structure. Specifically, the vibrations are carried from the cables down through the balustrade posts and into the structure and are received by the suspension cables as a different sound?

Fontana: As a different sound, yes. Part of the sound is picked up by the main suspension cables and it's filtered by the whole structure of the bridge. What's left is this

amazing, high pitched sound that I never really recognized before when I was doing the test recordings.

Borthwick: So on a windy day you have the sound of the thin, very actively vibrating, balustrade cables that the bridge interpreted in two different ways. Accelerometers on the cables themselves interpret the movement of the cables as a kind of 'brrraaaaannng'-like metallic sound, like you're strumming an electric bass guitar that's not plugged in. A bass guitar has metal wire strings which, when switched off, are extremely metallic. When there is some system of amplification to process the sound it pulls out the harmonics and resonances of the vibrations. For this, you need to listen to the way the accelerometers on the thick suspension cables receive the sounds made by these suspension cables. Now the 'brrraaaaannng' is processed by the balustrade post which acts as the amplifier, or receiver, for the vibrating suspension cables. On its journey through the different parts of the bridge's architecture, the rattling sound is compressed so that you hear only a single ping, like a high pitch wood block or triangle. Now, there is another sound that the balustrade cables make in very windy conditions which is quite extraordinary.

Fontana: It starts to oscillate with this droning sound.

Borthwick: And so the oscillation happens because the wires, instead of banging from side to side of the hole in the post that keeps them in place - am I right in understanding? - actually spin around the edge of the hole thereby creating a smooth vibration?

Fontana: That's right.

Borthwick: So the principle is the same as rubbing the rim of a wine glass but in this case it sounds like a theremin with the same haunting melodic intensity.

Fontana: Right.

Borthwick: You have these eight inputs or channels of sound (four on the thick, structural, suspension cables and four more on the thin, balustrade cables beneath the handrail) but you have mixed them down in different ways. But you don't have all 8 channels being played back in the Turbine Hall. You've created a series of mixes or templates through which the sound is directed and distributed in different ways. Can you talk about the distribution of channels within the space?

Fontana: In mixing for the Turbine Hall I never played all of the 8 input channels at one time – I play different combinations of them. I've arranged a series of about 2 dozen short spatial compositions that work with as few as 2 inputs in the bridge and as many as 6 at one time. The sounds enter softly and quietly into the space and then start to slowly change their positions and move around in the space. They explore the acoustics of the space, and then slowly disappear and become silent, and always returning to the hum of the Turbine Hall and the ambient sound of the space. And this work is always breathing, coming in as a gesture, leaving space untouched for a while and then coming back at a different wave. And so because the sounds are live, and the personality of the bridge is affected by the number of the people on it, the weather conditions, it is always something different to hear. So it's never quite the same.

Borthwick: So it's not possible to recognize where in the cycle you are because even though the system is the same, the traffic through that system is different with each cycle?

Fontana: Well, I can kind of tell when maybe I hear some of the inputs that are playing. But from hearing it I don't know exactly where it is in the cycle.

Borthwick: What you end up with is a sort of patchwork of playbacks which sometimes are very quiet, with just occasional percussive hits, with maybe some footsteps resonating almost as a pulsating drone, but then at other times you have much more of a foreground, sort of powerful rhythmic palette.

Fontana: Yesterday morning when I came here the bridge was extremely quiet and today it's very active. The other day when it was raining the sound was amazing. You could hear the raindrops hitting the cables. It was beautiful, just beautiful to hear it in the rain.

Borthwick: I look forward to more rain then!

Fontana: Rain and wind.

Borthwick: Yes, yes exactly. There aren't many times when we wish for it! Now just the other day we went upstairs to have a coffee in the Members Room on Level 6 which looks out over the Millennium Bridge and St. Paul's Cathedral. Something that struck me is the shadow that's cast by the bridge onto the water. Now this struck me for two reasons: First of all, you mention shadows when you talk about the relations between the bridge as a physical structure and the sounds you extract from it.

Fontana: The large suspension cables actually will pick up what I would describe as the shadows of acoustic sounds. They'll hear part of the frequency spectrum of ships passing under the bridge or they can even hear the squeals of train wheels on the Blackfriars Bridge. A couple of times I have heard seagulls, I once heard a bagpiper. They don't hear the full range of the acoustic sound, just the part of it that happens to fit with the frequency spectrum of large steel cables.

Borthwick: The partial nature of what filters through is fascinating. A visual equivalent would be looking through cracks in a wall – you only see fragments of what is happening without being able to build a narrative of how those fragments fit into the larger picture. These fragments become an abstract language with its own structures and forms that have an internal logic until, very occasionally, something happens that is instantly recognizable. I've listened to the bagpiper and the sound of the pipes carrying through the cables is quite amazing. Love them or hate them I think everyone recognizes the bagpipes; the resonant sound of pipes carries for a huge distance which is why, I suppose,

they are associated with the battlefield – no matter how heavy the artillery, you will always be rallied on by the sound of the piper! Can you explain the physics behind why this particular sound penetrates the cable?

