Corpus Corvus: Stereoscopic 3D Mixed Reality Performance

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Abstract

Corpus Corvus is an experimental mixed reality performance artwork that utilizes stereoscopic projection, motion capture animation, an integrated physical/media choreographic vocabulary, and electroacoustic composition to explore the Pacific Northwest Native American myth of the raven as god and thief who steals the sun and creates the universe. The title Corpus Corvus refers to the body of the raven. The piece traverses the environment of the Corpus Corvus through dilations into ten corporeal dimensions: formation, throat, wing, eye, claw, belly, brain, heart, spine, dissolution. Each of these segments articulates an integrated three-dimensional kinesthetic-audio-visual composition.

Formally, the piece explores the relationship between movement of a physical body and stereoscopic animation in a physical/digital three-dimensional image field. The animation is generated from motion capture data and kinesthetic media composition processes based on physical choreography. Through precise temporal alignment and stereoscopic theatrical effect, the projected animation is perceived to surround the performing body in physical space.

The art/research process informing and contextualizing Corpus Corvus is a practice-based exploration and discovery of an emerging theatrical poetics. The premise for this poetics is an expansion of the body that extends the human sensory system into immersive media perceptual hyperspaces. Corpus Corvus probes this premise through four primary research trajectories that constitute the technical and artistic foundations for the artwork:

• Mixed Reality Performance
• Contemporary Mythos
• Expanded Embodiment
• Immersive Media Composition

This document illuminates the process of research, manifestation, and discovery within each of the four trajectories. The approach reflects DXARTS art/research methodologies, building upon the integral idea that new form emerges from excavations into deep historical bedrock in tandem with technological innovation and forward-thrusting probes. Accordingly, elements of form and technical processes integral to the construction of Corpus Corvus are contextualized by the historical root systems that support and inform the creation of the work.
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- 3D Documentation Video (DVD 2)
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I. Narrative Overview

*Corpus Corvus* is an experimental mixed reality performance artwork that utilizes stereoscopic projection, motion capture animation, an integrated physical/media choreographic vocabulary, and electroacoustic composition to explore the Pacific Northwest Native American myth of the raven as god and thief who steals the sun and creates the universe. Excavating historical foundations of performance as myth, formally instantiated in the ancient Greek theater and reinvented throughout history, *Corpus Corvus* extends the integral premise of performative mythos into an immersive media performance technology framework.

The title *Corpus Corvus* refers to the body of the raven. The piece traverses the environment of the *Corpus Corvus* through dilations into ten corporeal dimensions: formation, throat, wing, eye, claw, belly, brain, heart, spine, dissolution. Each of these segments articulates a densely integrated three-dimensional kinesthetic-audio-visual composition.

Formally, the piece explores the relationship between movement of a physical body and stereoscopic animation in a physical/digital three-dimensional image field. The animation is generated from motion capture data and kinesthetic media composition processes based on physical choreography. Through precise temporal alignment and stereoscopic theatrical effect, the projected animation is perceived to surround the performing body in physical space. This physical-virtual dance is informed by principles of constructal/flow theory, and completed by a sound score based upon ravens’ vocalizations abstracted through human imitation and technological processing.

The totality of the performance/technology infrastructure is conceived as an extension of the human nervous system, an expansion of the spine – the epicenter of sensation. The sensate body of the *Corpus Corvus* loops from the wholly kinesthetic spine of the performer-as-animal through its extended digital peripheries. This pulsation is the lifeforce of the *Corpus Corvus*, and reaches toward an integrated continuum of sensate embodiment that extends from the animalic to the immaterial.

The work is performed by a solo dancer. Duration is 16:30. The performance space consists of a 9’ diameter circular scrim with stereoscopic projection, theatrical lighting, and stereo sound.
Corpus Corvus premiered in Seattle, Washington, USA, at the Fremont Abbey Arts Center on February 5, 2011.

Production Credits

Concept & Direction: Heather Raikes
Stereoscopic Animation: Heather Raikes
Choreography: Heather Raikes
Sound: Richard Johnson Logan-Greene
Lighting: Peter Bracilano
Set: Heather Raikes & James Ryan/Tandem Fabrications
Costume: Heather Raikes
Live Dance Performance: Julie Funk
Movement Research: Julie Funk, Eric Geiger, Heather Raikes
Performance for Motion Capture: Eric Geiger
Technical Coordination: Mike McCrea
Technical Crew: Martin Jarmick, Sam Potter, Derek Edamura

Produced with generous support from:

DXARTS: Center for Digital Arts and Experimental Media, University of Washington

University of Washington Dance Program

University of Washington School of Music

Motion Capture Laboratory, Department of Computer Science and Engineering, University of Washington

John M. Marzluff, Denman Professor of Sustainable Resource Sciences and Professor of Wildlife Science, College of Forest Resources, University of Washington

Performative Computing Laboratory, Center for Research in Computing & the Arts (CRCA), University of California San Diego

