Marc Downie / Paul Kaiser
OpenEndedGroup

selected artworks 1998–2024

Marc Downie and Paul Kaiser — known collectively as OpenEndedGroup* — have pioneered approaches to digital art that frequently combine three signature elements: non-photorealistic 3D rendering; the incorporation of body movement by motion-capture and other means; and the autonomy of artworks directed or assisted by artificial intelligence.

Their works have appeared at Lincoln Center, MoMA, the New York, Berlin, Rome, and Sundance film festivals, the Pompidou Center, the Isabella Stewart Gardner Museum, the Hayward Gallery, ICA Boston, Sadler's Wells, the Barbican Center, the Museum of the Moving Image, the Brooklyn Academy of Music, SITE Santa Fe, EMPAC, MASS MoCA, the Detroit Institute of the Arts, the MIT Media Lab, the York Minster, Barclay Center, the Wellcome Collection, ICA London, ICC/Glasgow, Bing Hall/Stanford, ZKM, Ars Electronica, and more.

*with Shelley Eshkar through 2013

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This document presents our works in reverse chronological order. For your convenience, however, we list them here by medium.

** Works marked by asterisks, such as our dance collaborations, derive in whole or in part from human motion.*

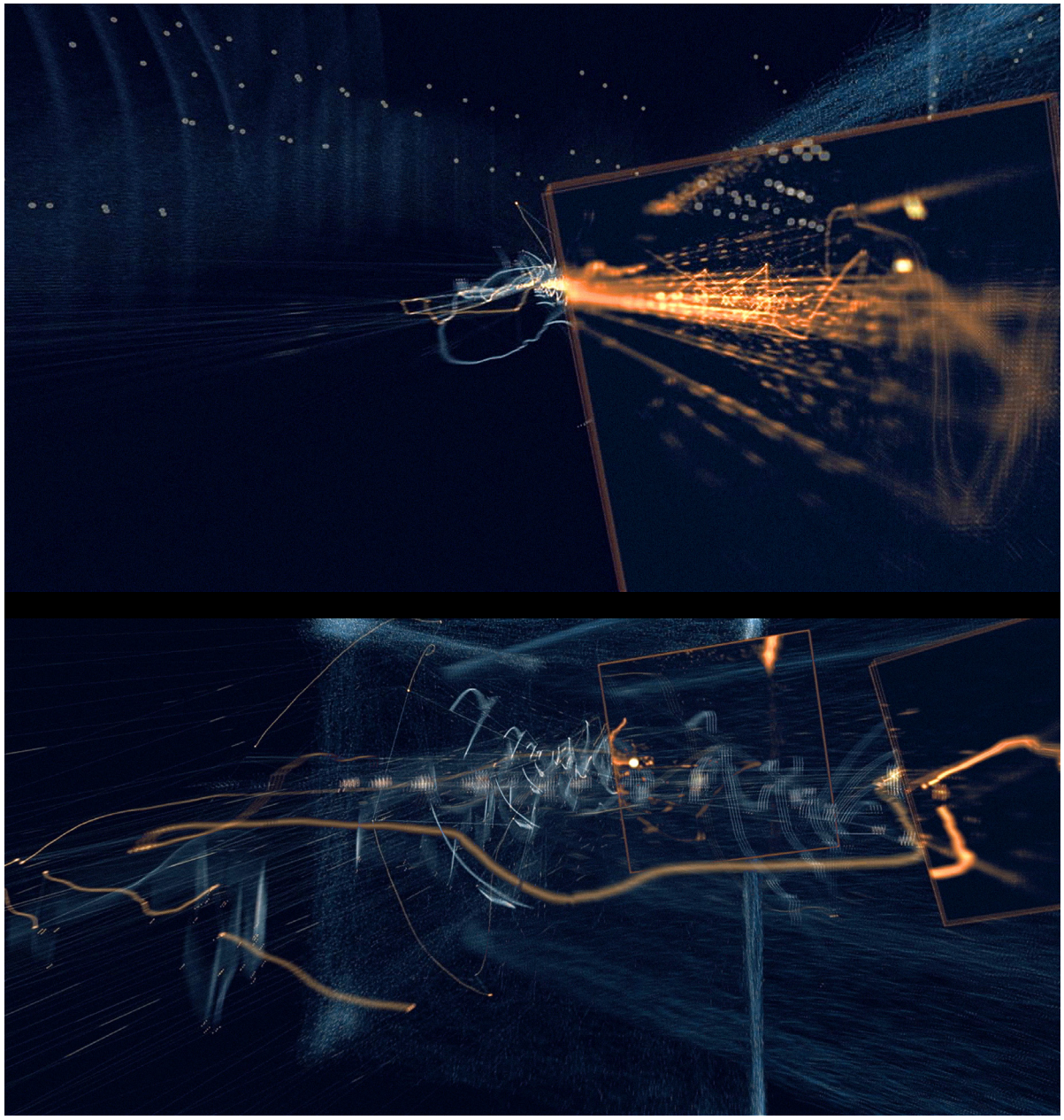
Point Line Piano | 2024

Point Line Piano uses the new medium of VR to innovate the composition, performance and reception of piano music by fusing its modes of creating, playing, and listening. It does this by means of a live graphic notation so visually compelling as to constitute its entire imagery.

When you immerse yourself in it you discover that your ears, eyes, and hand act in concert both with one other and with the interactive artwork itself. It starts with your hand stroking hand-drawn lines freely in the VR space. As these strokes inscribe themselves in that space, the notes they spark are notched as points on the line. Rapidly accumulating, these notes form distinct melodic phrases and rhythms, which may modulate autonomously to form their own variations. In the same fashion, the computer begins to elaborate intricate geometries in response to the points and points and lines you've drawn.

The hand controller serves you in two ways: first as the paintbrush by which you create your 3D notation; then as a virtual lens through which to study and transform that notation. It may magnify those parts of the imagery you frame at the same that it amplifies or modulates the sound of the notes it frames; or it may serve as a sort of magnet by which you can pull a given note or set of notes across the musical space, thus changing not only the pitches but the also the rhythmic structure or and the acoustic space.

Created in collaboration with composer Jaroslaw Kapuscinski, it premiered at ZKM in Karslruhe in March 2024. Funded in part by the Digital Score Project, which is funded by the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme.



Reaching for the Doors to Paradise | 2024

Viewers behold the peculiarly entrancing spectacle of a crowd passing in opposite directions through the swinging glass doorways of a subway station in Queens, New York. Your eyes move within it at extreme close-up within the intimate 3D space as the moving hand of one person after another is followed. You encounter all sorts of hands as they reach for the door handles or push against its glass or balance a cup of coffee; and the surrounding space is aswirl with moving contours, colors, shadows, and reflections, making a sort of visual music that we become aware of through the phrases of piano lapsing to periods of silence that make up the soundtrack.

The footage was shot well before the Covid pandemic, which claimed more lives than in this neighborhood than anywhere else,. and so we realized with great sadness afterwards that a number of these spellbinding hands must have belonged to people who lost their lives in the pandemic.. And so while we did not initially conceive it this way, we have come to regard the work in part as a requiem.

Created in collaboration with composer Jaroslaw Kapuscinski, it premiered at ZKM in Karslruhe in March 2024.



Blackletter | 2023

Blackletter is a live stereoscopic performance, generated in real time and autonomously aligned to the semi-improvised music of Tom Chiu. It arose from a University of Chicago commission to reflect upon the life and legacy of Martin Luther, a figure suddenly relevant to the present in a new way. We are caught up in a secular reformation that utterly overturns the relation of humans to pictures: a revolution that bodes to be no smaller than Gutenberg's.

The work injects Luther's pronouncements on women into the black box of AI image generation. His words express the misogyny that runs through much of scripture, but conveyed with his usual blunt graphic force (his earthy metaphors verge on obscenity). Yet he also had words for conjugal pleasures, having broken with Vatican doctrine by marrying and procreating.

The AI images seeded by Luther's words are projected onto the figure of a particular woman, in the flesh and in motion: the virtuoso dancer Jodi Melnick. She appears in close-up from a variety of unexpected angles and ambiguous distances, often superimposed with her own likeness as well as with various layers of the alien imagery generated by AI. The AI sometimes caresses her, sometimes tattoos her, sometimes assaults her; often it tries to embody her, even attempting to animate a feature of a painterly landscape into a semblance of her moving body. In this fashion, the work achieves a terrifying sort of beauty.

Commissioned by the University of Chicago and made possible with the support of the Wilhelm von Humboldt Fund.



America Afterimaged | 2019

America Afterimaged is a 3D installation that conjures up the city of Detroit out of misty predawn darkness. The work conjures an urban afterlife out of predawn darkness, with its scenes emerging gradually from the mists and glimmers of the sleeping city. The imagery is in motion, but not steadily or smoothly. Sometimes it advances tentatively until it alights on a striking composition. At other times, though, the imagery may skitter by; or superimpose; or mirror itself, with bottom reflecting top.

All of this is called forth by piano notes, for the work arises from its tight counterpoint of image and sound. The piano-playing is speculative, exploratory — the music tries things out, sees how its phrasings and rhythms advance us into the imagery. When a note is sustained, so too is the image, even as the note fades into silence; and when the pianist's hands continue up or down the keyboard, the image also moves on through different fragments of footage until the next perfect shot is discovered and settled into. When key images reverberate in the viewer's mind, they are colored with the bell-like quality of the piano sound.

Created in collaboration with composer Jaroslaw Kapuscinski, *America Afterimaged* was commissioned by Stanford University and premiered at the Warsaw Autumn Festival in October 2019.



Heaven | 2019

Heaven is a a 3D film that exposes the residential sections of Brush Street from East Grand Boulevard in Detroit to Buena Vista Street in Highland Park from the unusual angles obtained by rounding the corners at every intersection and traversing those alleyways not blocked by debris or undergrowth — and then by flipping the image upside down to force eyes over-familiar with the everyday world into seeing that world anew.

The effect of parallax is greatly intensified in 3D, sharpening perception of the striking juxtapositions to be encountered there: backyard grills and barking watchdogs; abandoned houses with sunlight pouring through broken doors and windows; yards mown and manicured as well as overgrown and reverting to prairie.

Support provided by the Witt Residency Program at the Stamps School of Art & Design, University of Michigan and by the Knight Foundation.



Revelation Machine | 2019

Revelation Machine exploits an extreme telephoto lens, shallow depth of field, and the reconstruction of 3D space from successive frames where possible to capture the rich surface details of a single route from the center of Detroit out to its periphery, with imagery ranging from brick walls and windows to fences and foliage to railings and graffiti.

Often verging on abstraction, it challenges the eye to find clarity in the welter of impressions, only occasionally honing in and freezing on such clarity itself.

Support provided by the Witt Residency Program at the Stamps School of Art & Design, University of Michigan and by the Knight Foundation.



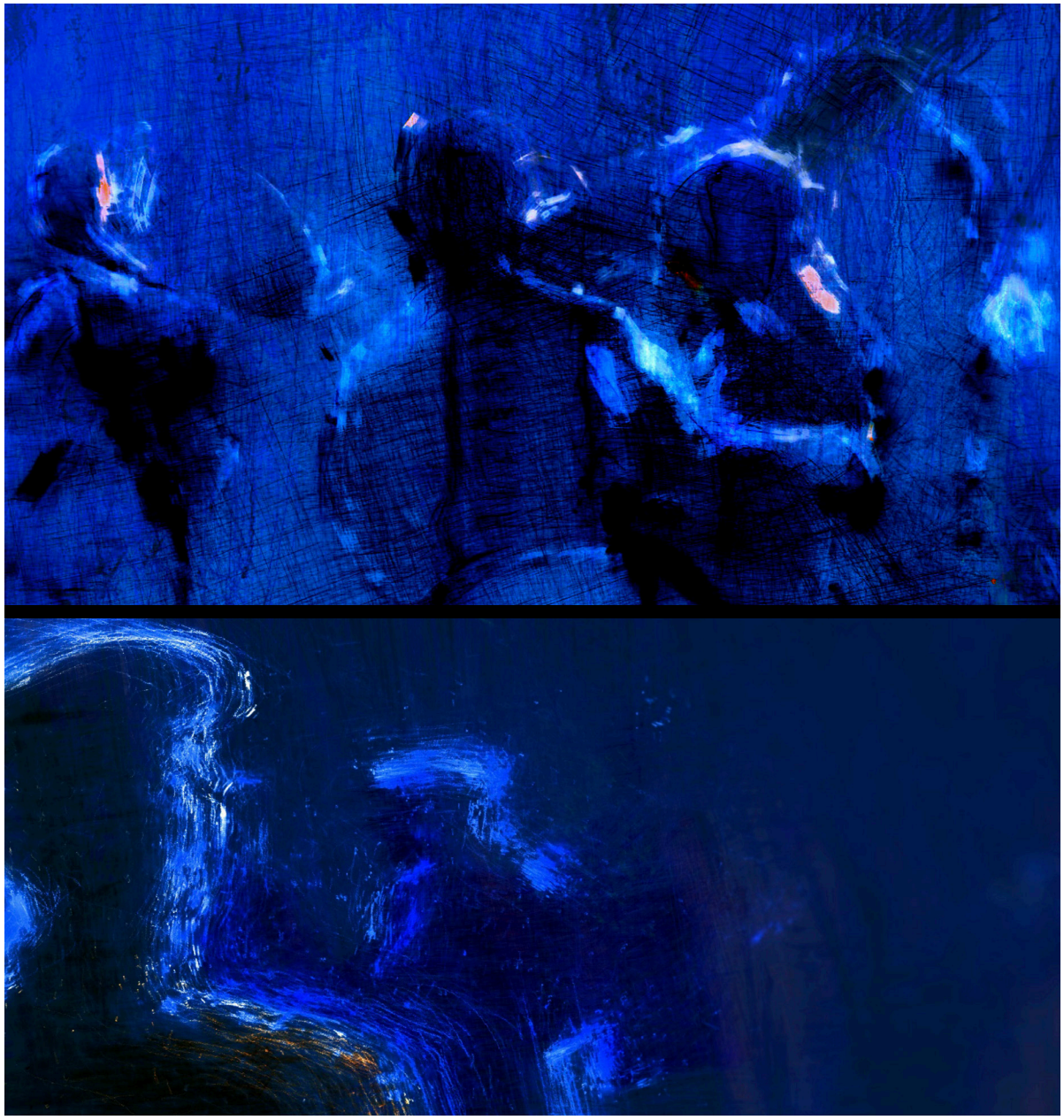
Innermost | 2018

Innermost is a visual/audio installation created by Marc Downie in collaboration with composer Natasha Barrett. This work's stereoscopic imagery and high-order ambisonic sound composition for 70 speakers crafts new mechanisms of sound / image relationship out of dense and joyous field recordings of public gatherings in Oslo. This material, absent of protest, political rally or the threat of violence, yet amassing the free expression of individuals, forms the basis of a magical synthesis of experience, paradoxically transporting the audience to the everyday.

Visually, *Innermost* reorients contemporary advances in AI's digestion of moving images away from the barbarisms of surveillance capitalism and its incessant drive towards identification, quantification and categorization, choosing instead to exploit these emerging technologies to magnify and celebrate the rich detail of pedestrian motion, space, sound and interaction. We create and deploy these new digital visual strategies to draw form and movement in previously unseen ways while harking back to the early days of hand-drawn experimental animation.

Musically, 3-D audio capture and spatial-audio source separation allows the complete soundfield to be addressed as a compositional subject within which Innermost's themes are reflected in the way that people's individuality emerge in the gait of the sound.

Innermost premiered at the Ultima Festival in Oslo in 2018.