Fontana: Well, in order for an accelerometer on a steel cable to pick up an acoustic sound there just has to be a correspondence between the frequencies of the acoustic sound and the harmonics of the material. The acoustic frequencies of the sounds must find a sympathetic frequency in the conducting material to make it vibrate. The balustrade cables don't have enough physical mass to them to be excited by an external force and they're constantly in motion whereas the suspension cables are under much more tension and because they have a much larger physical surface they have more ability to be influenced by something and transmit it acoustically.

Borthwick: So within these recordings that you've made it's almost as if the sound of the piper is like a kind of acoustic version of a geological fossil. It's like it will be there forever in posterity and future generations will wonder what the hell that sound is.

Fontana: Yes, right. It is like a fossil. But it's also like the other feeling I get when I listen with accelerometers on the bridge, especially when I was doing the test recordings, I was reading all of these Brian Greene books about string theory and multidimensional universes and because when you stand on the bridge none of the sounds the accelerometer picks up are audible to your ears, I really felt like the sound inside of metal is like another dimension of reality, another dimension of the universe.

Borthwick: What is extraordinary is that it is the bagpipes and the squeak of the train wheels that comes through in the very few instances of a true sound being transmitted by the cables.

Fontana: It's funny. According to these physicists like Brian Greene, gravity is the only sort of force in the universe that is common to all the eleven dimensions of the universe. Gravity is the only common force between all of the dimensions of an eleven dimension

universe and it's kind of like what these acoustic shadows make me think about a little bit.

Borthwick: When we were up in the café looking down onto the bridge, the sun cast a shadow at a certain angle that made it resemble the strings riding down the neck of a violin or cello onto the raised wooden element which is known as the 'bridge' of the instrument, before being tied down to the structure itself. And so the tuning element, or the tuning metaphor that you've talked about, really came through that visual image for me. And since then I have started to notice the visual images of musicality in some of the background images that you have gathered together. For example, in the poster for the project it shows a shot looking down the suspension cables with Tate Modern in the background and it's as if the posts that hold the suspension cables in place are hammers hitting piano strings. Like I've said, the violin or cello example from the shadow. How much do you look for these recognizable elements within the world of music when you do a project, or are those just absolutely by chance?

Fontana: I think that it is just by coincidence really in this case. I think I was really kind of looking, or seeking the sound and it was just a happy coincidence.

Borthwick: Thinking back to the other projects you've done, a number of them use bridges as a starting point: the Golden Gate Bridge, the Brooklyn Bridge which bring to mind harps and lyres and the architecture of other musical instruments like that. They all have a set of visual references which highlight the way a physical structure, be it a bridge or a violin, carry vibrations. A violin concentrates those vibrations into the cavity that amplifies it as sound while a bridge neutralizes the vibrations by distributing and earthing them. In each case they need to conduct the vibrations in a very steady and efficient manner. What makes the Millennium Bridge so unique is that it is a footbridge that is also a suspension bridge which means the structural load it bears is considerably lighter, making it much more musical in its range because it is more pliant.

Fontana: It's more interesting, it's a more elastic structure. Golden Gate Bridge is very stiff in comparison. The Brooklyn Bridge when I worked on it was interesting because it had a steel-brig broadway that made these beautiful oscillating sounds.

Borthwick: But that was less about the cables than the surface.

Fontana: It was about the broad surface of the bridge. The cables produced a very little sound compared to the Millennium Bridge.

Borthwick: I imagine that while the Golden Gate or Brooklyn Bridge look quite diaphanous in the way that the Millennium Bridge does, when you're up close, the width of the cables are probably the size of our bodies.

Fontana: Well, also they're designed to vibrate much less. On a structure bearing that much weight you don't want that much vibration.

Borthwick: One of the moments when the visual effect of floating weightlessness became most apparent to me was when we were trying to work out what was causing these short bursts of static that slowly rose in a crescendo and then decayed away. You realized that what we initially thought was some kind of radio interference with the signal was actually the vibrations of a propeller from a boat passing under the bridge. There is something very poetic in the transformation of the minute vibrations sent up through the concrete stanchion towers of the bridge and absorbed as some sort of stimulus of the suspension cables. That is a remarkable addition to the range of sounds that comes through.

Many of your projects have been based in the public realm, in public spaces. You have done projects within museum spaces before – you have a permanent installation at the Leeds City Art Centre for instance and at SF MOMA in San Francisco, you've also done projects within the building. But the Turbine Hall is a fairly unique space both in terms of its scale as well as its sonority. Can you talk a little bit about what it is like to work in these different kinds of environments?

Fontana: Well I suppose the Turbine Hall at Tate Modern is the most extraordinary museum space I'd ever worked in because of its scale and because of its acoustics. Those two factors lend themselves well to this type of sound art project. But the fact that the sound that's coming into here is always changing is important; it's always a real connection to the bridge. None of the moments of sound that happen here will ever be repeated exactly. It fascinates me.

