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Marketing sonic thinking with creative visualization: getting decision-makers to listen

Christopher A. Williams (b) and Charlie Morrow (b)

ABSTRACT

Sound artists and musicians understand sound's impact on health and well-being; their knowledge can make a difference in the planning and construction of healthy cities. As immersive sound experience designers at Charles Morrow Productions LLC, the authors have created numerous installations for health and well-being throughout the world. In our professional experience, however, communicating our knowledge about the importance of sound to visually-oriented professionals who design and manage urban spaces can be a challenge. In this article, we outline our learnings in order to develop principles for visualizing sonic environments that can help decision-makers to listen to and with us. We speculate that such visualizations may aid other sound artists and designers to generate interest for sound among diverse stakeholders.

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Introduction

Bit by bit, sound is reentering the concerns of those responsible for built environments. Architects, urbanists, and planners, as well as researchers in the hard and social sciences, are becoming increasingly attuned to the impact of sound on health and wellbeing. The present issue of *Cities & Health* is but one sign of these positive developments.

Musicians, sound artists, and event makers have a singular intimacy with sound's power to shape place and experience. For thousands of years, members of our trade have known how sound can calm, animate, inspire, entertain, and even heal.¹ Yet our professional milieus today all too rarely overlap with those of urban place-makers who might benefit from our skills and creativity.²

Therefore, a significant part of our work at the immersive sound experience design firm Charles Morrow Productions is outreach, or sharing the benefits of sound. Our objective is to develop common ground with diverse professions for integrating sound and sonic thinking into built environments – beyond the usual contexts of music, art, and entertainment.³

Although sound can (and ought to) be carefully considered in all urban spaces, many prospective clients who design and manage them have little or no interest in it, at least initially. For busy people in an ocularcentric world – an airport executive, a commercial or residential architect, a marketing director for a hotel chain, a city parks manager – sound may simply seem irrelevant.

In our experience, the best way to convince decision-makers of sound's importance is to offer them a sonic experience firsthand. Actual concentrated listening, however brief, reveals what words and charts can only begin to describe. But getting prospective clients 'in a room', i.e. piquing their interest in sound to the degree where they are open to listening, can be a long road. How can we and others in our line of work break through this disciplinary sound barrier, here and now?

In this article we explore solutions that add sonic dimensions to the ocularcentricity that seems to hinder us. We propose a creative approach to visualizing sound that emphasizes fun, affect, and interactivity. These visualizations can be compared and later paired with sounds as part of the design process. We speculate that such an approach holds potential to capture the imagination of a broad professional audience and bring artistic expertise further to bear on the role of sound in healthy cities.

Design philosophy and projects

Before proceeding to questions around how to communicate the importance of sound in built environments, we wish to introduce our work with respect to health and well-being. This obviously affects how we share sonic knowledge with clients.

We offer many services, including bespoke 3D soundscapes, noise masking, kinetic sculptures, sonic branding, acoustic and audiovisual planning, and more. The thread that runs through our work is shaping a sense of place. In this sense, we use sound much as architects and designers use visual and tactile materials.

Knowing where we are and what a location holds for us is fundamental, both in given environments before we intervene and in the environments we



Figure 1. Fortaleza Hall, SC Johnson Headquarters.

create. Each location has a unique sound signature which is its ambience and environmental sounds, including machines, devices and life forms including the observer. History, memory, mood and other subjective factors run through these sounds and ground sonic experience.⁴

Our company's primary tool for shaping place is called MorrowSound.⁵ MorrowSound is a scalable 3D speaker array combined with custom software for authoring and playing back montages of recorded or streamed audio content. Speakers are placed above ear level and on the floor; left to right; and front to back. Typically speaker arrays take the form of a rough cube.⁶ This allows us to create a sound bubble with a strong vertical element, thus using all three spatial dimensions.

Sound in three dimensions, or what some people call 360° sound, means that one is able to tell where any sound is at any given time. 3D sound moves up and down and all around. In 'everyday hearing', as sound scholar William W. Gaver calls it, sound localization is closely intertwined with sound recognition; what and where are codependent (Gaver 1993, p. 9). Consider for example the sound of a mosquito buzzing around one's head: once one has located it and traced its motion, one will also have identified it. Memory chimes in; one does not localize this sound abstractly in three dimensions, one situates it in experiences the sound evokes – such as the mosquito bite – that enable one to deal with it. The vertical plane is thus a crucial part of creating believable sound environments.