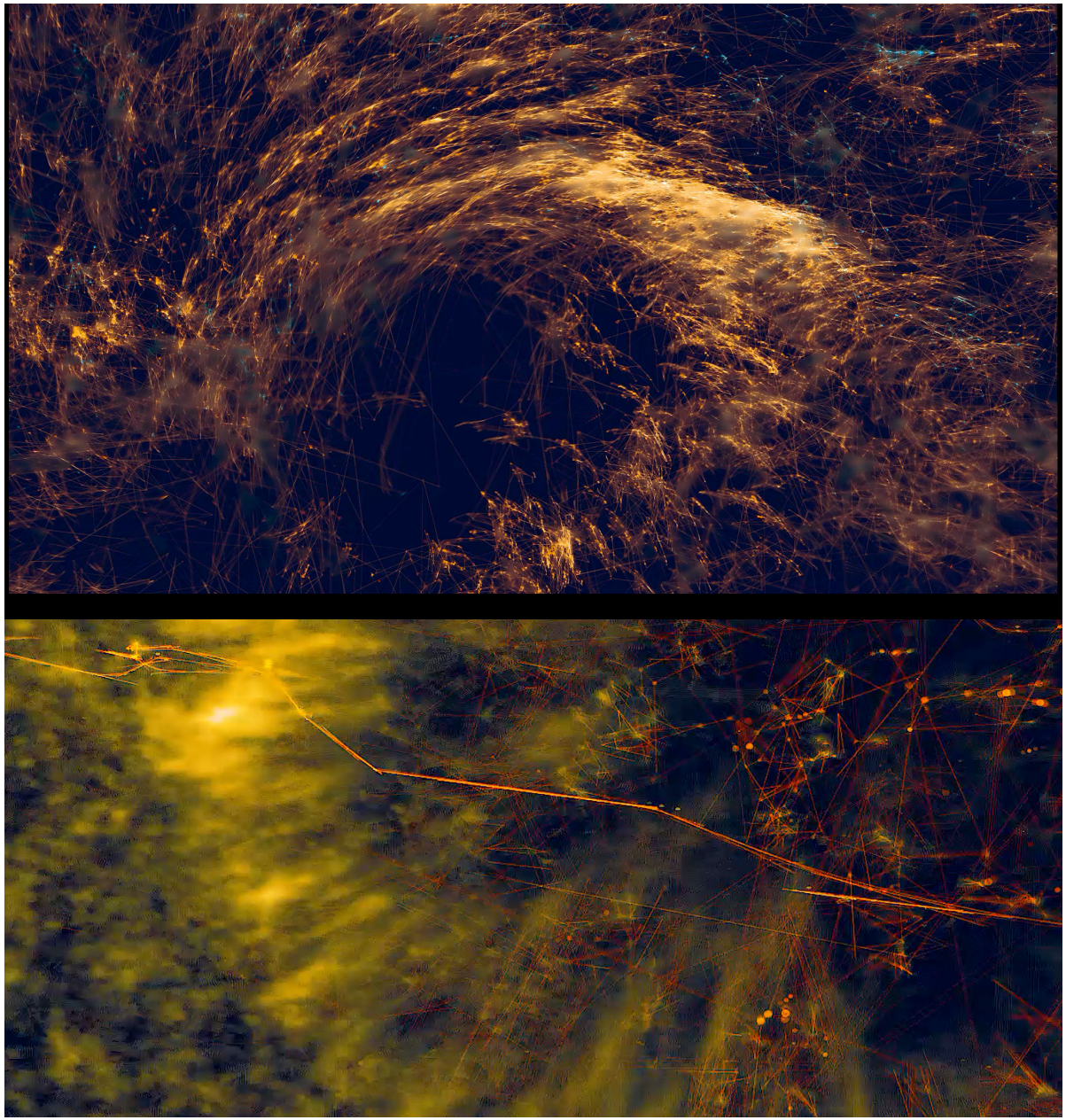


Pockets of Space | 2018

Pockets of Space takes two separate forms — as VR and as installation. In VR, it matches interactive binaural 3D sound with immersive imagery comprising up to 300,000 separately controlled points generated in real-time. In installation form, it combines high resolution 3D sound delivered over a 64-loudspeaker hemisphere with 3D projection.

Fusing 3D sound and image, the work plunges its viewers deeply inside the intricate workings of their perceptual systems and consciousnesses at large. Vast and unexpected spaces unfold for eye and ear, and in virtual reality the viewer often floats in imagery that not only extends in every direction but also comes so close as to touch and seemingly penetrate the body.

Created in collaboration with composer Natasha Barrett, *Pockets of Space* was commissioned by IRCAM and was exhibited in both VR and installation forms at the Pompidou Center in summer 2018.



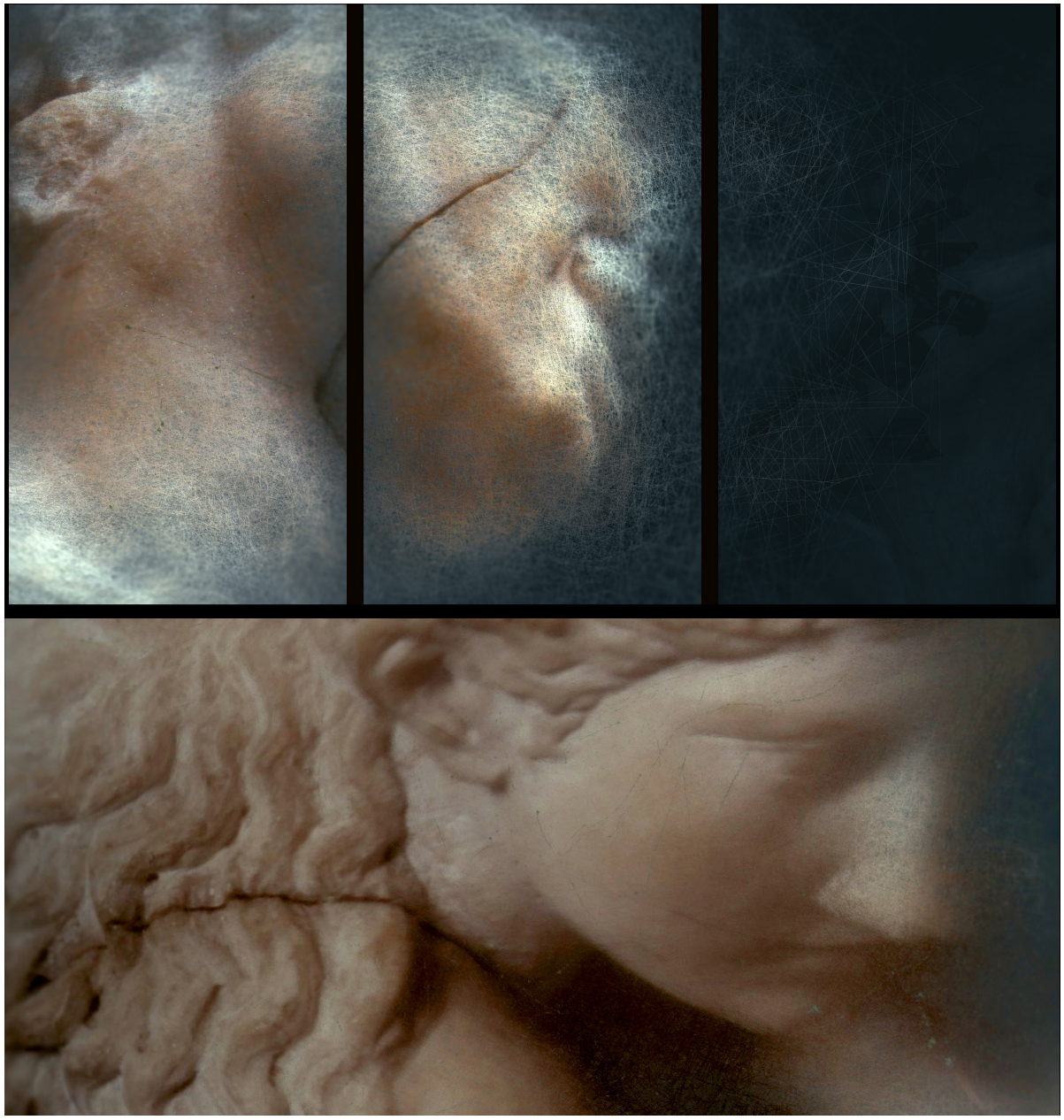
Maenads & Satyrs | 2018

Maenads & Satyrs is an immersive 3D installation commissioned by the Isabella Stewart Gardner Museum, where it will open in 2018. The work transforms our experience of one of the museum's key treasures, a Roman sarcophagus unearthed in Renaissance times.

A triptych of 3D projections, the installation places the viewers' bodies in relation to the 3D bodies of the sarcophagus, which float ambiguously within their field of vision. The rendering, which evokes painting rather than photography, engages the viewer's sense of touch, though in uncanny fashion: the lines of the image seem to dangle within hand's reach, but of course one's hand passes right through it as if a ghost's, and it's only vision itself that seems so curiously tactile.

When the three virtual cameras move in coordinated synchrony over the ancient figures, they seem to bring them back to life, momentarily unfreezing their motions as they enact their erotic dances. This has a powerful proprioceptive effect on the viewers, who feel not only their eyes but also their bodies drawn forth by these motions.

A similar sense of the body arises from the music, a composition for solo cello and electronics by the much-acclaimed contemporary composer Kaija Saariaho in a performance by Yeesun Kim of the Borromeo Quartet. Stringed instruments are most suggestive of touch, and the cello the most suggestive of the body, particularly of a woman's body. Yeesun's bow on the cello strings matches the stroke of lines of the 3D imagery as well as in the gestural motions of the virtual camera — all give an intensely tactile sensation.

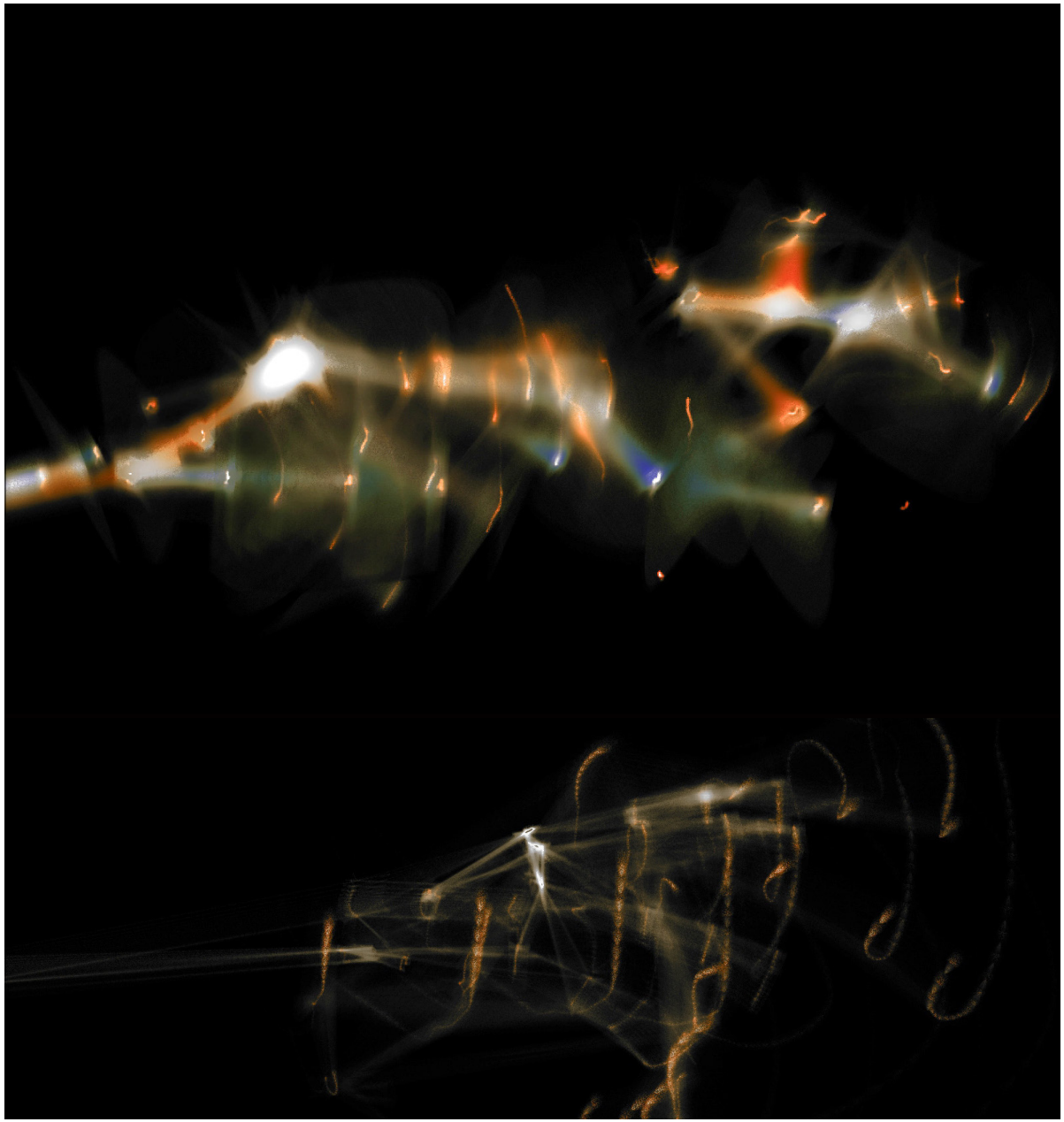


Loops; Loops VR | 2001-18

Our fourth and final collaboration with Merce Cunningham, *Loops* is an abstract digital portrait of the famed choreographer that attends not to his appearance, but to his motion. Derived from a motion-captured recording of his hands and fingers, *Loops* turns the points of his hands into nodes in a fluctuating network of relationships. At times these suggest the hands underlying them, but more often they evoke complex cat's-cradle variations. This artificially intelligent artwork renders itself in a series of styles reminiscent of hand-drawing, but with a different sort of life. Many viewers liken their experience of seeing Loops to that of gazing into nature: its flickering motions put them in mind of fire or of primitive biology, perhaps seen under a microscope.

Just as Cunningham's motions generate the imagery in *Loops*, his voice generates the music. The initial source is Cunningham reading diary entries from his first visit to New York City in 1937 at age 17 years — an old man's voice evoking an earlier city and self. His intonation and rhythm of are propelled into a virtual instantiation of the late composer John Cage's prepared piano. The pattern of notes they strike is picked out and then evolved by autonomous musical intelligences.

In 2001, *Loops* was commissioned and exhibited by the MIT Media Lab; in 2005 its sound score was re-made for Ars Electronica; in 2007 it was re-created in tryptich form, with its underlying code released as open source; in 2011 it was recreated in cinema-resolution 3D for the New York Film Festival, and in 2018 it was recast entirely for virtual reality. Created by Downie, Eshkar, and Kaiser.



Stories by Hand | 2017

This unusual collaboration between Paul Kaiser and Preeti Vasudevan of Thresh Dance entails no digital technology at all — it is, rather, a one-woman show that interweaves voice and gesture to evoke a personal reality from Indian myth, family, and the displacements of distance (east and west, past and present, mythic and everyday).

The collaboration draws upon Vasudevan's deep background in classical Indian dance (*Bharatanatyam*), especially in the intricate interplay of eyes and mouth with hand gestures (*hasta mudra*) — 52 positions of the hand that enable the exquisite articulation of sequence and story.

The minimal stage space, articulated by the precise lighting design of Robert Wierzel, expands and contracts as Vasudevan's body becomes the vehicle for her ancient temple dance tradition, for her girlhood explorations and discoveries, for her contemporary dance performances, and for the birth of her child.

The work is intended as a counterpoint to OpenEndedGroup's long collaboration with Merce Cunningham combining his solo dance with hands with his spoken recollections. Our goal is to create a complementary version of *Stories by Hand* for virtual reality.

Commissioned by NY Live Arts, which premiered it in 2017; a 2018 tour in India brought it to Chennai, Bangalore, Mumbai, Delhi, Kolkata, and Hyderabad.



Ulysses in the Subway | 2016

Ulysses in the Subway is an hour-long 3D film create collaboration with the legendary Ken and Flo Jacobs.