University of California San Diego Department of Theatre & Dance

DepthQ Stereoscopic/Lightspeed Design, Inc.
II. Context for Research

Throughout history, the evolution of performance has been catalyzed by macrocosmic conceptions, theories and systems of the theater. Relevant examples include Aristotle’s *Poetics*, Richard Wagner’s *Gesamtkunstwerk*, Antonin Artaud’s *Theater of Cruelty*, Jerzy Grotowski’s *Poor Theater*, the futurist *Synthetic Theater*, the Bauhaus *Total Theatre*, the *Dialectical Theater* of Bertolt Brecht, Erick Hawkins’ *Theater of Perception*, Richard Schechner’s *Environmental Theater*, as well as countless other systems of performative inquiry that may or may not have codified names. As theater is fundamentally a medium of synthesis that contains and orchestrates a vast number of sensory elements and dynamic possibilities, there is a deep logic to the development of a poetic system that defines parameters for theatrical exploration, organizes the process of composition, and ultimately produces both works of art and a historically transformative theatrical aesthetic.

*Corpus Corvus* is practice-based exploration and discovery of an emerging theatrical poetics. The premise for this poetics is an expansion of the body that extends the human sensory system into immersive media perceptual hyperspaces. *Corpus Corvus* probes this premise through four primary research trajectories that constitute the technical and artistic foundations for the artwork:

- Mixed Reality Performance
- Contemporary Mythos
- Expanded Embodiment
- Immersive Media Composition

This document illuminates the process of research, manifestation, and poetic discovery within each of the four trajectories. The approach reflects DXARTS art/research methodologies, building upon the integral idea that new form emerges from excavations into deep historical bedrock in tandem with technological innovation and forward-thrusting probes. Accordingly, elements of form and technical processes integral to the construction of *Corpus Corvus* are contextualized by the historical root systems that support and inform the creation of the work.

The emerging theatrical poetics is, arguably, a whole greater than the sum of its parts, and something that can only be fully expressed in the experience of the artwork. Nonetheless, the documentation of the *Corpus Corvus* represented here provides a comprehensive account of its process of becoming – with the intention of evoking an understanding of its poetics.
III. Research Trajectory: Mixed Reality Performance

“... a human being struggles in space. The theatre is the art of the human being in space.”
– Jean-Louis Barrault

*Corpus Corvus* utilizes a novel mixed reality performance environment that merges stereoscopic depth space with physical depth space, constructing the illusion that the performing body is immersed within a three-dimensional media projection. The artistic intent driving this research pursues new, kinesthetic experiences in perceptual immersion; an evolution of theatrical form; hybridized, symbiotic exchange between the physical body and its technological extensions; and a vital framework for the exploration of 21st century mythos. The discovery and development of *Corpus Corvus*’ mixed reality performance environment is integral to both its genesis and construction, and draws upon historical artworks and ideas that have pioneered sensory immersion in live performance over the past 150 years.

*Gesamtkunstwerk (1849)*

A dominant root node for the research informing *Corpus Corvus* is the archetypal idea of the *Gesamtkunstwerk*, or "total artwork," as articulated in Richard Wagner's 1849 essay *The Artwork of the Future*. Wagner posits an approach to composing theater that unifies the senses in a total, fundamentally immersive perceptual experience. He regards the theater as an instrument for synthesis, capable of containing and integrating the sensorial stimuli of other discrete art forms. Moreover, Wagner's expression of his aesthetic ideal for the *Gesamtkunstwerk* is essentially mythic – both in the intensity and totality of perceptual experience, and in his specification that the artwork should be a profound expression of a folk legend transcending its provincial specificity to resonate as a universal humanist fable.

The premise of Wagner's *Gesamtkunstwerk* permeates the totality of *Corpus Corvus*’ aesthetic and compositional framework. *Corpus Corvus* addresses the 21st century theater as a canvas for the integration of material and immaterial form through an approach to immersion that is simultaneously theatrical and perceptual. That is, the performing body is immersed formally and compositionally within a stereoscopic projection accompanied by a precisely orchestrated sound score, while the audience is immersed within the 3D spectacle of a mixed reality performance myth.
**Futurist Performance (1909-1924)**

While the *Gesamtkunstwerk* informs the gestalt of *Corpus Corvus*’ foundations, Futurist performance is the dominant historical root node informing the creation of its mixed reality performance infrastructure. Beyond performances, the Futurists envisioned and often created *theaters* – extreme, self-contained architectural syntheses of body and machine that functioned as total frameworks for the exploration of their aesthetic ideas. Specific examples include the *Magnetic Theatre*, a huge robotic stage machine whose shifts in space and mass were to be the central action of the drama; the *Circular Total Theatre*, a theatrical system consisting of twelve round stages and a suspended apparatus that dramatized the sun and moon; and the *Electric-Vibrating-Luminous Theatre*, a large screen that filled the entire back of the proscenium and acted out light dramas with the thousands of colored lights that composed it.