In making projects with MorrowSound, we use a wide variety of source material: natural sounds (weather, waterways, vegetation, and wildlife), music (of all time periods, places, and genres), historical and historically recreated artifacts (events, tools, machines, etc.), human voices, and electronically synthesized sounds. We layer and interweave them to create sonic environments that augment or transform physical locations.⁷

The purpose of this augmentation and transformation is often to promote health and well-being. Some projects make problematic acoustics more liveable. One example is our work at SC Johnson's world headquarters in Racine, Wisconsin (Figure 1). Fortaleza Hall is a visually beautiful cylindrical glass lobby designed by Sir Norman Foster. In the acoustical prebuild analysis, we determined that the hall had a reverb time approaching 9 seconds between 1 kHz and 2 kHz. This made conversation difficult and amplified footsteps of those passing through it. To fix this, we applied a thin veil of Brazilian rainforest sounds to mask some of the most problematic room resonances. At the same time, the soundscape mitigates the negative effects of the room acoustics by providing an object of positive distraction. Our sound thematically animates the space by situating the story of H.F. Johnson, Jr., the third-generation company leader, and his lifechanging 1935 flight to Brazil. (His one-man airplane hangs in the middle of the hall.) To ensure freshness, different sounds of nature change throughout the day in harmony with the weather outside, so visitors and employees do not tire of repetitive loops.

We also support projects for which health and wellbeing is a primary objective. Medical facilities can by their very nature produce anxiety. The sounds of medical equipment, ambulances, and nasal-sounding overhead announcements do not help. To ease visitors' tensions, on the instructions of the interior architect, we installed the sounds of nearby Pacific Palisade Park in a waiting room at a medical clinic in Santa Monica, California. These accompany exact park benches, photo panoramas and vertical gardens in the physical space. On the wishes of the staff focus group, the soundscape includes joggers, cyclists, crowds of passersby, buses, dogs and a flagpole pinging in the wind. Sound helps to transport patients from a place of uncertainty, unwellness, and impersonality, to a place of warmth, positive familiarity and relaxation.

Anatomy of a morrowsound soundscape

The way we conceptualize the above-mentioned projects, and indeed all our soundscapes, is rooted in the artistic experience of company associates – particularly Charlie Morrow's previous work as a designer of large public outdoor events before the invention of MorrowSound in 2002. Two examples reveal important principles in our methodology.

In *Toot 'n' Blink* (1979/1982), boaters take center stage in a harbor drama. The fast Night Boat Squadron, just over the horizon, speeds to Chicago's mile-long Navy Pier. Larger boats are moored around Navy Pier. The two groups of boats are conducted verbally by radio announcers out on a pier in this night event. The event is broadcast by FM radio. The boats hear their commands by this FM signal. They move, toot their horns, and blink their lights on command. The audience brings FM radios to follow the commands. The boat captains reply to the radio announcers via ship to shore radio, which is also broadcast (by special permission of the Federal Communications Commission). The Night Squadron is greeted by the large boats as they arrive at the pier. All play together. In *Citywave Copenhagen* (1985, Figure 2), 2,000 performers from all areas of Danish music life are conducted by radio as they give five concerts in five outskirt areas in Copenhagen. These concerts include audiences and musicians in processions, flotillas, and bicycle groups for the finale at Nyhavn. The Fool, played by Morti Viski, runs through city streets and arrives for the finale, making a grand entrance to join the gathered forces. The Fool is raised by a crane to the top of the Charlottenborg Building. Accompanied by all the musicians and singers, the Fool sings *Citywave* and disappears into the sky.

In both these environmental events, participation is primary. There is no fixed stage, nor are there any passive observers. Everyone present as well as nonhuman life forms walk, sputter, or fly through the landscape and contribute to the sonic environment. Interactive movement, rather than discrete materials or locations, is the basis of the compositions.

A scale of movement is also the *sine qua non* of our soundscapes, which we conceive in layers. We begin with an atmosphere, or the 'broth' of a sound soup within which other elements float. If it is a story, a linear tale, we establish a moving point of view per the client's wish. On the other hand, if it is a relatively



Figure 2. Citywave Copenhagen, score.

static 360° soundscape for participatory activity as opposed to spectatorship, we deliver a steady mood.