Evoking Manhattan's vast subway system, it brings to the eyes what normally goes only to the ears.

What you hear is a recording of Ken Jacobs's making his way through the midtown subway lines and stations. What you see are extraordinary detailed animations, constructed in 3D from more than 20 different ways of algorithmically analyzing and visualizing sound. So that while the sound is always pictured accurately, the way it's pictured can switch on a dime. These switches re-tune your eyes and ears; you perceive the world anew. The image/sound synthesis turns fleeting presences (voices, footsteps, steel-drum performances) into oddly epic events. At key moments a frame might freeze on the screen so that the viewer's eye can freely wander through the unbelievable complexity of a moment of everyday life. A subtext of the film is an Edison film of the NY subway from 1905. Re-rendered in 3D, that film surfaces unexpectedly from time to time, the past making itself felt in the present. Its ghosts, too: for the fleeting images of long-gone passengers on a subway platform mingle with the sounds of passengers today.

World premiere at the Berlin Film Festival; US premiere at the Museum of Modern Art.



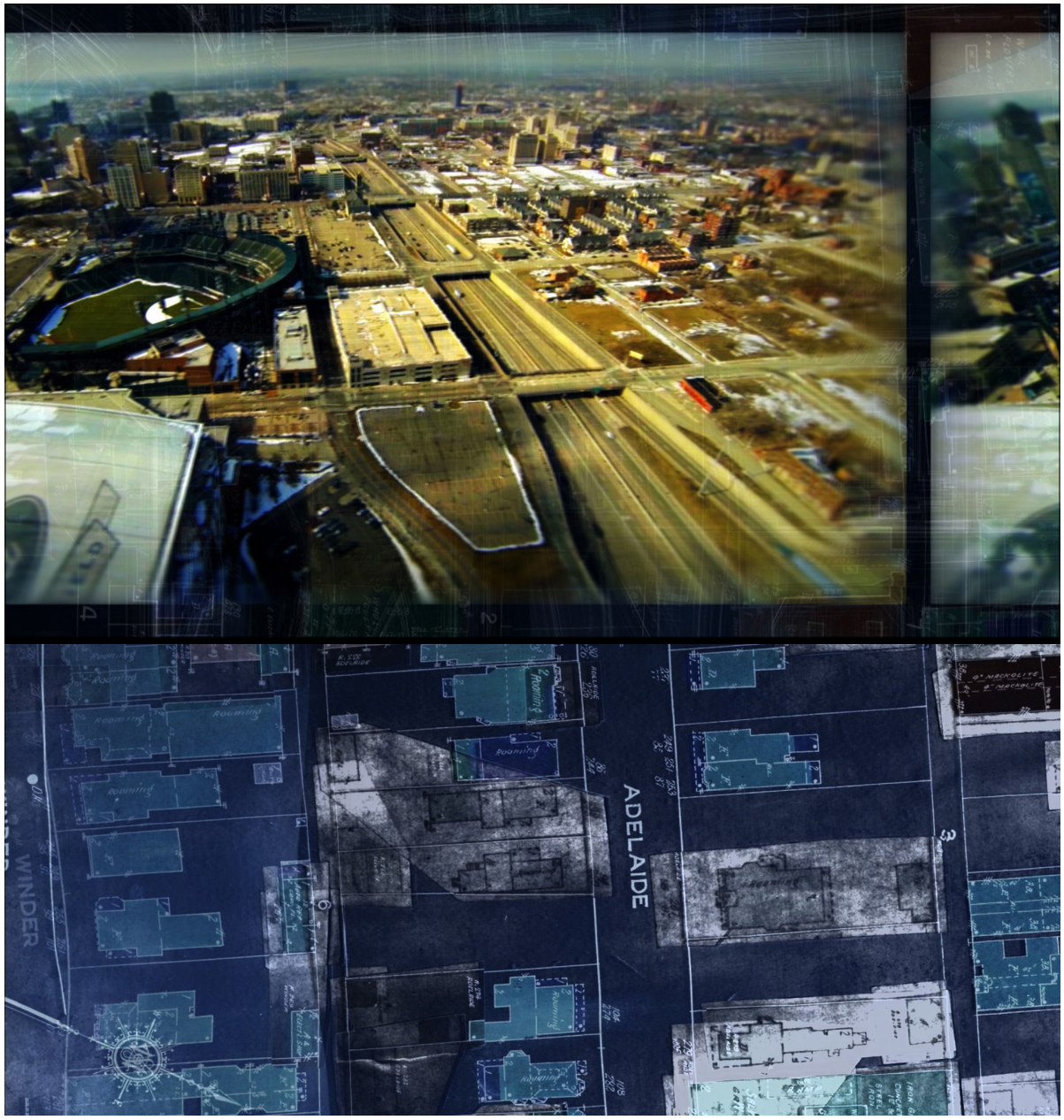
Detroit Transect | 2014

Detroit Transect is a large suite of 3D films, each of which forges a new kind of optical documentary that radically differs from the conventional documentary form. These films may be shown individually or in sequences in cinema settings; or juxtaposed spatially within a gallery or museum.

One series of films entail repeated visual searches along the full length of the Brush Street transect, moving south to north. The sections include an aerial survey matches helicopter footage to vintage fire insurance maps; a traversal of every piece of graffiti on each side of the road; a rippling search along both east and west sides of the street for all living figures, which are ever-sparser in the emptying Detroit landscape; and a telescoping of all vacant lots along the transect to form a continuous vision of a terrain returning to prairie.

Other sections forge unusual navigation routes for the eye. For example, in the *Circling* film, each shot must show something that can be seen in the next. Thus, a curve in the monorail can suddenly appear in a distant helicopter view , with that aerial landscape then seen in an outdated scale model of the city's failed model for the future.

Detroit Transect was acquired by the Museum of Modern Art for its permanent collection.



12 Stabs | 2014

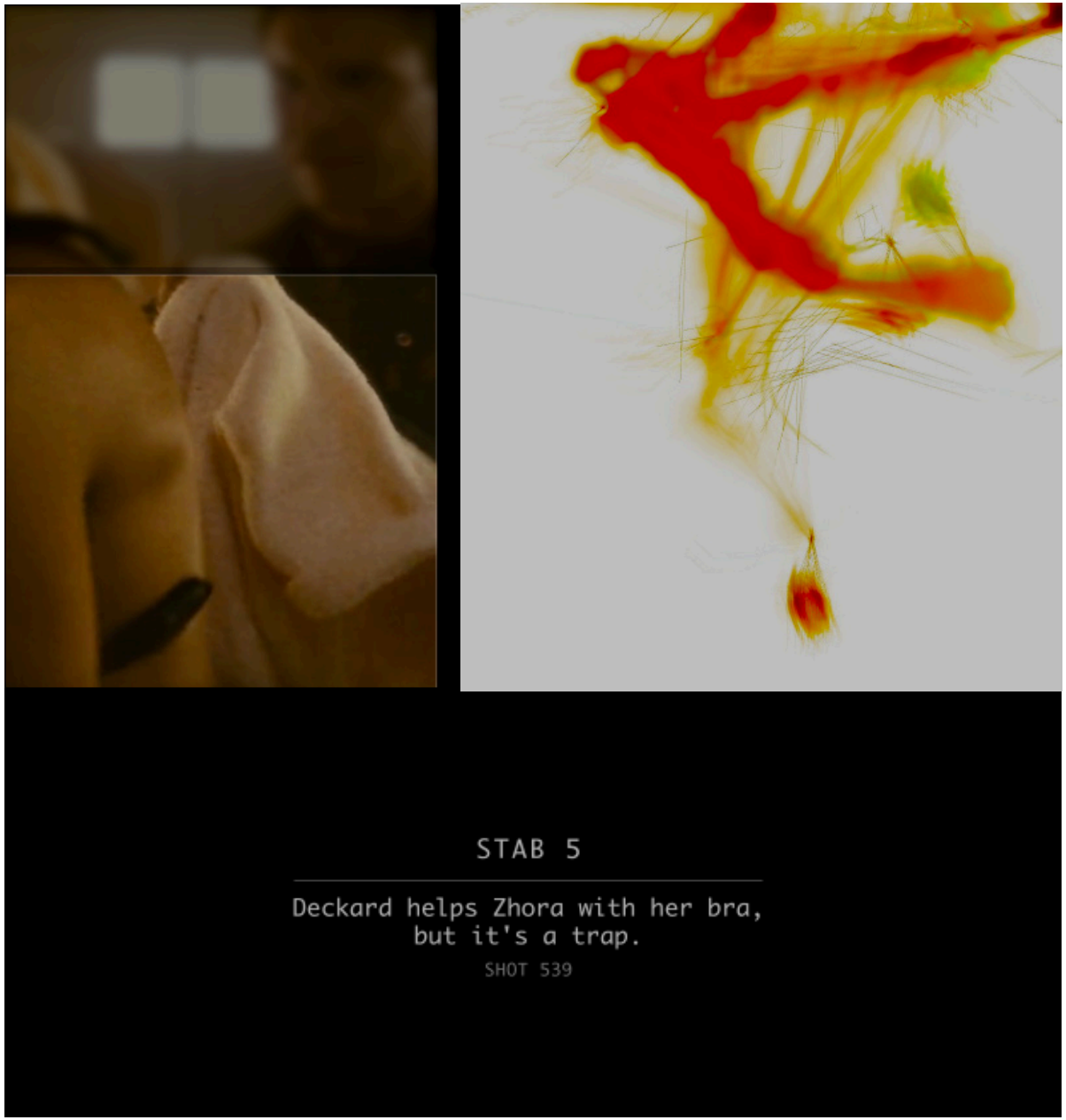
12 Stabs is a 3D film built out of algorithmic responses to sectors of twelve randomly selected shots from the science fiction movie *Bladerunner*.

The film takes as a point of departure the way a robot sees with computer vision at the time this work was made . It detects edges, colors, and motions, but it can't tell figure from ground, actor from set, or action from camera movement.

In addition, we added a further source of confusion, allowing the computer to hallucinate depth as it tries to configure a virtual body out of the movement it sees on the screen.

For each shot, the film presents a few of the many trial replications attempted — with phantasmagoric results far truer to what replicant vision might really be like than anything Hollywood could conceive.

12 Stabs grew out of our 3D installation *Becoming* (2013). Partial support was provided by The Arts Council, UK and The Wellcome Collection, with special thanks to Wayne McGregor.



Saccades | 2013

Saccades evokes the intricate web of connections between paintings, sculptures, chairs, windows, doorways, and spaces throughout the Isabella Stewart Gardner Museum. It navigates these spaces not the way a physical visitor would, but rather the way the mind might as it follows a fleeting paths of association.

The filmmakers captured 3D objects and the gallery spaces by means of exhaustive photography (more than 24,000 photographs). They then designed special software that enabled them not only to create imagery more akin to painting and drawing than to the photorealistic 3D of mainstream filmmaking, but also to peer from physically impossible angles and positions — through the back of a painting to see the room it faces or down through a ceiling.

The 36 minute 3D film is divided into 24 sections. Each enacts a different kind of formal mechanism, many of which feature new kinds of montage made possible by custom algorithms. Many of the sequences (but not all) are blazingly fast.

The imagery was created by Downie, Eshkar and Kaiser; the music was composed by Downie and Kaiser with Tom Chiu (Flux Quartet).

The work is the second of three commissions by the Gardner Museum, which premiered it in the Museum's Calderwood Hall.



Linked Verse | 2013

Linked Verse is a composition of music theater that explores the gaps and the overlaps between Japanese and Western ways of being.

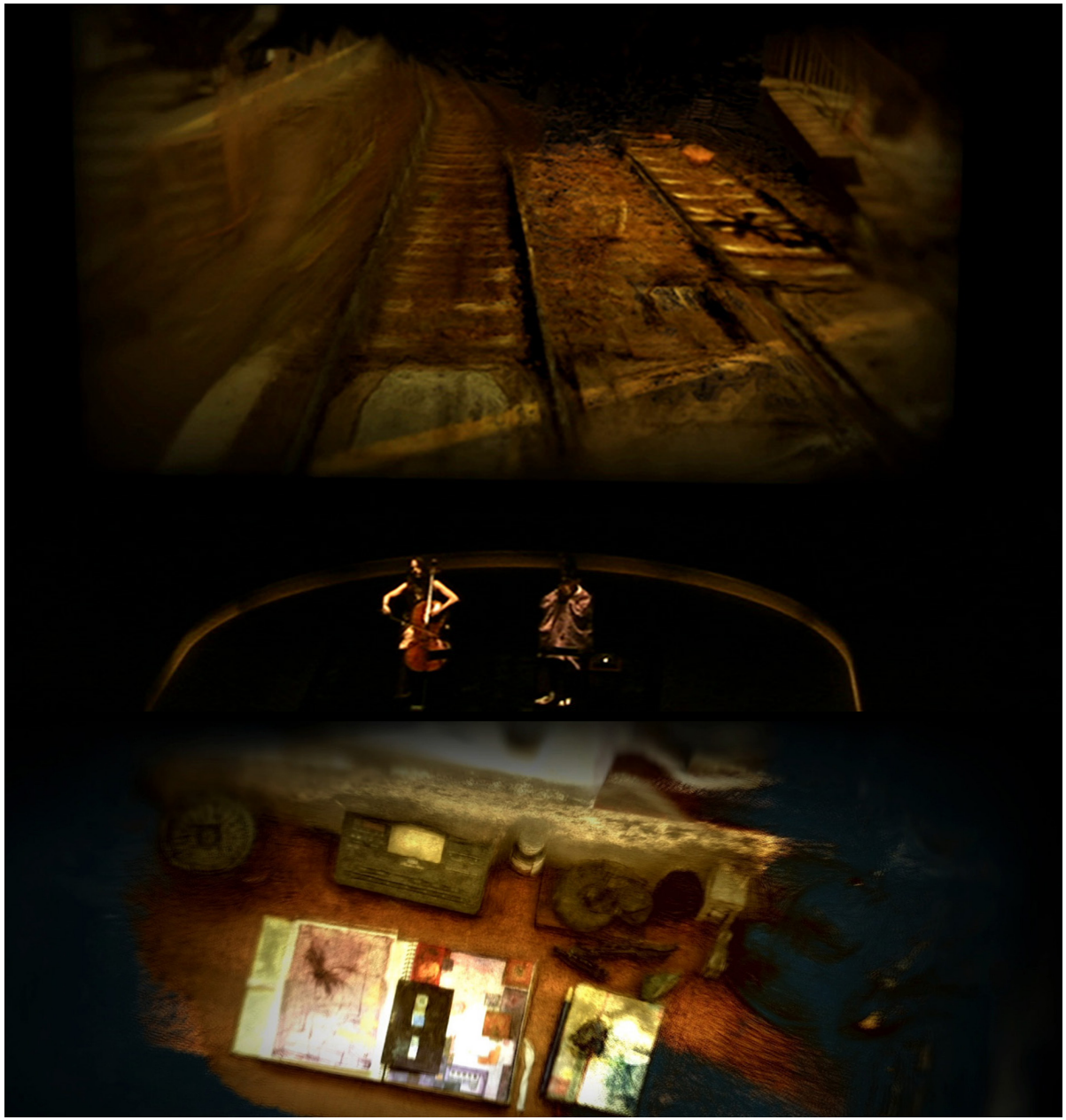
It features 3D projections that conjure up scenes of Tokyo and Kyoto in Japan and their rough equivalent places in America: New York City and San Francisco.

The sequencing of projections is inspired by the traditional *renga* form of linked verse, which sets up a non-linear chain of images that proceed by association of meaning and overtone rather than by narrative.

The music was composed by Jaroslaw Kapuscinski for an unusual pairing of instruments: the Western cello and an ancient Japanese mouth organ called the sho.