Synchronous with Futurist movements in visual art and music, Futurist performance artists were aggressively modern and nearly fanatical in their embrace of technology. Although actual documentation of their performances is largely unavailable, they produced manifestoes, scripts, sketches, and diagrams that evoke a vision of the theater in which body and machine merge in pursuit of new dimensions of theatrical experience.

![Figure 1: Enrico Prampolini, Sketch for *Merchant of Hearts*, 1927.](image-url)
The writings of Enrico Prampolini in his Futurist Scenography Manifestoes are of particular import to *Corpus Corvus*. He states:

“...The stage will no longer be a colored backdrop but a colorless electromechanical architecture, powerfully vitalized by chromatic emanations from a luminous source... From these will arise vacant abandonments, exultant, luminous corporealities... Instead of the illuminated stage, let’s create the illuminating stage: luminous expression that will irradiate the colors demanded by the theatrical action with all its emotional power... In the totally realizable epoch of Futurism we shall see the luminous dynamic architectures of the stage emanate from chromatic incandescences that, climbing tragically or showing themselves voluptuously, will inevitably arouse new sensations and emotional values in the spectator.”

– Enrico Prampolini, Futurist Scenography Manifesto (1915)

![Figure 2: Enrico Prampolini, Sketch for *The Plastic God*, 1924.](image)
**Bauhaus Total Theatre (1924-1932)**

The Bauhaus Total Theatre and its leading artists Walter Gropius, Oskar Schlemmer, and Laszlo Moholy-Nagy created a laboratory for the development of a theatrical poetics based upon the aesthetic principles of the Bauhaus movement. Evolving the pursuit of a total artwork, Gropius designed an architecture for the Total Theatre that included movable structures, cinema screens, and a spherical form, which he believed enhanced the sense of immersion within the presentation of the spectacle. He said of his design:

> “An audience will shake off its inertia when it experiences the surprise effect of space transformed. By shifting the scene of action during the performance from one stage position to another and by using a system of spotlights and film projectors, the whole house would be animated by three-dimensional means instead of the ‘flat’ picture effect of the customary stage.”

– Walter Gropius

The Total Theatre assumed a unification of art and technology, and conducted artistic explorations revolving around distillation and synthesis of the theater’s “primary elements:” space, form, motion, sound and light. Oskar Schlemmer, who held the title Master of Form at the Bauhaus Total Theatre workshop, created extensive and pioneering work revolving around abstracting and transforming the figure in space. His most influential work is the 1922 “Triadisches Ballett,” in which performing bodies are hybridized and transformed into abstract geometric shapes.
Another substantial artwork to arise from the Bauhaus workshop was Laszlo Moholy-Nagy’s *Light-Space Modulator* (1922-1930). Originally designed and conceived to present plays of light and manifestations of movement in the theater, the *Light-Space Modulator* further abstracted and redefined theatrical playing space, positing light itself as a dynamic agent of theatrical form.  

*Laterna Magika* (1958-Present)  

Continuing to evolve this trajectory of experimentation and discovery into the mid and late 20th century, Czech theater artists Laterna Magika pioneered a non-verbal performative synthesis of film, theater, and dance that they referred to as “multi-genre” performance.  

Scenographer Josef Svoboda described their aesthetic:

> "The play of the actors cannot exist without the film, and vice versa – they become one thing. One is not the background for the other; instead you have simultaneity, a synthesis and fusion of actors and projection."  

– Josef Svoboda (1958)
These early visions resonate deeply in the concept and manifestation of Corpus Corvus’ performance environment, and in the compositional integration of its material and immaterial aspects. Body and machine are in continuous, evolving, symbiotic conversation. The ensuing theatricality situates the work in a liminal zone between media performance and live stereoscopic cinema – in any case, actualizing dimensions of theatrical experience that these early 20th century artists gestured toward.

Recent Historical Predecessors & Influential Contemporaries

A diverse array of late 20th century and early 21st century artists provide influential research foundations for the development of Corpus Corvus’ mixed reality performance infrastructure. As performance is live art, these relatively recent works have had a strong impact because of the opportunity to directly experience their theatrical poetics.

Prior to the cultural inception of digital media, The Wooster Group’s mixed media performance projects created a fascinating theatricality that distributed and extended the expression of human presence throughout a mixed physical/technological performance environment. Comparably, Laurie Anderson’s multimedia performances introduced a new experience of the performing body amplified and morphed by media extensions, and situated the human voice within a brave new world of technological immateriality. And, Richard Schechner’s environmental theater practices with The Performance Group forged new approaches for ambient, immersive theatrical composition.

As digital technology began to transform contemporary performance, George Coates Performance Works pioneered bold experiments in immersion, bringing VR technologies to the stage. The Builders Association, descendant cognates of the The Wooster group, created sweeping spectacles of augmented reality theater using intricate projected scrim animation in conjunction with modular, telematic narratives. Robert LePage and his Montreal-based company Ex Machina achieved virtuosic form in mixed reality performance through a refined directorial voice that weaves swiftly, elaborately, and seamlessly through the physical and virtual dimensions of his theatrical canvases.