Within the atmosphere, geographical and architectural surfaces absorb, reflect, and refract a complex of minor sounds belonging to a location, establishing acoustic and affective horizons. Seasons, spatial volume, building materials, density of life, and myriad other aspects that make places feel as they do can all be inferred from an atmosphere. Our software can shape the perception of space, making a small space large, a large space intimate, and other psychological illusions. Without an atmosphere, there is no sound of *place*; there is only the *space* of the physical room.

The second layer consists of sound scenery, or groups of sounds hovering around a particular area on the horizon – wind rustling through the trees overhead, people playing racquetball off to the side, a brook trickling along the ground. Sound scenery can be iconic, such as ringing church bells, flapping flags, or the rhythmic chop of a fishmonger's knife, and thus tell us more about the atmosphere. The proximity and presence of sound scenery can depend heavily on the position of listeners, who generally have freedom of movement in our installations. If there is a wish to guide the listeners through the space, we integrate a set of signals into the sound scenery.

The third layer consists of sounds that change position with respect to the atmosphere and sound scenery: the flapping wings and quackety-quack of a duck flying overhead, or a basketball bouncing by. These moving sounds can be near or far, slow or fast, refining local perspective. They may belong to and thus reinforce a realistic unified environment, as a fish in a pond; or they may be surrealistic interlopers, as barrel organs flying down a hallway. They may be baked into the soundscape, or users may be encouraged to trigger them interactively by means of sensors or touchscreens in the installation.

In practice, all three layers tend to bleed into each other. Atmospheres, particularly complex ones such as a market or a rainforest, usually contain sound scenery of some sort, unless they derive from quiet locations like a Nordic forest in winter or an insulated room. Likewise, moving sounds are generally not recorded in a soundproof studio, so they will carry some signature of the location where they were captured. A single source recording may contain all three layers internally and thus preclude the need to add other recorded layers.

The relationship of the layers in any given installation changes over time, allowing the soundscape to unfold. Our senses are differential systems. We hear changes better than invariance. Thus, many of our soundscapes are generative, changing with the weather, time of night and day, or user choices. We aim for them to work in harmony and complementarity with flows of human and vehicular traffic, adding vibrancy or providing respite as needed. The above approach as a whole has been key to our work toward improving health and well-being in nominally nonartistic projects, such as Fortaleza Hall and the aforementioned medical clinic in Santa Monica. We draw a direct connection between our artistic experimentation, reflection on same, generalizable knowledge of sonic environments, and applications of that knowledge to the task of shaping place in specific projects outside the artistic realm.

Our approach is by no means the best or only way to conceptualize soundscapes or the use of sound to improve urban spaces more generally. It is personal, practical, and limited. What we wish to point out, however, is that creative interventions can yield unique insights into the nature of sonic experience as well as new methods of intervention.

By the same token, we propose in the following section how artistic perspectives might also lead to new insights in the *visual representation* of sonic environments, and ultimately generate greater interest among urban place-makers who can engage us to help them.

Visualizing sonic environments

Acoustic ecologist and composer R. Murray Schafer has commented that 'all visual projections of sounds are arbitrary and fictitious.' (1977, p. 127) While this might be an overstatement, indeed there are countless ways to visualize sound, as one may gather through any brief look at DJ software, classical music scores, noise pollution charts, or sound maps. There is no comprehensive or objective way to notate it. Each medium or context emphasizes those aspects of sound that best engage a reader/viewer to work with it in a given context.

In representing real or virtual sonic environments to urban place-makers with no prior interest in sound, what aspects are relevant? Perhaps some of the principles at work in MorrowSound soundscapes apply here. In this section we draw from our experience in the field to propose three anchors for sonic visualizations that inform and excite potential clients: participation; the importance of history, memory, and emotion; and the role of time.

Participation

We take participation as a starting point. Everyone with the faculty of hearing is always already contributing to and navigating sonic environments. Thus, the task of 'convincing' a potential client of sound's dynamism and impact is perhaps a question of finding the right perceptual sleight of hand, rather than the right argument. Visualizations that seduce readers/viewers into the complexity of sonic environments and foregrounds their role in it could be a way. This also gives a hint of our methods for collaborating with clients through prototyping.