The score gave the musicians, Maya Beiser and Ko Ishikawa, considerable latitude in interpretation, and a custom OpenEndedGroup musical score displayed their separate cues graphically during the performance on a tablet, allowing them to improvise while remaining in perfect sync at key moments of the performance.

Linked Verse was commissioned by Stanford University to help inaugurate its new Bing Concert Hall, where it premiered on 7 December 2013. Created by Downie, Eshkar, and Kaiser.



All Day | 2013

All Day presents a kaleidoscope of Brooklyn spaces, from its vast skyline and horizon to its brownstone stoops, its backyard gardens, its murals and playgrounds. The work's non-photo-realistic scenes are derived from 14,000 photographs captured in the neighborhoods near the Barclays Center, which commissioned the work.

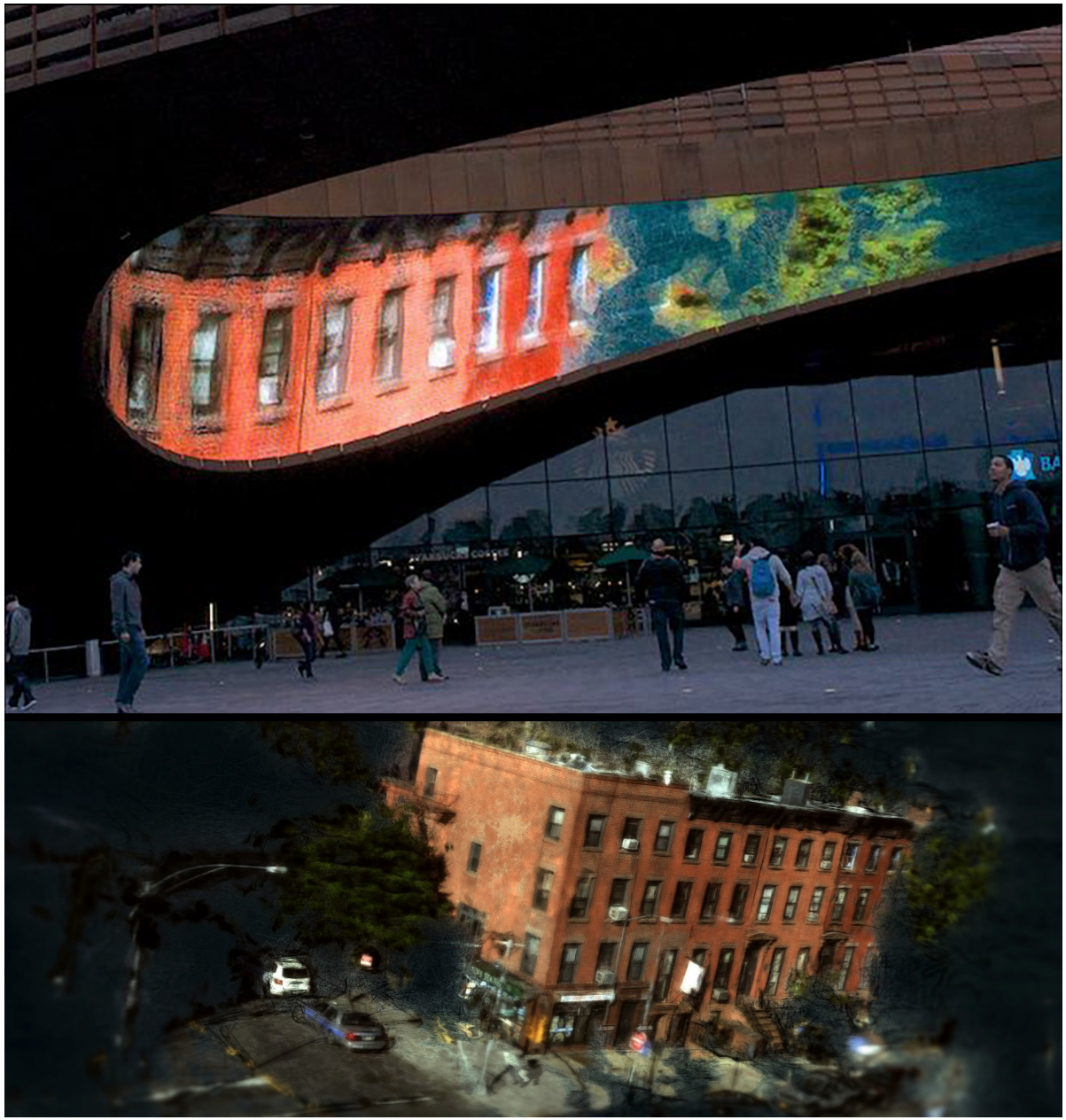
The animations of *All Day* exist in three distinct forms:

- as gigantic images on the LED "Oculus" just outside the main entrance to the arena on Atlantic Avenue (the subway escalator from the station below brings you right up in front of the Oculus overhead);
- as synchronized sequences in a five-screen installation inside Barclays Center;
- and as a 5-minute 3D film for cinema.

The *All Day* Oculus and 5-screen installation displays opened on 10 October 2013 and will be on permanent display there (eventually alternating with our earlier adapation of *After Ghost-catching* in the same formats).

The *All Day* 3D film premiered on 11 November 2013 at the Museum of Modern Art.

Created by Downie, Eshkar, and Kaiser.



Twice through the heart | 2013

Twice through the heart projected the 3D stage set for a chamber opera by English composer Mark-Anthony Turnage. The projected imagery filled a transparent scrim set across the full dimensions of the large stage at Sadler's Wells in London, which commissioned the work.

The performer, soloist Sarah Connolly, was immersed in 3D scenes evoked by the libretto she sang, which tells the story of a working class English housewife imprisoned for killing her abusive husband.

The floating imagery suggests her mental state: the suffocating fear and violence she endured for years in a cramped council flat, along with the brief mirages of a happy life she had once hoped for.

The partially abstracted imagery derives from photographically captured spaces of a council housing flat of 70's vintage as well as of the now-faded "English Riviera" boardwalk and beach in Paighnton.

Created by Downie, Eshkar, and Kaiser.



Knight's Rest | 2013

Knight's Rest is a meditative encounter with the Gardner Museum's Spanish Chapel. A five-minute 3D film, it derives from a single camera pass that moves into and then back out of the space in a pattern, unconsciously evoking that of the knight's move in chess.

Advanced software analysis of the frames generated a 3D reconstruction of the space, so that the camera movement could be shifted to angles otherwise unreachable – which allowed for such miraculous shots as looking down into the small chapel from *above* the ceiling.

The accompanying soundscape, composed and performed by Jaroslaw Kapuscinsk, is a contemporary take on Domenico Scarlatti sonatas.

Knight´s Rest premiered at the Isabella Stewart Gardner Museum in October 2013 and was then screened at the Musuem of Modern Art in November 2013.

Commissioned by the Gardner Museum, it is the first of three works to result from an extended artists' residency in 2012-13.

Created by Downie and Kaiser.



Becoming | 2013

Becoming is a live artificially intelligent installation in which an abstract body tries to master all the movements present in an iconic 1980s science-fiction film.

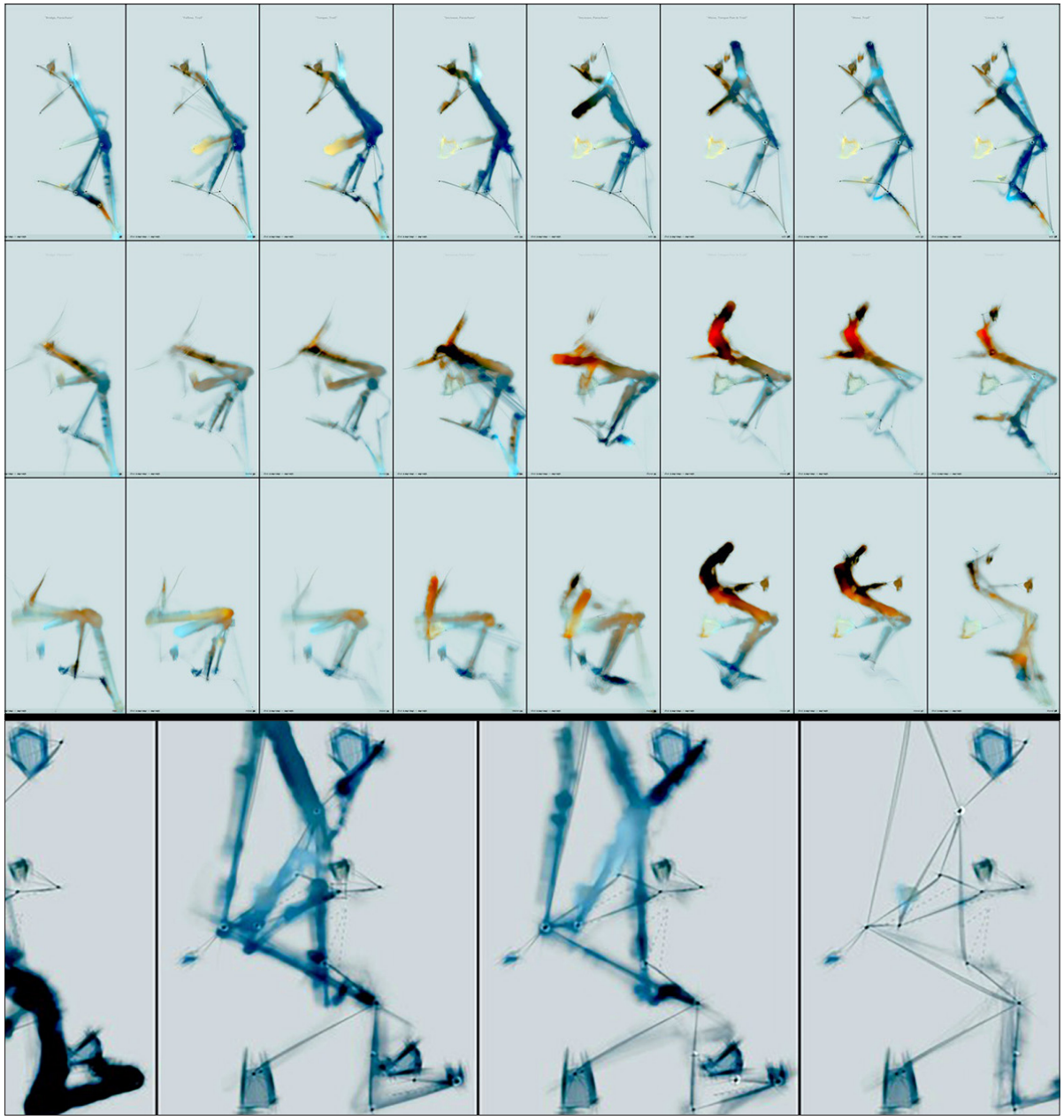
Each of the film's 1240 shots was subjected to a battery of computer vision techniques to extract their geometry, color, and movement. The abstract agent then enacts an heuristic search through the space of all the configurations and muscle activations of its own peculiar body to match the movement of each shot. It works out its approximations through a series of iterations, stopping only when satisfied that it has come as close as it can. The instructions it issues to itself are made visible in captions; these are commands such as "Increase trail," "Into emptiest space, move to side," and "Torque (long) and parachute."

Becoming is displayed in portrait mode on a 6 foot 3D screen, so that the virtual body has the height of a human body.

The virtual agent of *Becoming* was used by British choreographer Wayne McGregor in his London studio as an "eleventh dancer" whose role was to instigate new ideas for McGregor and his Random Dance company as they created a new work.

Commissioned by the Wellcome Collection in London, the artwork was part of the Thinking with the Body exhibition there, where it ran live from September 15 through October 27 2013.

Becoming was created by Marc Downie in collaboration with Nick Rothwell.



plant | 2012

plant exists in two forms — as a two-screen 3D installation and as a cinema-resolution 3D film.

plant is an immersive exploration of the huge factory ruins of the long-abandoned Packard Plant in Detroit. It builds on the spatialization of many thousands of photographs to create a haunting non-photorealistic space of "point-clouds," in which traces of the original shots sometimes hover. As the artwork moves through the fractured space of the ruins, the viewers encounter remnants of the past (factory floors, discarded cabinets, empty elevator shafts) as well as the surprising evidence of ongoing activity there (graffiti sprayed on the walls, the sound of birdsong, distant voices, and even shotgun blasts echoing through the emptied spaces).

The work serves as a virtual memorial to a grand urban site that is slowly collapsing and now threatened with complete demolition. The squalor of the contaminated material ruins is transcended by the beauty of the light and the intricate spaces to be glimpsed there, so that some of the scenes in *plant* take on the unexpected beauty of stained glass windows or of Cubist paintings, though always in fleeting rather than fixed renderings.

plant was commissioned by the University of Michigan Institute for the Humanities. In its two-screen installation form, it opened at the University and then at the Detroit Institute of the Arts.

As a 3D film, *plant* premiered at MoMA, which thereafter acquired it for its permanent collection. Created by Downie, Eshkar, and Kaiser.



All Sides of the Road | 2012

All Sides of the Road derives from a twelve-minute 3D video capture of Old Highway 101 entering and departing Dewitt, Iowa. After the title image, the cameras are pointed directly down at the highway, which becomes a rushing microcosm of the world that evokes landscapes both of America and of the mind. The resulting spectacle is both utterly photo-realistic and phantasmal.

In addition to landscape, this digital film also evokes earlier forms of analog film, especially those of the American avant-garde, for the physical properties of the highway are like those of celluloid. In motion, the textures of asphalt and concrete look a lot like film grain, while the lane markers flickering by are easily mistaken for the lines and letterings on film leader rushing through the projector gate.

At the same time, the 3D imagery is so immersive that its grain and flickering patterns begin to look like the inside of your brain.

The work is framed by this short introductory text: *No hitchhikers on the road anymore. No stories, or silence, between strangers.*

All Sides of the Road premiered at the Rome Film Festival and has been screened at festivals in Germany, Brazil, and Cyprus, as well as at MoMA, which has acquired it for its permanent collection.

Created by Downie and Kaiser.



Drawn Together | 2012

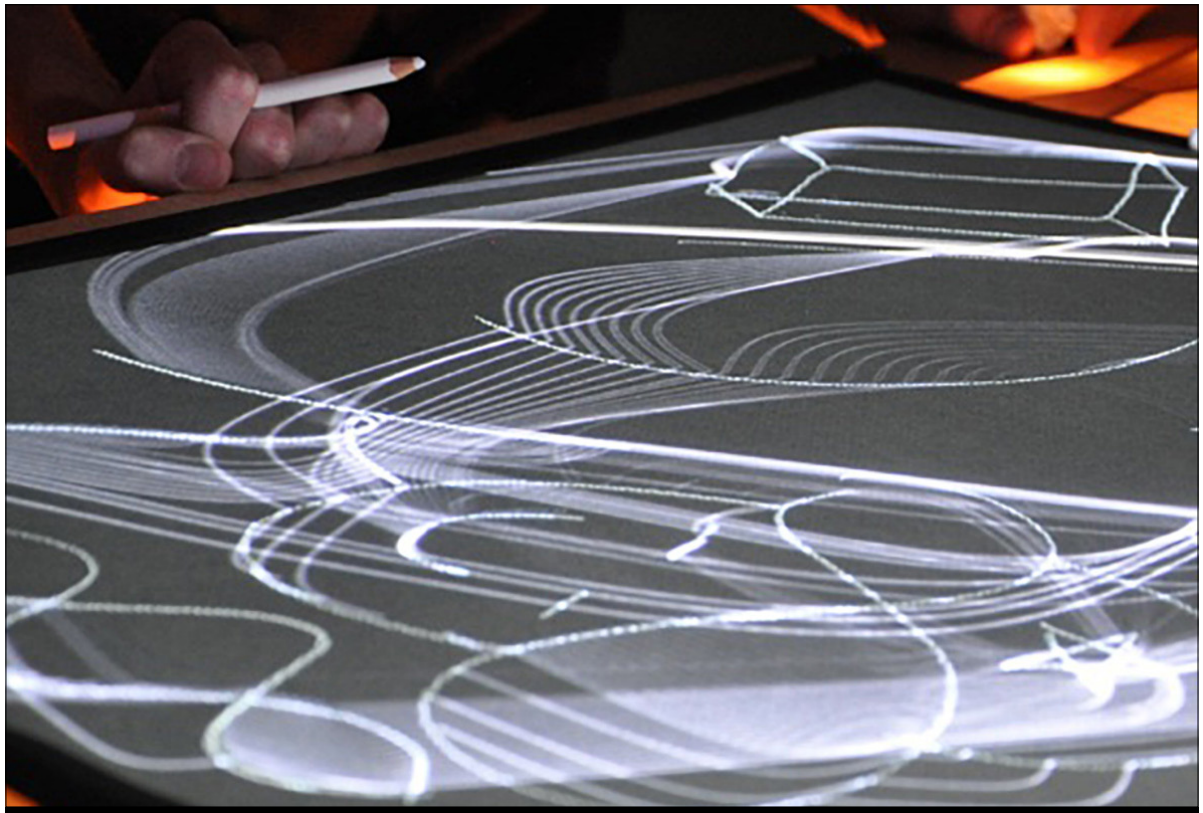
This artwork has participants interacting with a digital intelligence to create unforeseen and original drawings and music in 3D – a performance of drawing whose form is in equal parts physical and virtual.