Concurrent with these developments in digital performance, Char Davies created immersive installations Osmose and Ephemere that continue to hold a standard with respect to embodied experience and immersive media. Tamiko Thiel constructed mythic, theatrical narratives within virtual environments. And Toni Dove’s installation/performance work articulated hybridized spaces of live cinematic performance.
Art/Research Practice Foundations

Corpus Corvus’ mixed reality performance environment also culminates a trajectory of exploration within my own art/research practice. Since 1992, I have been working with the integration of media and performance, continuously probing deeper levels of perceptual immersion and symbiosis between body and technology. Hamletmachine (1992) utilized a site-specific media performance environment consisting of stacks of stored furniture props, two rolling television monitors with VCRs, three boom boxes, a microphone, and slide projector. Still Point (1995) brought the audience into a room full of semi-transparent mirrors. A beam of light served as a touchable switch to trigger video projection from laserdisc that reflected between the mirrored surfaces, accompanied by animation on two computer monitors and a stereo sound collage. Lepidoptera (1996) synthesized abstract narrative dance performance with video projection onto geometric surfaces, animation on suspended monitors, and stereo sound collage. Sine (1999) brought evening-length video projection into the proscenium theater. Although the projection was a flat surface upstage of the dancers, the choreography was developed in conjunction with the “kinesthetic video,” and the media elements were compositionally approached as strands of a braid that seamlessly wove video, movement, and sound. cosine (2001) was a bold experiment in immersive media performance. The proscenium was shattered by a mobile media/architecture performance environment that dynamically shifted throughout the performance, radically changing the structures and surfaces that defined the playing space. Dancers moved throughout the structures, and the dynamic surfaces were illuminated with projected animation and video from four directional sources. The audience was invited to change position as they wished, and a 32-layer sound collage spiraled spatially around them through eight speakers. The Wave (2003) penetrated the screen boundary as a solo performer interfaced with abstract digital video avatars that appeared in ambient circular projection pools evocative of the sea and sky. flower (2005) had its epicenter inside the screen. Its primary form was a videodance, and two different performance adaptations were extracted from it and performed in conjunction with it. futuRasa (2007), a performance installation that consisted of a performer painted white standing directly in front of an 8’x3’ projection surface, achieved a substantial symbiosis between body and projection as 3D animation constructed with physical gesture animation techniques merged seamlessly with physical choreography to construct a hybrid form of physical-virtual embodiment. Finally, Purnachandra Raktva (2008) provided the formal groundwork for Corpus Corvus with the discovery of stereoscopic projection in a theatrical context. This collaborative group dance piece broke new ground in merging stereoscopy and theatrical depth space, and served as valuable experimentation with respect to compositional and technical strategies for stereoscopic performance.
Elements of Form & Technical Processes

Corpus Corvus Mixed Reality Performance Infrastructure

In its February 5, 2011 premiere, Corpus Corvus’ mixed reality performance environment utilized a Christie Mirage HD6 stereo projector illuminating a 9’ diameter circular scrim on a freestanding frame designed by Heather Raikes and James Ryan/Tandem Fabrications. Stereoscopic animation run by DepthQ software was projected onto the semi-transparent scrim surface with parallax constructed such that the animation largely appeared situated behind, or upstage of, the screen. Theatrical lighting by Peter Bracilano illuminated the body conjointly with animation. The audience wore LCD shutter glasses synced to an infrared emitter, enabling digital stereoscopic vision. The sound system consisted of two Meyer UPM-1P full-range loudspeakers, a Meyer UMS-1P subwoofer, a Soundcraft MFXi 8 mixer, and SuperCollider software.

Figure 5: Diagram of Corpus Corvus Mixed Reality Performance Infrastructure, 2011.
Stereoscopy

Digital stereoscopy is the central element of Corpus Corvus’ mixed reality performance environment. Stereoscopy is a broad term that includes any technique in which three-dimensional information is recorded and presented via a two-dimensional format. Stereoscopy is based upon stereopsis, which refers to binocular stereoscopic vision in humans and apes. Stereoscopic vision produces the perception of depth as the brain processes and synthesizes the slightly varied data gathered by the left and right eye, which are, on average, separated by 65mm. There are a host of different techniques that fall under the umbrella term stereoscopy, but the field has experienced a recent renaissance due to the emergence of digital stereoscopy. Corpus Corvus utilizes a digital 3D active stereo projector, the Christie Mirage HD6, and Liquid Crystal Display (LCD) shutter glasses. The Christie Mirage HD6 uses 3chip Digital Light Processing (DLP) technology to display an interleaved stream of left and right images at 120 frames per second. It projects at 6,000 lumens with 1.0kW CERMAX Xenon illumination technology. The LCD shutter glasses are IR synced with this stream and block images such that the right eye only sees the right image and the left eye sees only the left.