Software interfaces for making virtual soundscapes are one possibility. In our demo software, different sound sources can be mixed to create new sonic environments. The dark grey panel (Figure 3) contains a series of tracks into each of which the user can load a sound file (mono, stereo, 5.1, 7.1, or native MorrowSound 8.1). Each track has controls for mixing volume, 3D panning, and simple EQ. In addition, the size of the sound image can be scaled. The master mix (below the dark grey panel) can then be resized, moved around the virtual space, remixed with adjustments to individual output channels, and adapted to different speaker arrays such as a cube or dome. There is a gamelike element to the presentation that invites viewers to ask questions and make changes, even when they are not playing directly with the software themselves. We often include photos of virtual environments as part of our content selectors.

At the same time, promoting awareness of participation in sonic environments is not only a question of designing them from above. Encouraging clients to mentally trace their movement through the sonic environment is another way to awaken a sonic sense of place.

Sound and media artist Yolande Harris' *Anchor*, an image from a project entitled *Taking Soundings* (Figure 4) highlights the mobility of participation. She writes:

These images exist on the edge between a score and a map, line and sound, an event and a recording. Produced from satellite data collected by GPS of travels at sea and along coastlines, the work is "taking soundings" of position and movement. These images are the result of re-drawing those traces during a performance; as each part of the line is digitally drawn the data is transformed simultaneously into electronic sounds. (Harris 2007)

Even without the sound included in the complete piece, *Anchor* as a standalone visual evokes a strong sense of place and rhythm. For potential clients, particularly those working on or near the sea, it may serve as an invitation to dance.

Foregrounding history, memory, and emotion

As Isobel Anderson has argued in her article 'Soundmapping Beyond The Grid: alternative cartographies of sound' (2016), media such as the decibel charts of noise pollution analysis or gridded sound maps are important sources of factual information in certain expert contexts. However, they fail to reflect the human experience of listening, and thus are inappropriate to the task of bringing lay communities closer to their sonic environments. We would take Anderson's call for more creative and holistic sound mapping even further and claim that subjectivity should be the *focus* of sound visualizations offered to urban decision makers.



Figure 3. MorrowSound software screenshot.



Figure 4. Taking Soundings: Anchor, Yolande Harris (2007).

This emphasis on highlighting the subjectivity of sound visualizations contributed to the project Sound Thoughts and Their Seven Threads that Crisscross in the Helsinki Sky Unifying the City into One Colorful Fabric (Figure 6). For the book for 20 + 12: Design Stories from Helsinki (Hagelstam et al. 2011), Maija-Leena Remes and Charlie Morrow teamed up with graphic designer Riika Haahti. Together they built a sound map (Figure 5) to describe iconic sounds that Remes, a Helsinki native, identified around a decommissioned railroad line dubbed the Low Line. The colors, colliding forms, and onomatopeias of the image give a sense of what it feels like to live in all of Helsinki's neighborhoods. Playful stories in the legend trace a history of sounds from the distant and not-so-distant past. Iconic sound events that occur occasionally touch all Helsinkians.

The purpose of the project was not only to create sonic awareness of the city in general, but also to lay the groundwork for a project by sculptor Martti Aiha with several architects to redesign the area around the Low Line. We also sonified Aiha's model of the proposed build, which now has been approved for construction in 2019–2023. This experience supports our speculation that creative visualization can play a leading role in sonic outreach.

Making time

When first presented with the idea of sonic environments and experiences, many people immediately equate sound with music. Consequently, they think in terms of relatively short durations, such as songs or playlists. Sonic interventions in urban spaces generally take place over much longer periods of time and aim for cumulative results over months or years, in addition to momentary events. Sound installations are maintained and updated to remain fresh over time. For example, in our aforementioned Santa Monica medical waiting room, a permanent installation running all day every day, content changes dynamically over the course of a day, from day to night, and from season to season. The soundscapes are generative (rather than looped), so content is never the same. Likewise, we make revisions to the material as requested by the client.

Sound visualization for prospective clients should thus strive to convey long-term change, as well as the short-term duration and sensations of a single experience. This can be difficult to achieve in a static image, particularly when reader/viewer attention spans are short. However, it is possible, as the *Helsinki Sound Map* hints.

Visionary landscape architect Lawrence Halprin sought to convey multiple temporal scales in his ecologically-oriented planning. He used 'ecoscores' to highlight the entanglement of geological and human evolution and made drawings that dramatized natural change over days, years, and epochs (see John-Alder 2014). Although these images did not address sound specifically, we can take them as a model for developing long-term perspectives.