Here's how it works: The physical manifestation of the installation, which echoes that of a drafting table, presents you with a variety of white drawing implements (chalk, gel-pen, pastel) with which to draw on a piece of black paper. While drawing, you wear 3D glasses and headphones.

As you draw your first mark on the paper, you hear its trace amplified in the headphones: the curved body of the table is itself an electro-acoustic instrument, with a resonating cello-like chamber. By withdrawing your hand from the drawing, you signal the end of your turn; and the computer then responds by projecting 3D lines that seem to draw themselves over, on, or under your paper. The virtual marks echo, extend, annotate, magnify, or complement the ones you've drawn physically and are accompanied by a music derived from the sound of your strokes. You then continue taking turns with the computer until you're done – which you declare by signing your name in the box projected on the lower right of the page.

The piece is not about mastery or winning, but about something like the opposite. You can't direct the outcome (nor can the computer) so the "drawing" becomes a human/computer interaction that will take you into unexplored spaces.

Commissioned and presented by Georgia Tech. Created by Downie, Eshkar, and Kaiser.



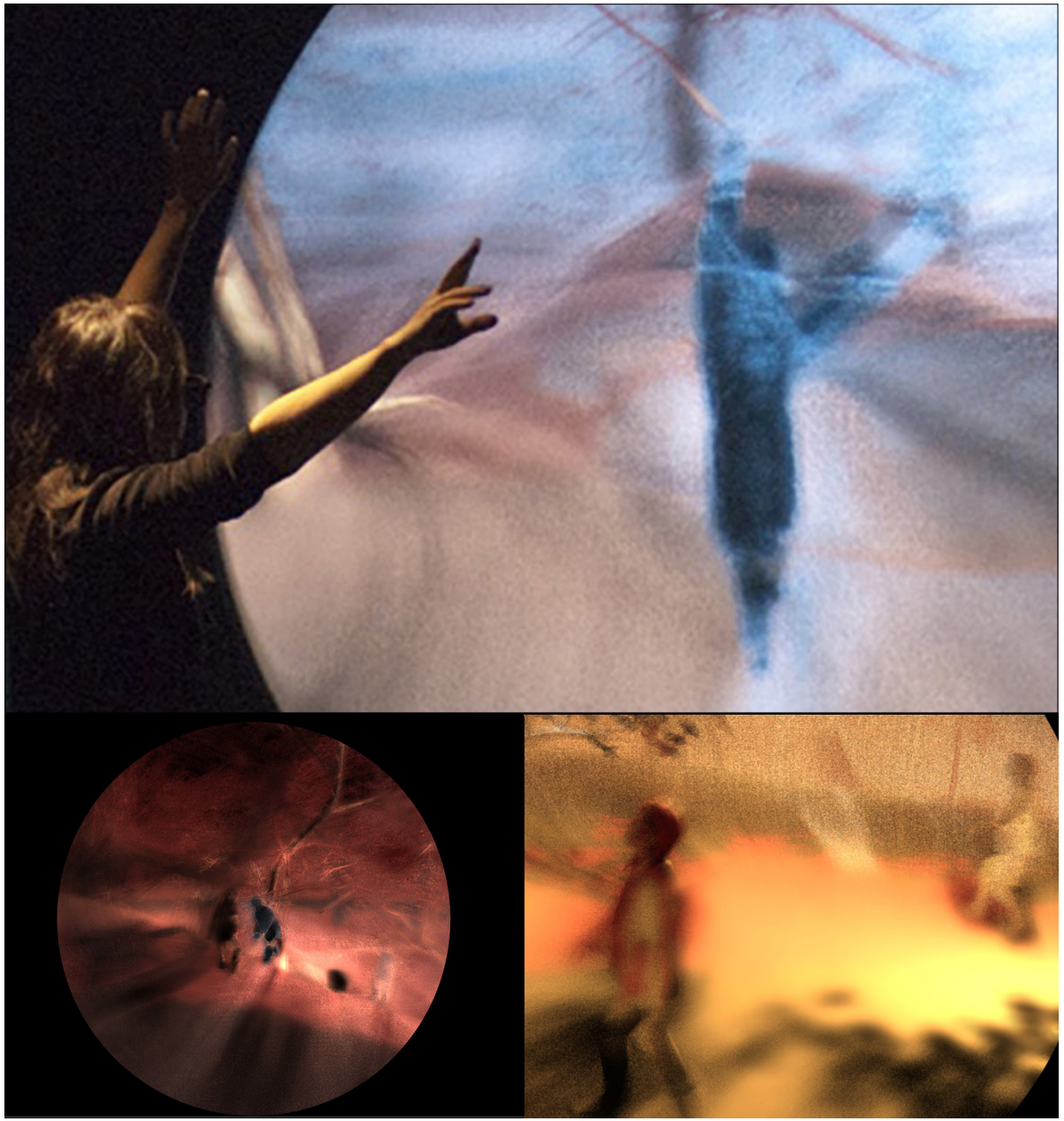


Into the Forest | 2012

Into the Forest is an interactive 3D installation that evokes the play and the daydreams of children exploring an ever-changing forest.

Into the Forest projects painterly imagery in real-time that seems to hover off the screen in stereoscopic 3D so that the viewer feels almost inside the imaginary virtual world. Indeed, from time to time, a spotlight comes on in the gallery, and anyone stepping inside it becomes a figure placed in that 3D world and momentarily intermingling with the virtual children there. The experience is akin to plunging back into the daydreams of childhood, which can be glimpsed again but never quite recaptured.

Into the Forest was commissioned and presented by the Museum of the Moving Image. Created by Downie, Eshkar, and Kaiser.



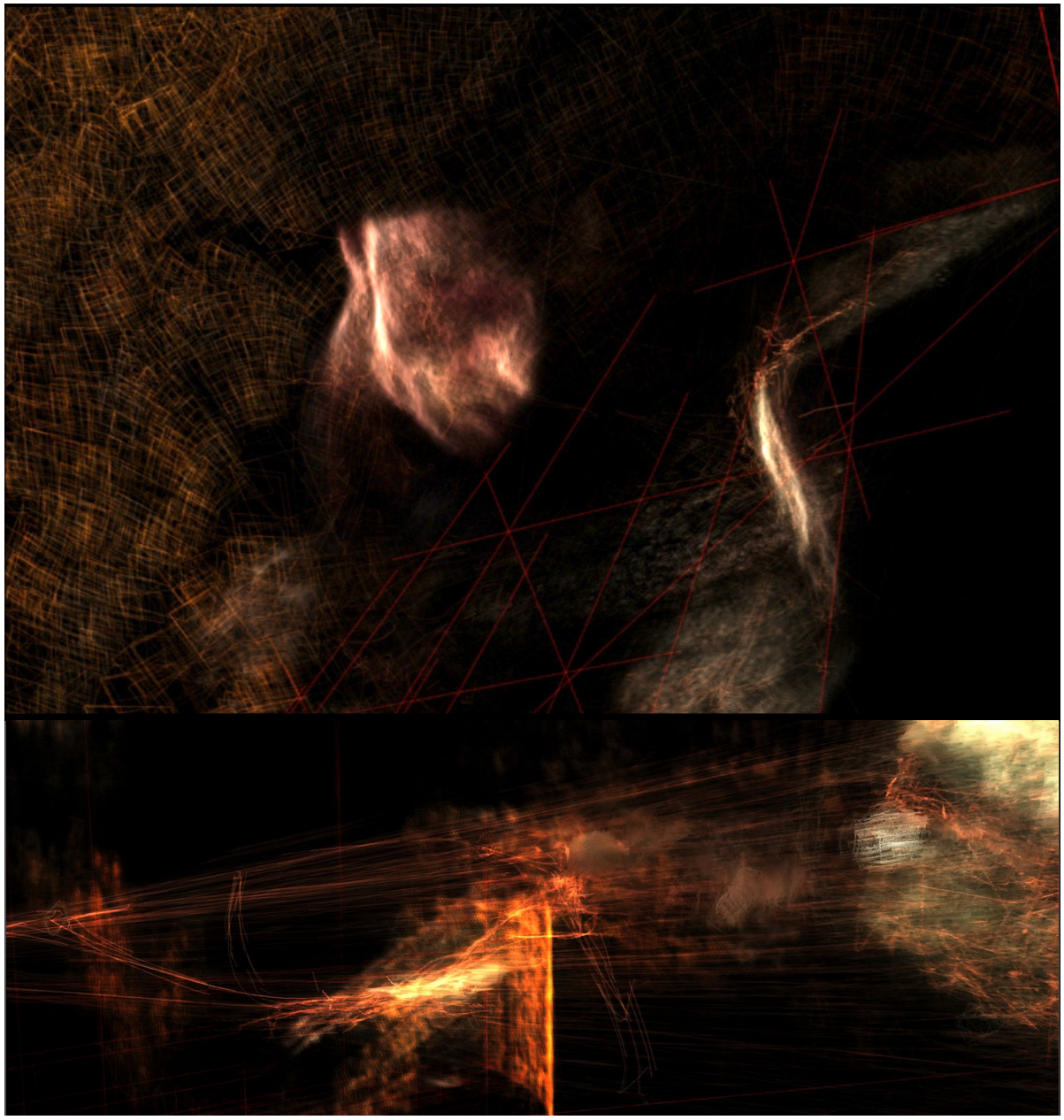
Stairwell | 2010

Stairwell was a 3d site-specific installation for Toronto's Hayward Gallery, where it deployed three immersive projections arranged vertically opposite the three landings of the gallery's circular staircase.

The work was created in collaboration with choreographer Wayne McGregor, who was captured performing in the same space in which the viewers encountered it. This capture, accomplished by means of a custom 3D capture camera array, yields spatialized stereoscopic video.

The scenes are rendered in an oddly elusive style, with the imagery always striving — but often failing — to cast McGregor's figure as a solid sculptural form for each instant of his movement. There's a perceptual battle to tell figure from ground, for a curvature of the architecture is easily mistaken for that of a limb, the angle of a knee or elbow for that of a stair. These renderings grow increasingly abstract from the top to bottom projections; the bottom-most imagery puts the viewer inside what feels to be the very neurons of the dancer.

Commissioned by the Hayward Gallery in London, *Stairwell* premiered there in 2010. A new version of *Stairwell* was created for cinema-quality 3D film projection and premiered at Lincoln Center in New York City. Created by Downie and Kaiser.

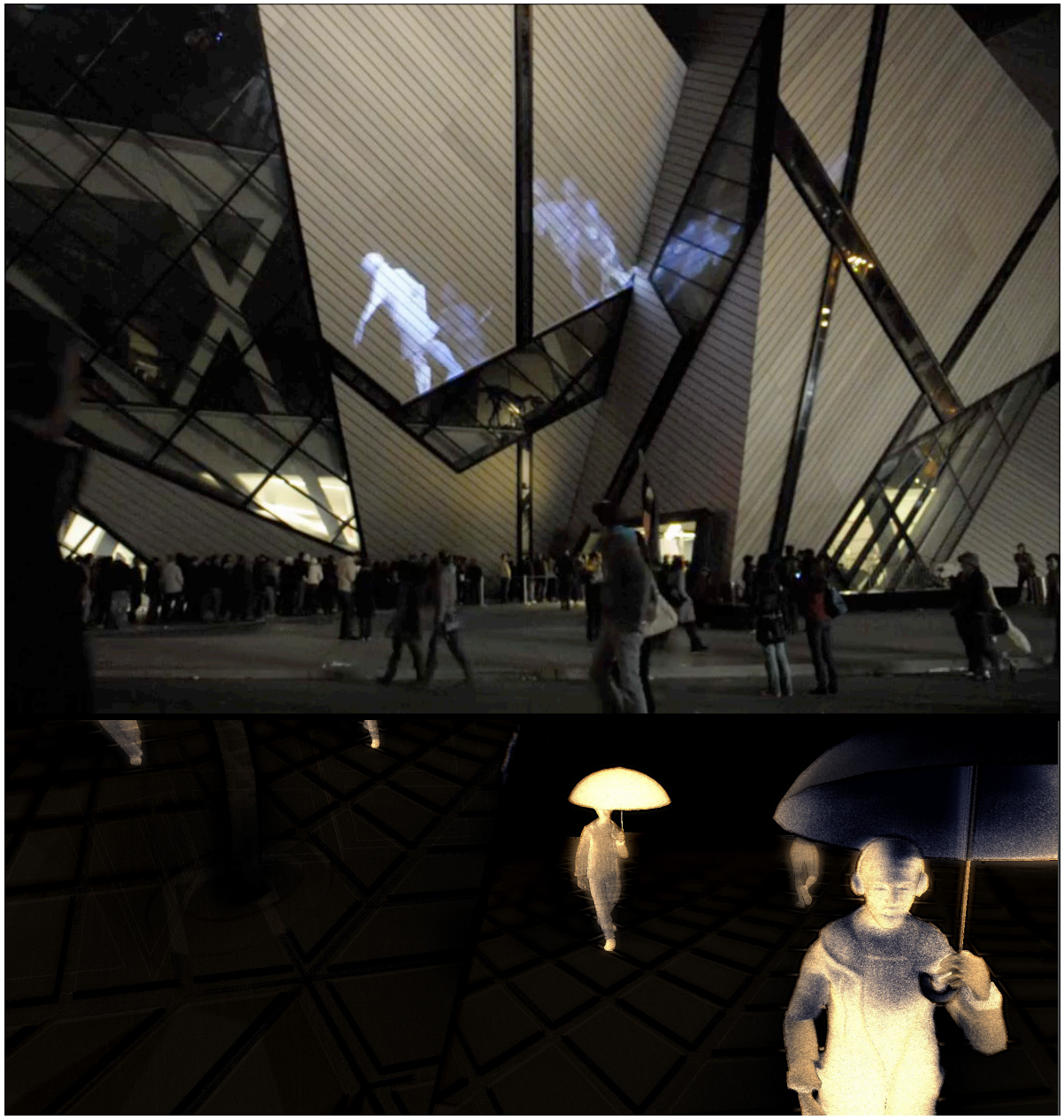


Crossings | 2010

Crossings was a site-specific all-night installation for Toronto's Nuit Blanche, October 2, 2010. It projected huge figures onto the facets of the "Crystal" facade, Daniel Libeskind's extension to the Royal Ontario Museum, which thousands of people took in as they wandered through the night.

Crossings is what we call a site-specifiable artwork – that is, one that can be rapidly and radically adapted to suit the space and context of a given site. It is especially suited for sites characterized by complex architecture and/or by multiple projections.

Created by Downie, Eshkar, and Kaiser.