Application of stereoscopy to live performance was a natural experiment. Creating theater is a process of composing in three-dimensional depth space. Superimposition and integration of a three-dimensional visual media layer in the physical playing space was a compelling invitation, and the premise for the mixed reality performance environment that ensued.

Figure 6: Sketch of Stereoscopic Theatrical Composition.
Parallax

A technical principle essential to successfully achieving the synthesis of stereoscopic depth space and physical depth space in the Corpus Corvus mixed reality performance environment is stereoscopic parallax. The basis for stereoscopic parallax is binocular convergence. When viewing a real world object, the axes of the eyes rotate such that the eyes meet at the desired location. This phenomenon is called convergence. In binocular vision, the angle of convergence is variable and determined by the distance between the eyes and the object. When viewing a very distant object, such as the moon, the axes of the eyes are essentially at parallel parallax and the object appears at a nearly infinite distance due to the extremely small angle of convergence. Conversely, a near object produces a very large angle of convergence between the eyes.

Stereoscopic images must produce an artificial disparity in the eyes in order to for the brain to perceive an image at a particular point in depth space. This is achieved by producing a parallax. There are four or more different types of parallax that are commonly discussed in stereoscopy. Corpus Corvus uses two: zero parallax and positive parallax. Zero parallax refers to a situation in which the eyes converge on the plane of the screen, as is the case when viewing a real world object. In a stereoscopic image, zero parallax produces the perception that the image is formed on the plane of the projection surface. Positive parallax occurs when the axes of the eyes converge at an angle between zero parallax and parallel parallax, and produces the perception that the stereoscopic image is behind the screen surface. In order to construct the illusion that the stereoscopic animation and the physical body are occupying the same depth space, Corpus Corvus uses zero parallax and positive parallax so that the animation is perceived to dynamically hover around the plane of the screen and converge with the body upstage of the screen.

![Parallax Diagram](image)

Figure 7: Parallax Diagram.
Set Design

The physical/virtual three-dimensional image achieved in Corpus Corvus requires the stereoscopic animation to be projected onto a semi-transparent theatrical scrim surface. The 9’ diameter circular scrim was contained within a free-standing metal frame created in collaboration with James Ryan/Tandem Fabrications. The metal forms that comprise the frame base are abstract echoes of ravens’ feet and wings; and the jagged, imperfect curvilinear momentum paths revealed in the motion capture data of Corpus Corvus’ choreography. The construction process, executed by James Ryan, involved heating, twisting, and coating metal for the tangled black tendrils, and fabricating sleeves that would attach the metal forms in a structurally solvent manner to the bottom of the ring.

Six tendrils provide the support required to mount the ring vertically. The remaining forms are loose. The circular scrim frame is a recycled set element from The Wave (2003). The scrim, a standard piece of white sharkstooth theatrical scrim cloth, is cut and finished to the form a 9’ diameter circle, and attaches to the back of the circular frame via industrial strength velcro.

Figure 8: James Ryan/Tandem Fabrications constructing metal forms for Corpus Corvus set, 2010. Photo by Heather Raikes.
Figure 9: *Corpus Corvus* Set Detail, 2011. Photo by Julia Bruk.

Figure 10: *Corpus Corvus* Set, 2011.
Lighting

Within Corpus Corvus’ mixed reality performance environment, lighting is a key theatrical composition tool that illuminates the body upstage of the scrim and the projected stereoscopic animation in balanced symbiosis. Lighting for the Corpus Corvus premiere utilized an ETC ELEMENT light board, six ETC Source Four 50° 575w instruments, and two LMI 4 channel dimmers. Light cues were written with intricate temporal precision to illuminate the body in sync with the animation. Because the Fremont Abbey is not a traditional theater, and due to the unique lighting parameters presented by use of stereoscopic projection throughout the piece, side lighting was used exclusively. This created an interplay of shadows and forms on the walls of the space, which brought another dimension into the work. A lighting score composed by Heather Raikes served as the starting point for lighting design, which was actualized in technical rehearsals by Peter Bracilano.

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Aesthetic approaches to lighting included subtle, symbiotic illumination of the body in relation to the scrim projection; shifts in lighting that paralleled and amplified progressions and patterns in the composition, and use of texture and shadow via side lighting.

Figure 11: *Corpus Corvus* Lighting Design, 2011. Photo by Julia Bruk.

Figure 12: *Corpus Corvus* Lighting Design, 2011. Photo by Julia Bruk.
Costume design for *Corpus Corvus* took a stark, utilitarian approach to creating a hybrid physical form that spans a continuum from the animalic to the immaterial, evoking bird raven, mythic raven, human physique, and abstract immaterial embodiment. It is also loosely influenced by Futurist and Bauhaus aesthetics, and by Merce Cunningham’s Dance *Beach Birds for Camera*. The largely nude colored bodice both echoes human skin and dynamically reflects the animation projected onto it. Black skull cap, arm bands, and leg bands are symbolic gestures of the raven’s extremities, and embellish the fierce, mischievous character of raven as thief who steals the sun and creates the universe.