Borthwick: And that relationship to an open structure runs back through your work over the decades to when you initially trained as a music student. Was there a formative moment that opened up the possibilities of working in this way?

Fontana: When I was a student in the late sixties in New York I received a lot of encouragement from John Cage and some people around him. I did some very modest experiments with making sound collages out of real sound that they thought was a path that I should pursue. But I think a big turning point for me was the opportunity to live and work in Australia in the early 1970s when I was hired by the Australian Broadcasting Company to document what Australia sounded like…

Borthwick: That's a pretty gargantuan project!

Fontana: Yes. It gave me access for several years to the state of the art recording technology and all the time in the world to go anywhere I wanted in this vast country to record sounds and to think about what it meant. The first works that I really called 'Sound Sculptures' were created in this period in my life because I had access to mobile 8-channel recording systems that were in an outside broadcast truck. And I can remember on a warm summer night in 1976 taking this truck to a place in the northern part of Sydney Harbor called Kirribilli and placing 8 reverb microphones over the openings of 8 minute cylindrical boreholes and a floating concrete pier. I got amazing rhythmic patterns of the waves passing under this pier in the form of 8 changing

compression waves in the boreholes. So that work, that Kirribilli work, was done in 1976 - that's 30 years ago - and in many respects I regard that as kind of Opus One.

Borthwick: Do you still think in terms of how important your training in composition is to the way that you work now?

Fontana: Well it's influenced me a lot because it's given me a musician's ear when I listen to the world and it's given me a composer's mind when I think about structure in the works when I'm mixing them and tuning them to a space.

Borthwick: We've just been talking about the more kind of contingent-Cagean works that you've done but recent pieces that you've made have a very different kind of composition or approach which is much more kind of grid-like and mathematical. I am thinking of commissions for the St. Martin's bell tower in Birmingham and again another bell piece, *Speeds of Time*, which was based on Big Ben and the paths of Westminster.

Fontana: Right, right. And those works really brought me back to some of my earlier days as a composer.

Borthwick: So pre-opus one, pre-Kirribilli Wharf.

Fontana: Yes. It was that side of my work that normally I don't have an opportunity to use but seemed to fit those situations.

Borthwick: When you say that side of my work do you mean…

Fontana: The real composer side.

Borthwick: So are those two pieces almost exclusive to your recent work or are there other works back throughout the years that take that same composition element?

Fontana: There were. I did a work for the University Art Museum in Berkeley or on the campus of UC Berkeley where there is a Carillon, a Dutch style for ringing bells where the bells are stationary and clappers of the bell move instead. The project there involved actually writing some minimal music for the Carillon that was picked up by microphones on the rooftops of buildings on the Berkeley campus and transmitted to a sound system installed on the façade of the museum. This was also within the sound field of the bells so the natural acoustic delays of the bells travelling through the campus interacted with the minimal composition I created. The actual sound of the bells became the missing piece of the composition. If you think of music scores and you see music-minus-one where, if you're learning a concerto, maybe you'll hear the piano accompaniment but you have to play the instrument with it. I sort of saw that as more like music-minus-eight because it was 8 channels. And in doing that the person playing the bells wore headphones and heard a stereo mix of the sounds travelling through the campus. So she could interact with that.

Borthwick: So it's the one Carillon player that was music-minus-one, yours became the composition while the Carillon player becomes the accompanist.

Fontana: Well she had a score to improvise with her interaction with what she heard from the acoustic delays, so that she could play with the acoustic delays of the bells and the parameters. Early on, around the time of Kirribilli Wharf, I had gotten involved with a couple of music schools in Australia and wrote a work for 4 pianos called *Music Sculpture for Four Pianos*. I wrote a work for 6 marimbas. I wrote a work that was a sound sculpture for a brass band, inspired a little bit by Charles Ives, I suppose, thinking of a brass band spread out for large distance in a landscape with the sound echoing. So I had those things in my past. And I suppose if circumstances ever came about in the future where I could sort of bring about those sides of my creative self I probably would find them again. But also the main instrument I used to play was the clarinet, and I had fantasies when I was working in the Turbine Hall and coming here in the middle of the night with a clarinet when nobody was around and just playing it. It was one of my fantasies while working here. I had written a piece of ultra minimal music for two

clarinets, it was called *Phantom Clarinets*, and it's for two clarinets that breathe together. A clarinet is capable of producing sub-audible sine tones which are really the threshold of audibility. So the two clarinets simultaneously play sub-audible sine tones that are very slightly out of tune with each other so that the different sounds - the B frequencies - are louder than the individual sounds of the instrument and it creates the illusion that the clarinets aren't making a sound. You see them breathing together and you get this spatially disembodied subsonic vibration and it modulates in any ambient noise in the room. So this was something that was even pre-Kirribilli Wharf, I mean I was doing this in New York before I went to Australia.

Borthwick: This sounds very much of that moment with Alvin Lucier and other people.

Fontana: Yes. This was early 1970s.

Borthwick: Well I hope that in the archives someone will dig up a secret recording of your midnight foray into the Turbine Hall!