After Ghostcatching | 2010

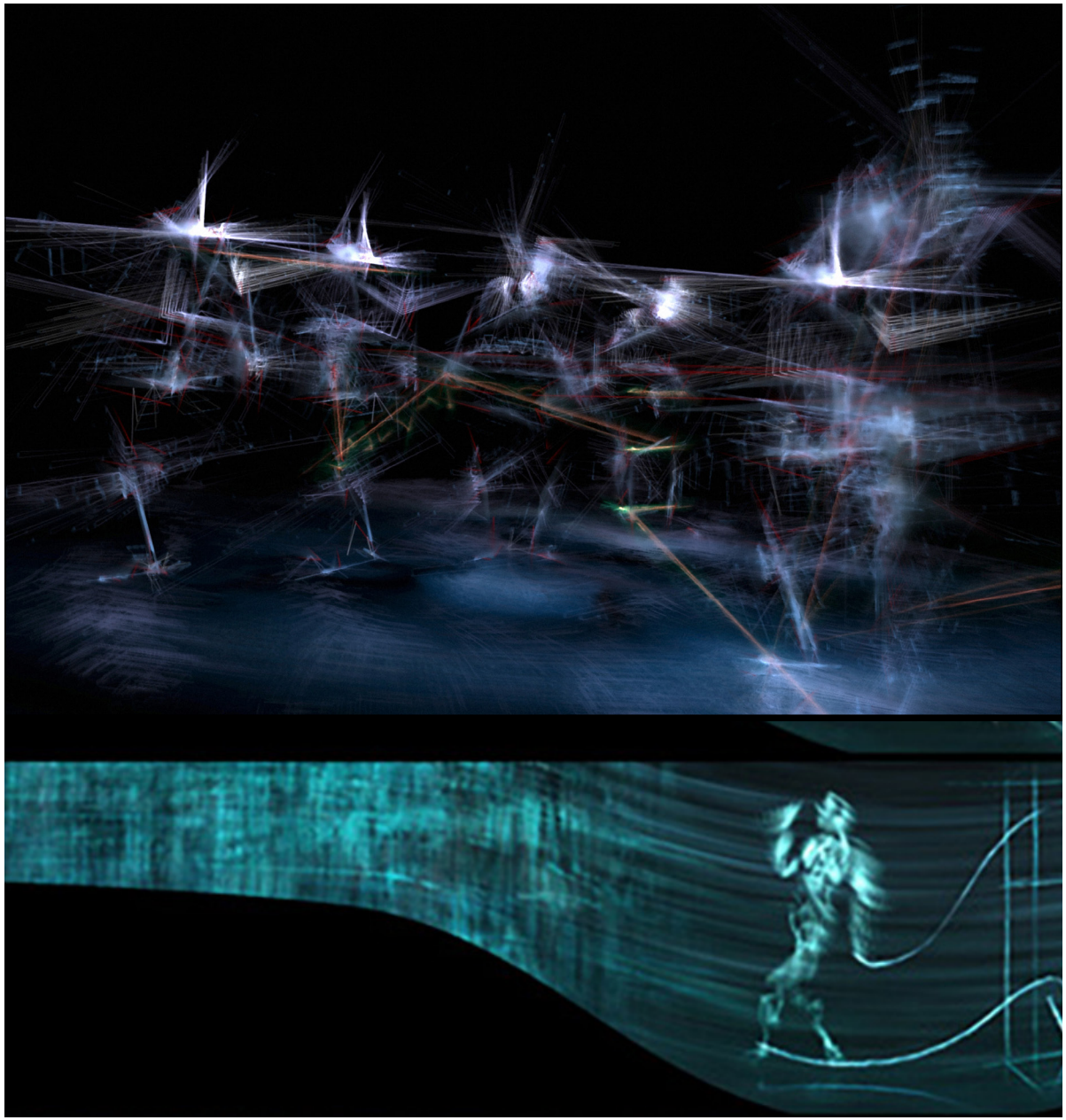
A re-envisioning of *Ghostcatching* (1999), *After Ghostcatching* is built up from a larger sampling of the motions and vocalizations of Bill T. Jones captured for the earlier work. It explores the themes of disembodiment and identity with the new possibilities opened up by 3D projection and a custom 3D renderer created in the OpenEndedGroup's Field software.

A disembodied dancer is rendered as a moving hand-drawn sketch – and that sketch moves in a projected 3d space that can seem so close as to let the viewer reach out and touch it. Though the work's imagery comes entirely from a computer simulation, it bears an unmistakable human trace – that of dancer Bill T. Jones, abstracted from his physical body via a process of optical motion capture that preserves his movement but not his likeness.

After Ghostcatching was commissioned and featured by SITE Santa Fe for its biennial show The Dissolve. It has since been presented at the Sundance Film Festival, the Utah Art Center, and the Film Society of Lincoln Center, the Boston Institute for Contemporary Art, and the Nelson-Atkins Museum in Kansas City.

A five-screen, 2D version was commissioned for Barclays Center, Brooklyn, as was a set of radically expanded excerpts shown on the 3,000 square-foot "Oculus" LED marquee in front of the stadium complex.

Created by Downie, Eshkar, and Kaiser.



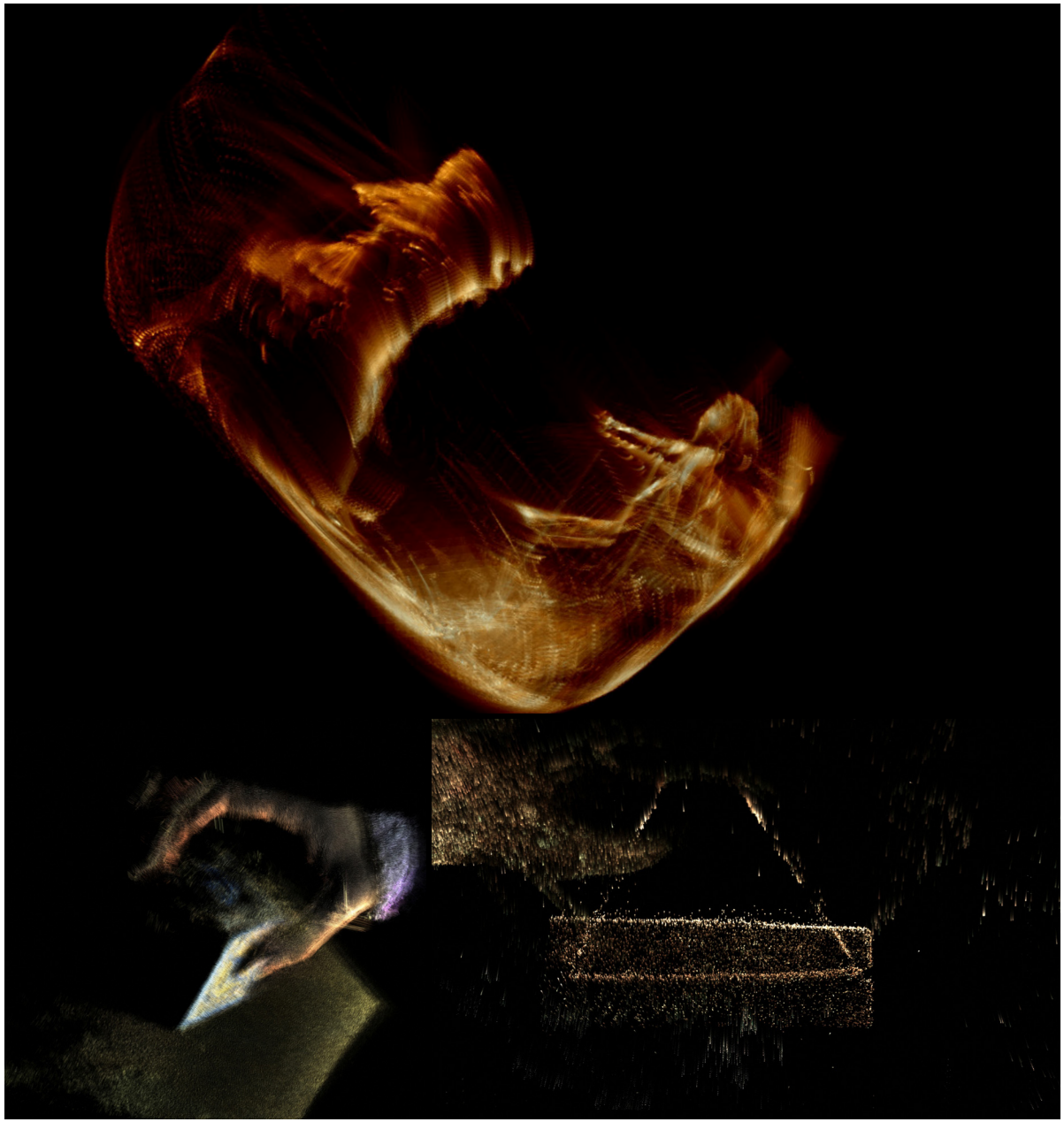
Upending | 2010

Upending takes the form of 3D cinema and has the viewers' eyes probing the projected imagery almost as if touching its light, feeling for the illusory surfaces of things as they cross the threshold from abstraction to likeness.

A drama of disorientation and reorientation, Upending is enacted on both perceptual and thematic levels. Ordinary objects, spaces, and bodies are probed and queried from unfamiliar perspectives, so that viewers become exquisitely aware of their own perceptual processes and of the their minds' continual attempt to spin out meaning from what their eyes take in.

The play of images is accompanied by a new EMPAC-produced recording of Morton Feldman's first String Quartet by the FLUX Quartet that places the listener, literally, in the center of the ensemble, with every sonic gesture articulated across space simultaneously. Through this aural lens, the moving image becomes almost balletic, even as the projected play of light allows the audience to hear Feldman as never before.

Created by Downie, Eshkar, and Kaiser.

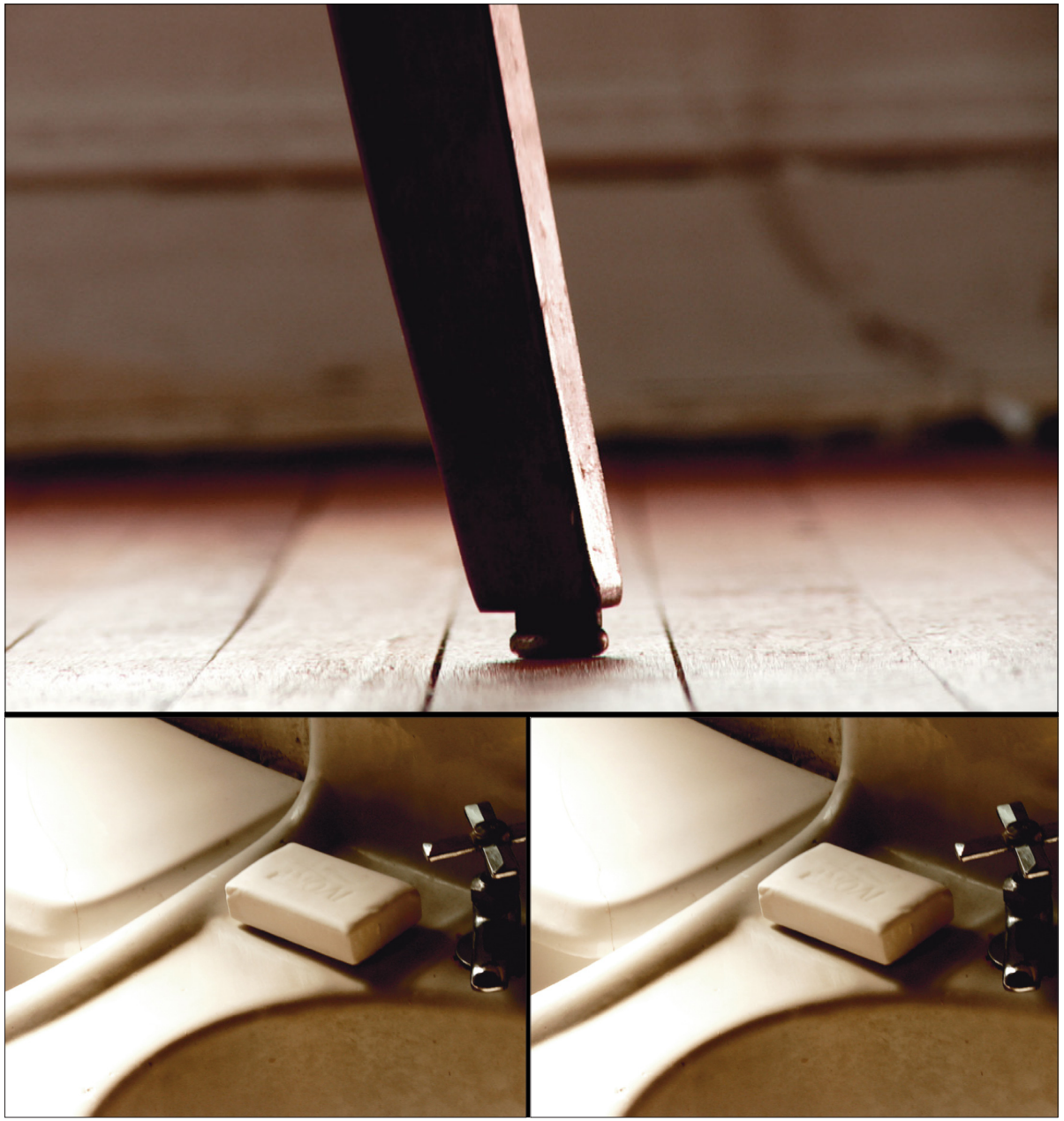


Housebound | 2008

Housebound is a stereoscopic installation that uses motion stabilization and geometry recovery in order to place narrative text into the illusory depth of subjective hand-held camera shots. The stereoscopic depth of *Housebound* is of film-like resolution, shot with paired cameras streaming uncompressed HD video directly to two computers.

Housebound tells the story of a woman trying reconstruct the eccentric thoughts of her deceased lover by "reading" the spaces of his now mostly vacant apartment. We gaze out his windows at the sky and at the bustling streets of upper Manhattan; we inspect his chair, his desk, and his bedframe; we scrutinize a light fixture and outlet, a sink and a stove-top, a drinking glass and a spoon, an intercom and a hallway.

The work was commissioned by Le Fresnoy: Studio des arts contemporains, where it premiered in 2008. It was created by Downie, Eshkar, and Kaiser.



Point A → B | 2007; 2009

This installation's point of departure is the urban sport of parkour, in which the goal is to get from point A to point B as rapidly, as inventively, and often as dangerously as possible. Rather than negotiating real spaces, here our virtual (motion-captured) traceurs encounter a vertiginous world where action, perception, and location are continually overturned. This sensation is heightened for the viewer by the two parallel projections of the piece, which only rarely coalesce into a continuous panorama -- more often they divide the space like a chasm. In addition, both figure and viewer find hard to traverse the space of *Point A → B* since it seems mainly conjectural, as if its design had been left incomplete on the architect's drawing board. The built terrain is under mental construction, the process of which is everywhere evident in generic cubes, wireframe scaffolding, place-holder masses, stock elements, translucent surfaces, and cut-away and cross-section views.

The project was developed with the UK-based parkour group Urban Freeflow. Blue (aka Paul Joseph) was the lead performer for the piece; NY Parkour traceur Exo (aka Exousia Pierce) also performed.

The first version of *Point A → B* premiered at the Centre for Contemporary Arts Glasgow in 2007; in 2009, a significantly transformed site-specific version was created for a space in St. Petersburg, Russia — the Tsarist dungeon of Peter and Paul Island. Created by Downie, Eshkar, and Kaiser.