![Figure 13: Corpus Corvus Costume, 2011. Photo by Julia Bruk.](image-url)
IV. Research Trajectory: Contemporary Mythos

“The great function of theatre is to present the myth... The enactment of the myth is the rite, the doing of the myth, the dromenon, the drama.

To quote the poet Louise Bogan: ‘It is the rite which enables the individual to participate in the myth. The myth can be lived only through the rite.’ Whatever the historical state of development of the theatre in America today, to go too far from its origin – the dancing place where the rite is performed – is to forego its greatest power.

Exactly what form the myth and its theatrical embodiment, the rite, will take in our theatre, I wouldn’t presume to say. But by our psychological constitution, men need symbols of integration in the inner drama today more than ever. The artists’ job is to find those symbols for use, just as the physicist, the statesman, the economist, the psychiatrist serve their function in serving their fellows. The need must be recognized and the challenge accepted.’ 12
– Erick Hawkins

Figure 14: Heather Raikes, Corpus Corvus, 2011. Photo by Julia Bruk.
Exploration and enactment of mythos informs Corpus Corvus on a deep foundational level. Fundamentally, Corpus Corvus is a creation myth enacted in a mixed reality performance environment. The composition is an abstract adaptation of Pacific Northwest Native American creation mythology. It is deeply influenced by Australian Aboriginal Dream Paintings – cosmogonical artworks that regard mythic body and physical environment to be indistinguishable. Its mixed reality enactment ensues from a physical body in symbiotic dialogue with an expanded, immersive stereoscopic reflection of itself dynamically composing and decomposing in time and space.

Pacific Northwest Native American Raven Mythology

The starting point for Corpus Corvus' composition is the Pacific Northwest Native American myth of the raven as creator and thief who steals the sun and creates the universe. There are a multitude of iterations and interpretations of this myth, but several common, fundamental ideas resonate deeply in Corpus Corvus' creative core, including the character of the raven as hybrid animal, human, and god; the synthesis of mythic, cosmological creation and marred, deceptive human psychology in raven as creator, thief and trickster; and the stealing of light, and creation of a universe from a stolen sun.
The raven in Corpus Corvus is deeply influenced by Dreamings of the Australian Aboriginal tradition – mythic bodies that are simultaneously creators, corporeal beings, and landscapes or environments. The Aborigines have occupied the Australian continent for at least forty thousand years and their artistic tradition is considered to be the oldest in the world. Australian Aboriginal art forms are based on a concept known in English as the Dreaming or the Dreamtime. The Dreamtime is often described as the beginning of the world, when ancestral, archetypal beings, or Dreamings, moved within the universe, and through their movement, carved and shaped the material earth from the formless void. Australian Aboriginal Dream Paintings are agents of this mythos. They are maps of creation, stories of the ancestral beings, and depictions of the sacred dimension of the present moment, as embedded in the forms of the physical environment.13

The archetype of the Dreaming has clear and compelling points of intersection with the mythical raven, especially in the context of Corpus Corvus’ mixed reality performance enactment of creation mythology. Stereoscopic motion capture-based animation synchronized spatially and temporally with physical choreography constructs the illusion that the movement of the raven’s body creates the dynamic, immersive media universe that it inhabits. In addition, the use of distinct, repetitive visual shapes and patterns in the Australian Aboriginal Dream Paintings is paralleled in Corpus Corvus’ use of particle streams with motion capture data to produce visually rhythmic, three-dimensional maps of the body’s movement in time and space.
Influential Mythic Artworks

Five 20th century artworks have served as foundational study for Corpus Corvus’ approach to mythos. They are: Erick Hawkins’ 8 Clear Places, Inagaki Taruho’s One Thousand and One-Second Stories, Jean Cocteau’s Orphic Trilogy, Cy Twombly’s Fifty Days at Iliam, and Iannis Xenakis’ La Legende d’Eer. The influence of these artworks is, to some extent, experiential and intuitive, but there are dominant aspects of their structural poetics that can be concretely described in relation to Corpus Corvus.

Analogous to Corpus Corvus in compositional form, Erick Hawkins’ 8 Clear Places (1961) consists of eight distinct sections, each of which has its own title (north star, pine tree, rain/rain, cloud, sheen on water, inner feet of the summer fly, they snowing, squash dances). The dance progresses through the eight segments with a stark, Haiku-like minimalism and poetic candor. Hawkins intended that the dance would become “a ceremony of awareness,” enacted with “violent clarity.” Within the ceremony of awareness, the perceptual intent was “seeing and hearing at the same time... seeing the music.” The work was constructed in collaboration with composer Lucia Dlugoszewski and designer Ralph Dorazio, who created the costumes, masks, and rain sculpture.