In Figure 7, for example, Halprin's sketch of a sunset over the ocean seamlessly and sumptuously conveys multiple time scales, from the instantaneous to the geological. Sunspots occur in the micro-short term, almost too quick to perceive. Waves crash on the shore and seagulls fly by over a slightly longer period of time. The wind and the clouds it carries commingle with the landscape on the horizon over several minutes or hours. All the while, the cliffs on the shore erode week by week, month by month, year after year ... The sunset itself can be perceived as an intersection of all these time scales, a daily cycle that becomes perceptible to humans by virtue of slowly morphing geological thresholds.



Figure 5. The Helsinki Sound Map in its Seven Colors, Riika Haahti. © 2011 Other Media. Please refer to the legend in Figure 6. Helsinki Sound Map Key. MAGENTA: People. BLACK: Tram, public transportation. GREEN: Birds, trees, parks. ORANGE: General alarm test signal (check your watch). PURPLE: Church bells. LIGHT BLUE: Wind, rain, snow. TEAL: Sea.

Sound Thoughts and Their Seven Threads that Crisscross in the Helsinki Sky Unifying the City into One Colorful Fabric

Charlie Morrow & Maija-Leena Remes

Sound and Event Designer & Editor and Translator

PEOPLE – People make sounds and call them sounds. We people have taken over Helsinki and the world, with no place on Earth immune to human sound. People move randomly, but sometimes with definite goals or with no reason at all. It is accented by the sound of steps on cobblestones and the tone of voice when we need a piece of advice or order a cup of coffee.

TRAM, PUBLIC TRANSPORTATION – The sound of the loops and routes traveled daily brings folks to all parts of Helsinki. The routes of public transportation, like planetary orbits, remain fixed over the years except for occasional changes. Helsinki cares for its population and circulates people around the city. The tram carries its sound with itself from one part of the city to the other, always the same fluctuating with the air, always different during different seasons.

BIRDS, TREES, PARKS – From the Baltic Sea to The Central Park, in parks and on trees along the streets, the birds have their resting and singing places. Birds bring an air of nature to urbanscapes. They connect us to the green network, for they have been chirping away on the branches for some 400 million years. And Finland with the locale for Helsinki has been their territory in its current topographical shape for the last 9 000 years. Birds fly nature from tree to tree, from park to park, from courtyard to courtyard, and from forests to the city and vice versa through The Central Park. Their songs ring sometimes soft and sometimes fill the whole city like in the autumn and in the spring. GENERAL ALARM TEST SIGNAL – The continuous, steady, seven seconds long sound alerts city people to check their watches on the first Monday of every month. And glimpsing at the watch at twelve o'clock sharp, most likely, brings out a smile, as there luckily is no other use, at the moment, for that sound design.

CHURCH BELLS – In 1923 even the Finns were granted freedom to worship as they please. Since then the church bells went on ringing maybe louder, despite noise laws, chiming, mostly on Sundays, their greetings from tower to tower.

WEATHER – The wind and the rain and the snow, the cycles of the climate, resonate across the life of Helsinki and shape the city. The current climate, after roughly 9 000 fairly stable years, has begun to change, many people say. During Quaternary glaciations, the ice traveled over Finland giving Helsinki its granite bed and granite cliffs on the sea. Weather sweeps with its sounds over the city, bringing in the four seasons and their fluctuations, at its most apparent when the wind rushes in from the sea and shakes the eardrums.

SEA – The sea surrounds Helsinki. It controls the climate and with its background effects makes Helsinki and its seaside market places what they are. The sea comes to everyone's life from east, west and south. In the winter its icy grip feels constraining, but it also offers refreshingly crackeling walks on the open sea ice. And it envelops in its soothing hug those who seek relief from the heat of the sunlit summer night.

Figure 6. Sound Thoughts and Their Seven Threads that Crisscross in the Helsinki Sky Unifying the City into One Colorful Fabric, Charlie Morrow and Maija-Leena Remes.



Figure 7. Sunset sketch, Lawrence Halprin. Lawrence Halprin collection, the architectural archives, University of Pennsylvania. Permission to reuse must be obtained from the rightsholder.

Moving forward

To have a real impact on the sound of healthy cities, soundmakers must reach and collaborate with decision-makers who aren't always open to listening to our work, or to the role of sound in the spaces and projects they manage. We must touch them in a way they can understand, which in the fields of architecture, urbanism, and planning is likely to center on the visual.