Breath | 2007

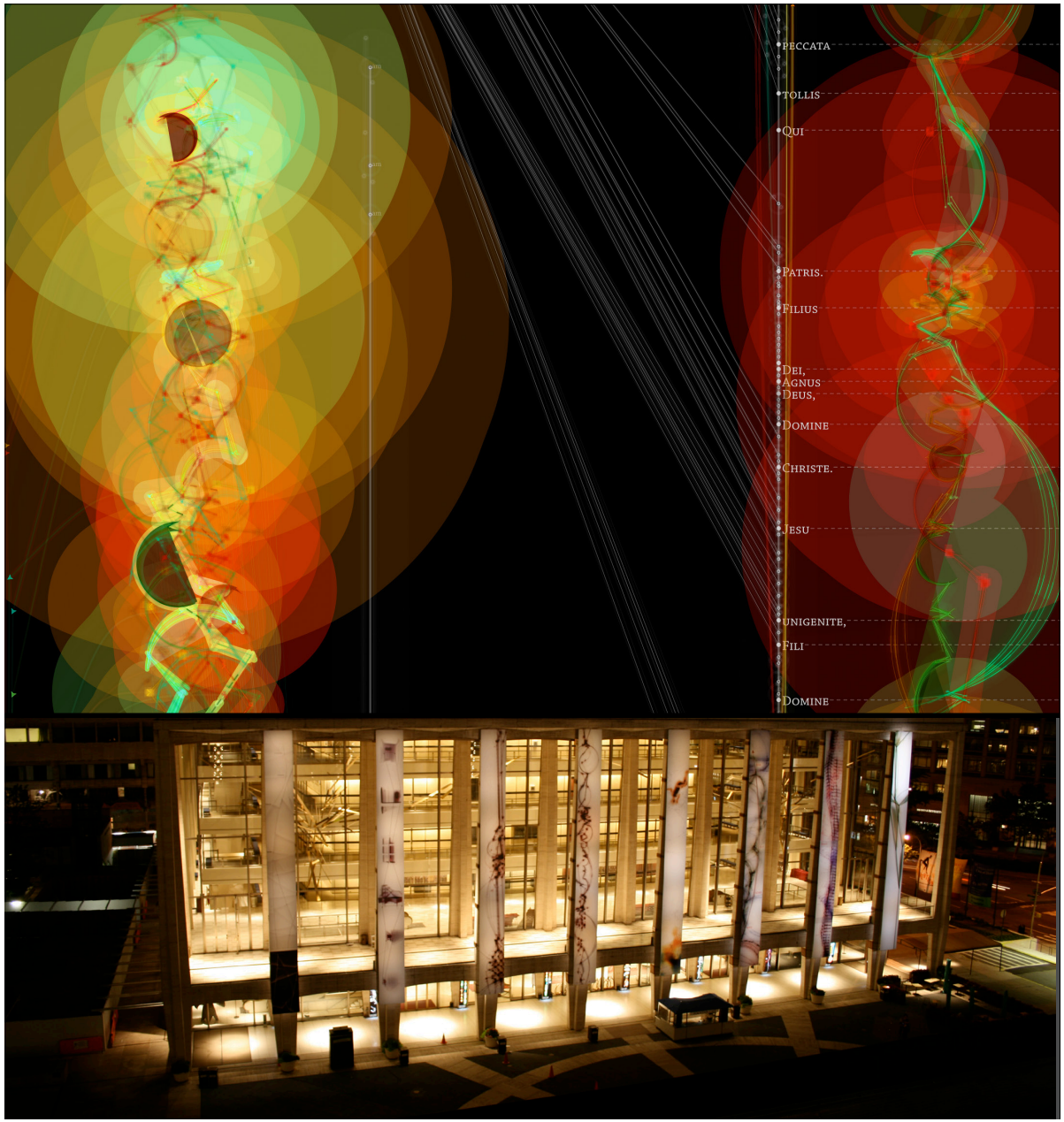
Breath was commissioned by the Mostly Mozart festival of Lincoln Center, where it was installed on the facade and in the colonnade of Avery Fisher Hall.

Illuminating Avery Fisher Hall throughout Lincoln Center's Mostly Mozart festival in 2007, *Breath* created a luminous counterpart for the Festival's focus on spirituality in music. Examining the relationship between the words, metaphors, musical scores, and languages of sacred music, the installation was composed of ten huge banners suspended outdoors. Within the Avery Fisher colonnade, eight light-boxes offered further diagrams of extraordinary intricacy. The imagery of each light-box arose from a computer-assisted analysis of a given subject, finding patterns in information often so dense as to elude manual search.

A new live self-generating musical work ran continuously, reweaving voices so that they would coalesce periodically into the lines of early sacred music.

In the evening, computer-controlled lighting matched the pulsing tempo of this music, as if Avery Fisher Hall were breathing with music, with light, and with contemplation.

Created by Downie and Kaiser.



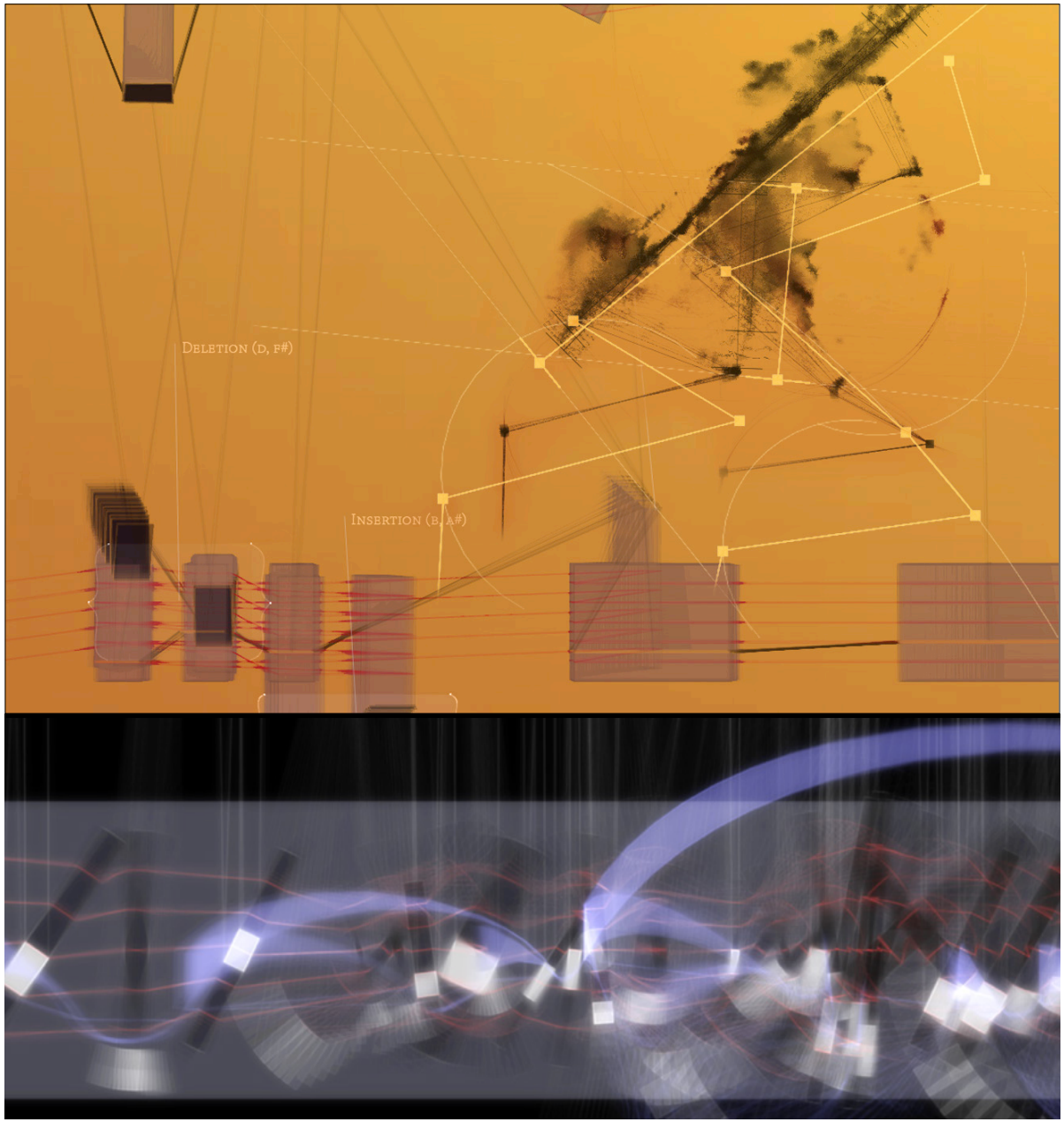
Enlightenment | 2006

Enlightenment was commissioned by the Mostly Mozart Festival of Lincoln Center to commemorate Mozart's 250th birthday. Installed in the colonnade of Avery Fisher Hall, it ran night and day for six weeks. As befitting a performing arts center, the installation was a live performance, with the artwork generating itself in real-time and never repeating.

Enlightenment recasts our view of classical music, looking beyond its stereotypical trappings (quill pen, powdered wig) to examine its underlying processes. It applies Information Age methods – akin to DNA sequencing and data-mining – to make new sense of Mozart, a key figure of the Age of Enlightenment. More precisely, it solved a problem of its own making – to intelligently reconstruct Mozart's most intricate musical structure (the coda to the "Jupiter" symphony) with a minimum of prior musical knowledge.

Enlightenment forged a new kind of interplay between sound and image, one in which the images *think* about how the music is put together – with the effort of that thinking fully visible. This process was marked by means of notational and gestural images, which drew on the score and on video fragments of the musicians playing their parts of the passage. *Enlightenment* generated new diagrams of understanding at each moment of its fleeting existence, simultaneously playing back its ever-closer approximations of the music. This audiovisual search is itself the work of art – our aesthetic response to Mozart.

Created by Downie and Kaiser.



Recovered Light | 2007

Recovered Light was a site-specific public artwork created for the York Minster in England. Projected directly on the scaffolded eastern facade of the cathedral, it acted as a kind of massive virtual x-ray (90' tall), peering through the scaffold at a masterpiece of 15th century stained glass, the Great East Window.

Obscured by scaffolding during a long process of restoration, the Great East Window is the largest work of medieval stained glass and illuminates the sweep of the Bible, from Genesis to Revelation. Vast in scope, its iconography is complex.

Recovered Light "solves" the puzzle of each main stained glass panel by magnifying its key elements and then reassembling them as if they were pieces in a complex jigsaw puzzle, matching the corresponding biblical passage with the given scene. In the process, it brings to light the expressive faces and vivid scenes from the past, many visible for the first time. Since this act of recovery runs live, the reassembly and magnification of a given panel never quite repeats from one cycle to the next.

The artwork does not perform a simple act of visual restoration; rather it performs an intricate act of artistic re-transformation. It is a creative response reaching back across time from the 21st century to the 15th.

The piece ran live for five hours every evening, taking more than seven hours to complete a single cycle of its never-repeating imagery.

Recovered Light is now on permanent display inside the Minster. Created by Downie and Kaiser.



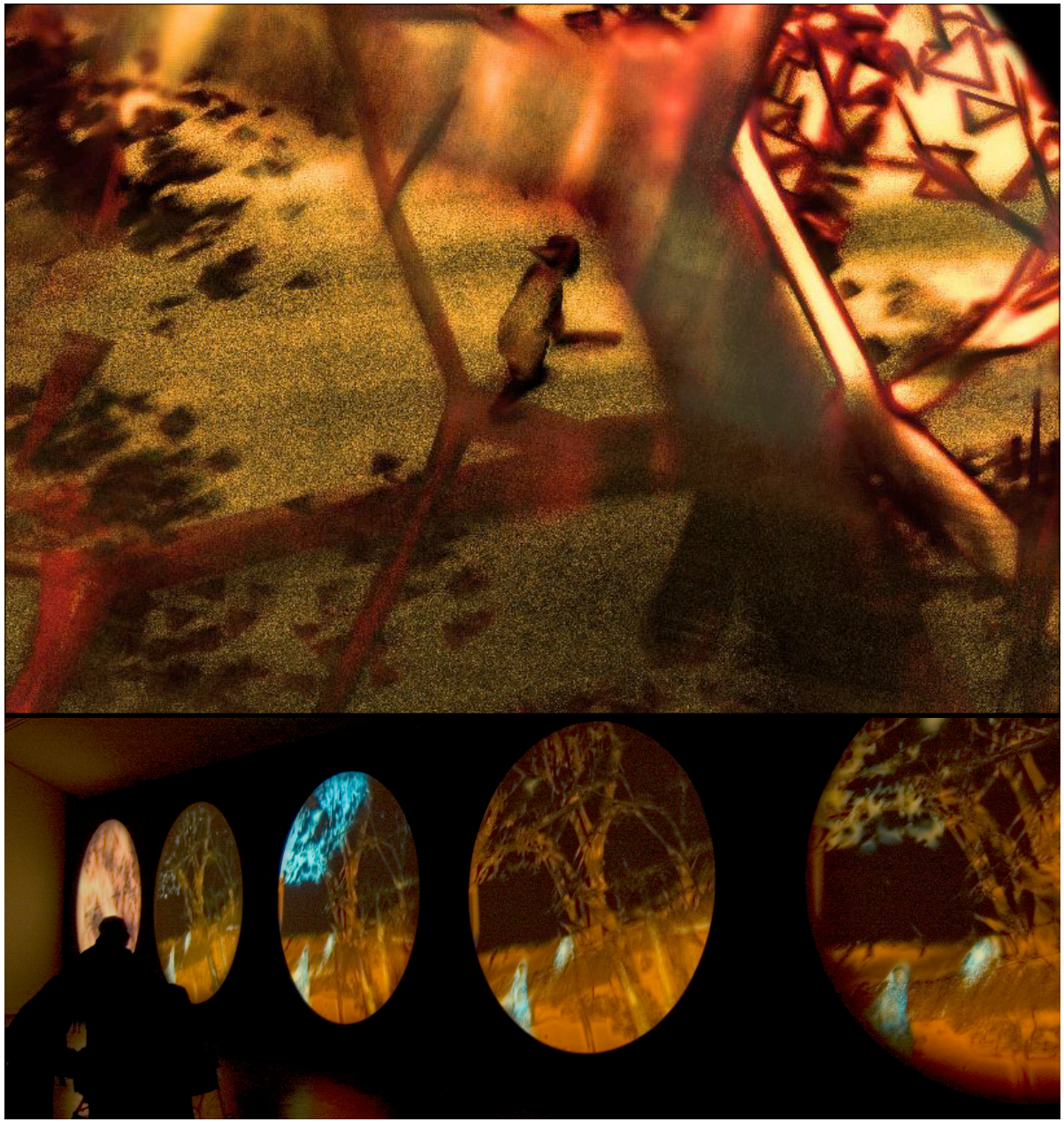
Forest | 2007-8

Forest is a visual enactment of outdoor games played in childhood. In this five-screen live installation, virtual children wander through a forested parkland playing hide-and-seek among the tree-trunks. They swing dizzily on monkey bars, then clamber up among the branches overhead, losing themselves in reverie and then re-encountering each other in the forest. The children's movements are uncannily life-like, for they were drawn from an extensive library of motion-capture data created specifically for *Forest*.

It's not just the children playing in this fashion — for the imagery itself plays similar games across the five circular projections. Each of its portholes looks out on the same forest scene, but these views are in dynamic disequilibrium with each other. One porthole may decide to jump to a different camera angle, for example, and the adjacent views will then struggle to catch up with that new angle. Another porthole may choose to switch its colorations, and again the others may try to shift theirs in the same direction.

The artwork generates itself algorithmically in real-time, so that no frame of the continuous animation ever quite repeats. Its custom renderer plays with all the factors that create each view – camera position, movement, angle, and zoom; scene lighting and shadow; the flow of time; and all the elements of its "visual physics" (which allow it, for example, to conjure up an image out of the propagation of its own grain).

A preliminary version was exhibited at SightSonic in York, UK in 2007; the full version premiered at the Centre for Contemporary Arts Glasgow in 2008.