Figure 17: Erick Hawkins, 8 Clear Places, 1961. Photo by Peter Papadapolous. Courtesy of the Erick Hawkins Dance Foundation, Inc.
Inagaki Taruho’s *One Thousand and One-Second Stories* (1923) is a book of Japanese Futurist poetry that epitomizes the aesthetics of the Futurist synthetic theater. The book is an assemblage of extremely short, vivid, intense, fragmentary poetic idioms that collectively comprise an outrageous cosmology. Its unconventional story-poems tell tales of celestial bodies – the moon, Saturn, the stars and comets – playing boisterous pranks on the narrator’s senses. The book is Futurist, modernist, bold, and absurd in its stretches between physical and metaphysical realities. *One Thousand and One-Second Stories* inspired *Corpus Corvis*’ aperture-like openings into its vivid, densely orchestrated constituent segments, and provided fascinating groundwork for the enactment of an original mythic cosmology.

Both Jean Cocteau’s *Orphic Trilogy* (1930-1959) and Cy Twombly’s *Fifty Days at Iliam* (1978) serve as examples of mythic artworks that do not strictly adhere to archetypal form, but synthesize classical structure with intelligent and innovative choices in composition. Cocteau’s *Orphic Trilogy*, in its constituent films *The Blood of a Poet* (1930), *Orpheus* (1949), and *Testament of Orpheus* (1959), constructs a surreal, eclectic, visually poetic landscape of the Orpheus myth as it weaves between reality and imagination. Twombly’s *Fifty Days at Iliam* is a ten-part narrative painting based on Homer’s *Iliad* that evokes the myth of the Trojan War through a raw, irreverent synthesis of words and images.

Figure 18: Cy Twombly, *Fifty Days at Iliam*, 1978. Philadelphia Museum of Art.
Finally, Iannis Xenakis’ epic *La Legende d’Eer* (1978) is a deep source of awe and inspiration underscoring *Corpus Corvus*’ structural poetics and approach to composition. Although experienced only through documentation and recreation, this work has afforded a glimpse of the mythic sublime. Accordingly, the measure of its impact transcends proportionate scale, and its influence extends beyond concrete description.

In its full manifestation, *La Legende d’Eer* was a multimedia spectacle staged in Paris for the opening of the Georges Pompidou Center in 1978. The “diatope” included architecture; electronic music; a computerized light show with four lasers and 400 mirrors; and five texts, including the Myth of Er as told in Plato’s *Republic*, from which the title is taken. *La Legende d’Eer* is archetypal in its temporal progression, essentially utilizing a classic “parabola” structure. Experientially, its layers, complexity, and compositional intelligence simultaneously evoke ancient mythology, modern science, visceral embodiment, evolutionary form, primal emotion, and mind-bending abstraction. It is, arguably, a living, vital articulation of contemporary mythos, and an ideal toward which *Corpus Corvus* aspires.
V. Research Trajectory: Expanded Embodiment

“The dance, as art, does not dance the body. It dances the soul, the inner man.

Right here is the most beautiful dance – the contemplation, in the theatre, of nature in man.

The body is a clear place.”

–Erick Hawkins

*Corpus Corvus* manifests an instantiation of sensate embodiment that spans a continuum from the animalic to the immaterial. The work utilizes a choreographic vocabulary generated from a synthesis of the raven’s primal lifecycle, modern/postmodern dance technique, and the physical body in relation to its mediated expansion through motion capture and physical gesture animation. Core influences include the choreography and embodiment ideologies of Erick Hawkins; the dances of Loie Fuller; archetypal gesture as articulated in 20th century sculpture by Naum Gabo, Constantin Brancusi, and Alberto Giacometti; and movement abstracted into data through motion capture.

![Corpus Corvus](image)

Figure 20: Heather Raikes, *Corpus Corvus*, 2011. Photo by Julia Bruk.
Corvus Corax

The foundational starting point for Corpus Corvus' choreography and articulation of embodiment is the body of the physical raven, Corvus corax. The raven is most notably a bird of exceptional intelligence. Ravens have disproportionately large brains and heads relative to their body size, and throughout history have been referred to as the bird that most resembles man.

Ravens walk on strong back legs and toes – rather than hop, as most birds do – and their stride is often interpreted as a “strut” with an arrogant, lordly, or military demeanor. Ravens are equally distinguished in the air, flying commonly at 30-60mph, and up to 70mph when going for prey. Ravens are also acrobatic fliers, and have been seen flying upside down for nearly a mile. Ravens and crows – referred to collectively as corvids – are very close relatives, but, in differentiation from crows, ravens are larger; they alternate between wing flapping and soaring when flying, and have a more dignified walk.

Ravens are also very expressive. They have perhaps the most complex vocabulary of any bird, as their vocal expressions include screaming, trilling, knocking, croaking, cackling, warbling, yelling, kawing, and making sounds that resemble wood blocks, bells, and dripping water. Like the human voice, ravens’ sounds can be varied in pitch, volume, rate, intensity and duration to convey subtle differences in their moods and motives. Moreover, ravens’ calls are accompanied and amplified by physically expressive posturing and body movement, along with pupil dilation. Corvids also use subtle changes in the arrangement of their contour feathers to express emotion.