We propose to solve this problem by offering creative visualizations of sonic environments. Three principles may guide creation and selection. First, engage prospective clients as participants and invite them to imagine themselves how they can have an impact on sonic environments. Second, keep it personal; foreground subjective elements in sonic experience including memory, emotion, and history. Third, convey the long-term, cumulative nature of sonic interventions as well as momentary experiences and sensations. These principles all derive from our practical experience as artists and sonic experience producers, in company projects such as Fortaleza Hall and the Santa Monica waiting room, as well as Morrow's compositions *City Wave* and *Toot 'n' Blink*.

The example of *The Helsinki Sound Map in its Seven Colors* suggests that creative sonic visualizations which reflect these principles can generate dialogs that lead to results. Ultimately, visualization is only a first step; we must open ears for concentrated listening and keep them open while collaborating with clients in the design process. But insofar as eyes and ears belong to the same people living in the same world, it seems to us to be a step in the right direction.

Notes

- 1. From the singing, whistling, and drumming of medicine men in the Americas and Africa to prescriptions of the Tarantella to cure spider bites in southern Italy, music has long been an important part of healing rituals and folk medicine around the world (Horden 2000). Additionally, modern Western medicine has also documented the use of music and sound in hospital environments since the mid-19th century (Iyendo 2016).
- 2. Many artists have worked with sound and the city in compelling artistic contexts (e.g. Mark Bain, Janet Cardiff, Peter Cusack, Christina Kubisch, Max Neuhaus, or Georg Klein). Likewise, a number of innovative research initiatives seek to bring artists and urban place-makers together (e.g. the research group Recomposing the City http://recomposingthe city.org, or conferences such as Animating pedestrian zones in the sonic dimension at McGill University https://newcities.org/perspectives-sound-in-the-cityare-you-listening-to-the-world-around-you/or The Role and Position of Sound and Sounding Art in Public Urban Environments at Leiden University https://www.universiteitleiden.nl/en/news/2016/11/ conference-sounds-in-urban-spaces). But let us not confuse these milieus with the world of business, which controls most actual urban development. As we will detail below, we believe sound artists and musicians have the skills to participate directly in the business world where decisions about built environments are made.
- We have worked in a wide variety of spaces, from museums, planetariums, and restaurants, to corporate building lobbies, public spaces, and hospitals. See www. morrowsound.com for information on specific projects.
- 4. For this reason, focus groups and prototyping are essential to our approach. People are very different in their sonic tastes.
- 5. We also shape sonic environments with textile and architectural materials, plants, fountains, and people.
- 6. See https://morrowsound.com/tech.html for more information on MorrowSound speaker arrays.
- 7. MorrowSound is one among many systems for producing spatialized audio such as Ambisonics, Dolby Atmos, and Wave Field Synthesis. Unlike these systems, ours emphasizes the vertical dimension (lower speakers are always placed on the floor); does not use metadata (resulting in lower computational expense); and is built around our approach to atmospheres (as discussed later in this article).

Disclosure statement

Williams is a senior associate of Charles Morrow Productions. Charlie Morrow is the founder and creative director of Charles Morrow Productions.

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Christopher A. Williams (1981, San Diego) makes, curates, and researches experimental music and sound. PhD, Leiden Univesity; BA, University of California, San Diego. As a composer and contrabassist, Williams's work runs the gamut from chamber music, improvisation, and radio art to collaborations with dancers, sound artists, and visual artists. Williams' artistic research on improvisation, notation, etc. takes the form of both conventional academic publications and practice-based multimedia projects. He also curates the Berlin concert series KONTRAKLANG and is a senior associate of immersive sound experience makers Charles Morrow Productions. www.christopheris now.com

Charlie Morrow (b. 1942 Newark, New Jersey, USA), is a conceptualist whose music and sound work explores many styles and forms, from events for media and public spaces to commercial soundtracks, new media productions, museum installations and programming for broadcast and festivals. Throughout his career, Morrow has sought to bring experimental sound and music to a wider audience. His works have ranged from massive free public events for New York Harbor to innovative installations for the world's leading institutions, including Kennedy Space Center, and the American Museum of Natural History. Morrow's work at the forefront of the rapidly-expanding field of 3D sound has been showcased at major venues and events, including the 2006 Torino Winter Olympics and Nationwide Children's Hospital, Columbus OH. www.mor rowsound.com

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