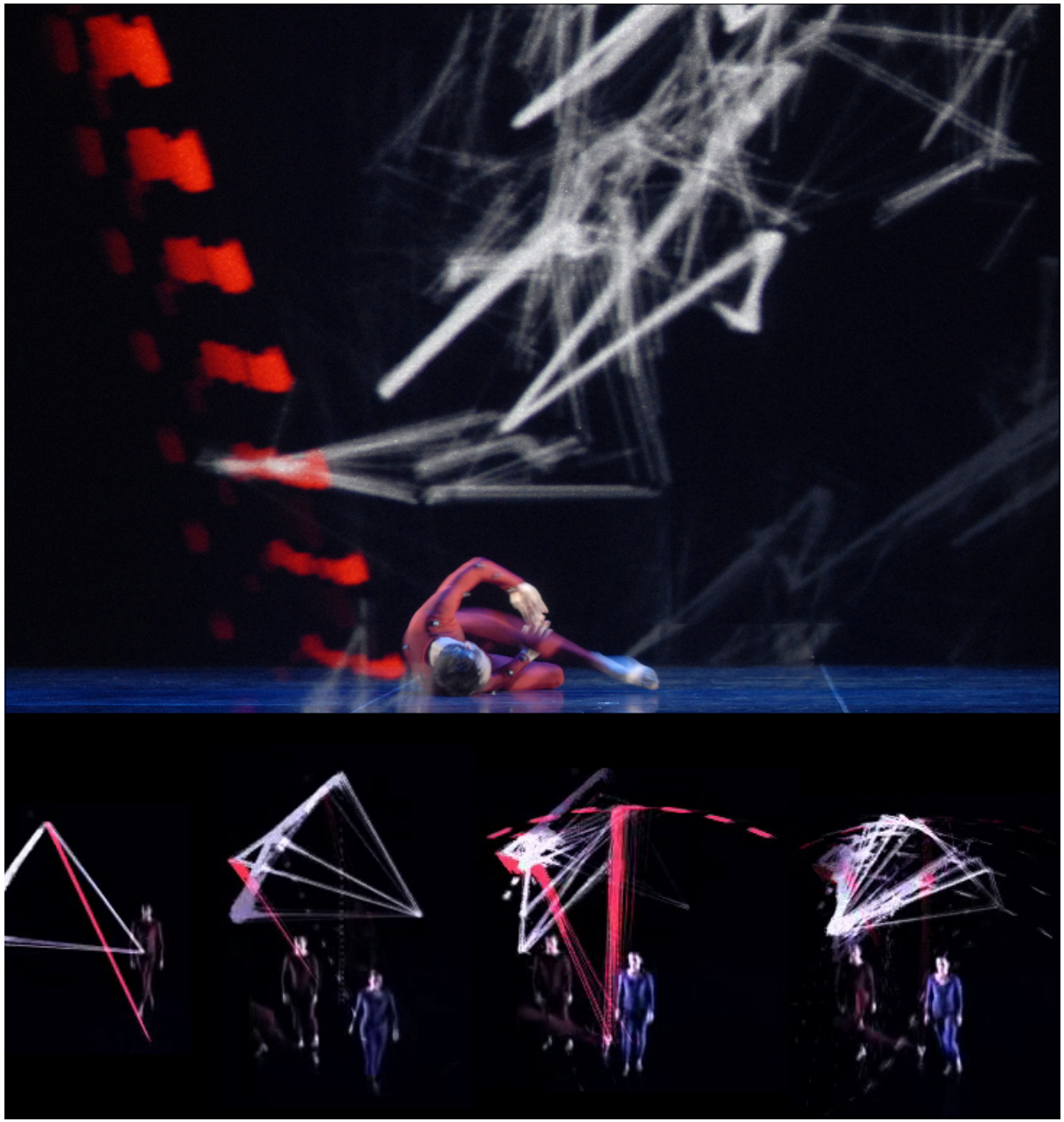
how long... | 2005

how long does the subject linger on the edge of the volume... was a collaboration with renowned choreographer Trisha Brown. In this live dance, our projected imagery responded in real-time to the motion-captured live performance of her dancers on stage.

The projected imagery had a mind of its own, as it were, since an artificial intelligence program determined the exact picture at any given point in time. The code detected patterns and relationships in the choreography as it unfolded, which it then represented in pictures that continually re-adjusted themselves to the dancing.

This presented the audience with a series of unique lenses through which to perceive patterns and structures in the choreography as they unfolded before them on the stage.

The work premiered at Arizona State University before traveling first to Lincoln Center and then to the Monaco Dance Forum in Monte Carlo.



Pedestrian | 2002

Pedestrian is a public artwork that projects its imagery directly down onto a city sidewalk or concrete floor. *Pedestrian*'s digital projection merges with the rough surfaces we walk upon: the tiny denizens we see down there wander through a *trompe l'oeil* illusion in a city that seems to float both upon and within that surface. A virtual camera is placed over this world; from this aerial position, it tracks the activity below and moves across the simulated city. The world of *Pedestrian* is populated entirely by virtual figures animated by motion-capture data, though the naive observer happening upon it in the city may at first take it for live video.

The artwork runs in a seamless 13 minute loop, not telling a single story, but rather suggesting multiple narratives and possibilities. Its audience often guesses at possible story-lines, which sometimes leads spirited discussions between strangers about what it all means. The *Pedestrian* process is not finished until viewers encounter it in public spaces. Their presence around the piece completes its composition and expands its meaning unexpectedly.

Originally conceived in the aftermath of 9/11 as an homage to New York City, *Pedestrian* was first presented outdoors at Rockefeller Center and Harlem's 125th Street and indoors in an underground subway station and at the Eyebeam gallery. On its extensive tour, it's been projected on medieval cobblestone in England and Belgium, on the glistening floor of a bus station in Seoul, and inside a vacant storefront in Boston.

Created by Eshkar and Kaiser.



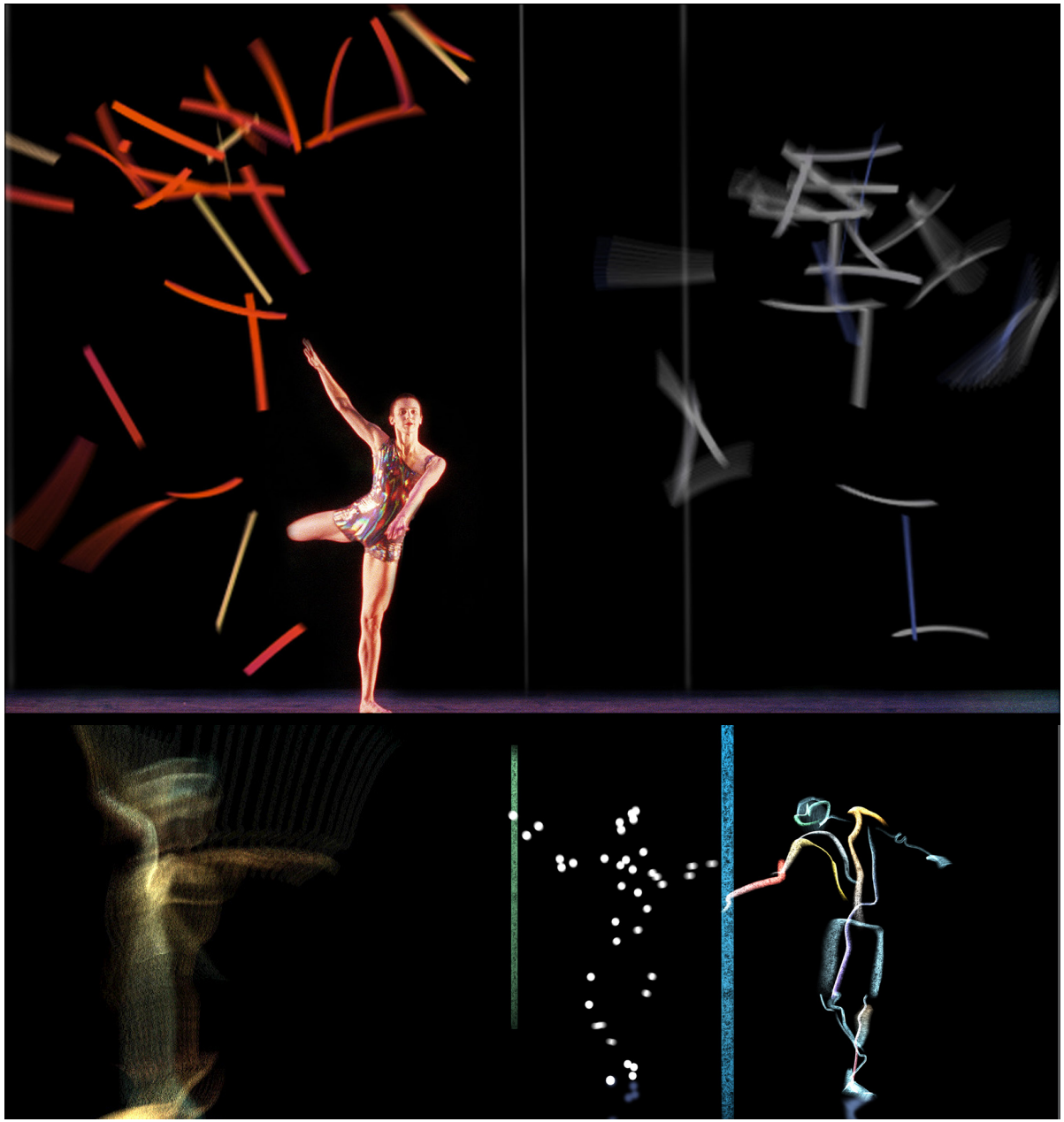
Biped | 1999

Widely acclaimed as a breakthrough in the integration of dance and technology, the *Biped* projections provided an ever-shifting visual decor for Merce Cunningham's dance of the same name. In performance, the imagery is projected on a huge transparent scrim covering the front of a large proscenium stage, giving the illusion of 3D as it floats in front of and seemingly *among* the live dancers behind it.

The projected movements are largely derived from motion-captured phrases from the choreography, which drive abstracted images of hand-drawn dancers moving through spare and evocative spaces. The sequences of animation, which vary from 10 seconds to 4 minutes, total 27 minutes; they run discontinuously through the performance.

Biped is the most widely seen of any Merce Cunningham dance; it has been performed numerous times throughout the world and was in Cunningham's active repertory from the time of its creation to the time of his death ten years later.

Created by Eshkar and Kaiser.



Ghostcatching | 1999

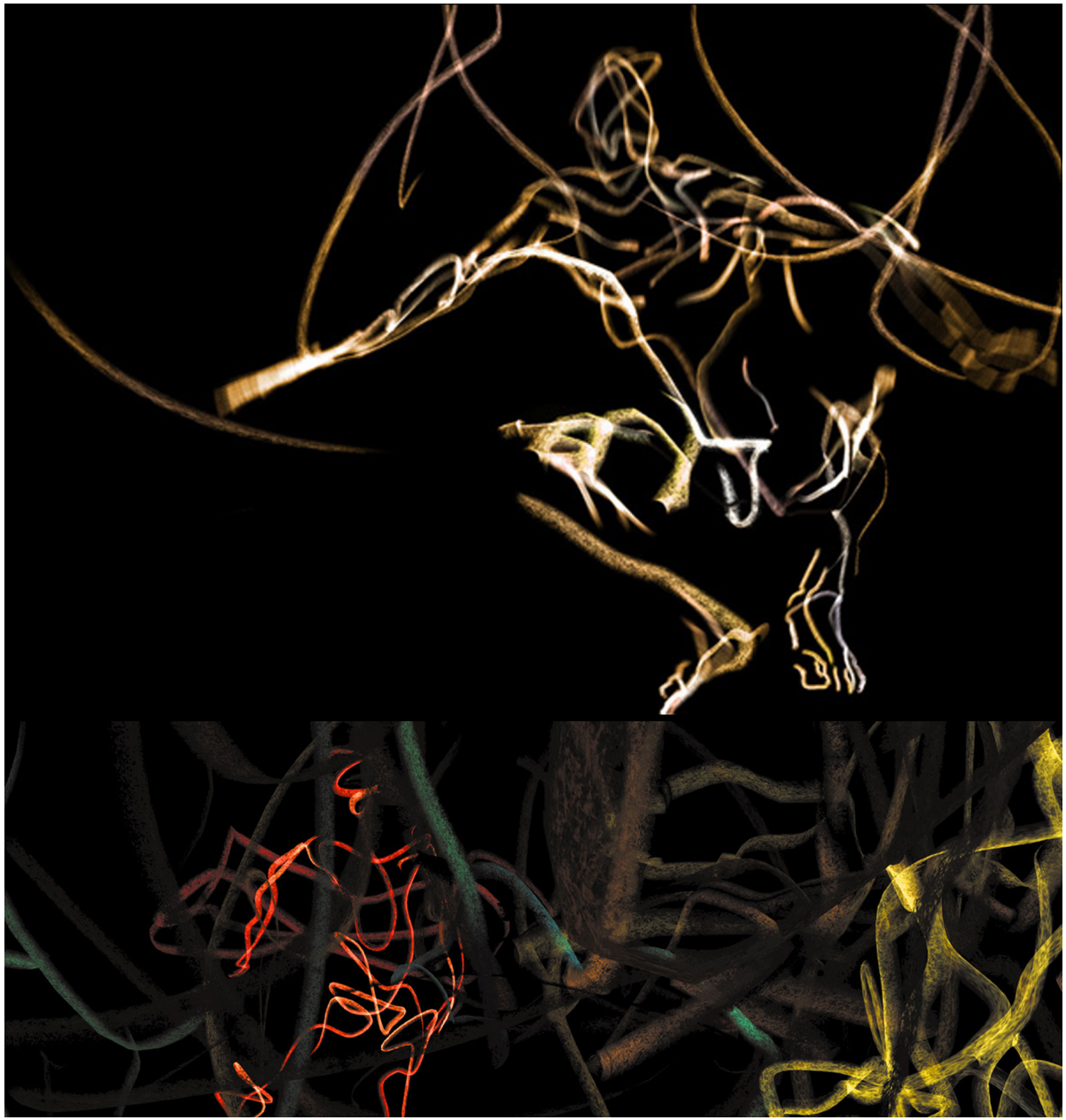
Ghostcatching is a digital art installation that fuses dance, drawing, and computer composition. Based on the motion-captured dance phrases of choreographer Bill T. Jones, the work is a meditation on the act of being captured and of breaking free.

Captured dance phrases are the building blocks for the virtual composition. As data, the phrases can be edited, re-choreographed, and staged for a digital performance in the 3D space of the computer.

Here, the body of Bill T. Jones is multiplied into many dancers, who perform as three-dimensional drawings. Their anatomies are intertwinings of drawn strokes, which are in fact painstakingly modeled as geometry on the computer — never drawn on paper.

Originally commissioned by The Cooper Union for the Advancement of Science and Art, which premiered the work, *Ghostcatching* has been exhibited in many subsequent venues and has garnered considerable attention both in journalism and in dance scholarship.

Created by Eshkar and Kaiser.



Hand-drawn Spaces | 1998

Hand-drawn Spaces is a virtual dance installation that presents a mental landscape in which motion-captured hand-drawn figures perform intricate choreography in 3D.

Commissioned by SIGGRAPH as a massive 3-screen projection, it was created in collaboration with the legendary choreographer Merce Cunningham, who devised its movements.

The virtual dancers appear as life-size drawings emerging from the darkness and moving in an apparently limitless three-dimensional space. Though the dancers are visible on three screens, they move through a much larger virtual area, and so travel in and out of the projected image, often traversing the spectators' space.

The spatial sound-score by Ron Kuivila evokes the virtual dancers' positions in space, making their presences felt even when not seen.

Designated a "masterwork" by the National Foundation of the Arts in 1999, it was restored at higher resolution and with a new surround soundtrack.

A smaller gallery version was exhibited at the Wexner Center for the Arts, the Barbican Centre, and many other venues.

Created by Eshkar and Kaiser.