Contributing to their infamous reputation as morbid hunters, corvids have bills that can cut, tear, crush, probe, rip, and open nearly anything. They are, by all accounts, decisive predators.

Cumulatively, the body of the raven offers a rich and inciting starting point for physical artistry – particularly when explored vis a vis the other foundational influences for Corpus Corvus' approach to embodiment and choreography.

Figure 21: Raven. Photo by Al and Elaine Wilson.
Erick Hawkins

I began my career as a modern dancer with the Erick Hawkins Dance Company. Erick Hawkins believed that dance must impart a holistic conception of embodiment relevant to an artist's specific moment in history. As a mid-20th century modernist, Hawkins articulated the body as a sensate, free-flowing kinesthetic system in contrast to the prior mechanistic models of the ballet and the oppositional, contraction-based technique reflective of the first and second World Wars. An evolution of Hawkins' conception of the organic, sensuous body permeates the vital core of my artistry. My work expands this core into posthuman dimensions, weaving sensate tapestries of integrated material and immaterial embodiment.

Erick Hawkins' movement technique articulates the body as a free-flowing kinesthetic system integrated around the axis of the pelvis and spine. The essence of movement is sensation, and the epicenter of sensation is the spine. The limbs function as "tassels," continuously emanating outward and looping back in to the sensate core. Moreover, Hawkins expands "body" to generously encompass the entire perceptual space of the theater, as awakened and encountered through live convergences of kinesthetic embodiment, acoustic instrumentation, and sculptural form. Within Hawkins' movement technique and ensuing system of theatrical poetics, a virtuosic body is a sensate body that communicates not only visually, but perceptually and kinesthetically, imparting the poetry of embodied experience.

The translation of kinesthetic sensation into the digital domain has proven to be challenging and elusive. Although many works in the realms of performance, digital art, and computer science have produced fascinating articulations of the digital body, few are directly concerned with extending and expanding embodied intelligence through sensation. Corpus Corvus addresses this domain. The mixed reality performance infrastructure is fundamentally conceived as an extension of the human nervous system, an expansion of the spine, the locus of sensation. The digital media elements are created both from motion capture data, and from kinesthetic media composition processes derived from my experience of translating the intelligence of a dancer into that of a media artist. As Hawkins' integrated sensate body is characterized by a continuous pulsation that loops from the central axis through the corporeal peripheries, so the sensate body of the Corpus Corvus loops from the wholly kinesthetic spine of the performer-as-animal through its extended digital peripheries.
This pulsation is the lifeforce of the *Corpus Corvus*, and produces an integrated continuum of sensate embodiment that extends from the animalic to the immaterial.

Figure 22: Erick Hawkins. Photo by Barbara Morgan.

Erick Hawkins’ total aesthetic approach, holistically referred to as the *Theatre of Perception*, permeates *Corpus Corvus*, inspiring and informing the body’s expansion into the larger perceptual arena of the performance environment. Emanating from Hawkins’ core conception of embodiment, the *Theatre of Perception* addresses the relationship between movement and sound in live performance; elements of craft and composition in time and space; kinesthetic integration of experiential ideas explored in visual art; performance as myth, and a multitude of other artistic premises. Hawkins’ *Theatre of Perception* represents the culmination of a masterful career. While *Corpus Corvus* is a relatively early career work, echoes and evolutions of Hawkins’ foundational concepts resonate throughout the piece and its process of manifestation. Specific articulations of these resounding perspectives include:
“Choreographers have been concerned that movement relate to sound emotionally, structurally (one dominating the other or both ignoring the other), even rhythmically. But an entirely new kind of theatre can be achieved by putting movement and music together so that they interrelate entirely and totally with poetry.

When I move and the composer is silent because I have moved, when I jump high and the composer is suddenly very quiet because I have jumped high, when I move my little finger and the composer lets loose with a strong, brave clear sound because it is so important to have moved a little finger, these are instances of real poetic dialogue between movement and sound.”

– Erick Hawkins, *My Love Affair with Music*

Figure 23: Erick Hawkins and Lucia Długoszewski, *Geography at Noon*, 1964.
Photo by Michael Avedon.
“In all the highly developed theatres of Oriental cultures, the actor and dancer is the same person. In some languages, there is no word to distinguish the actor from the dancer. That has been true in all primitive societies and presumably was once true in Athenian theatre.

The element of rite, and its primary instrument, dance, releases, I feel, the other components of theatre.” 17

– Erick Hawkins, *The Rite in the Theatre*

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Figure 24: Erick Hawkins, *Death Is a Hunter*, 1986. Photo by Martha Swope.
“I cherish strangeness because it can shatter ordinary reality ... What I’m after is a new structural possibility . . . the hurtling of strange jewel-like explosions of high dynamics into a continuum of mythic meditative hush.” 18

– Erick Hawkins

Figure 25: Erick Hawkins, *Black Lake*, 1969. Photo by Ted Yaple.
Another definitive historical anchor for *Corpus Corvus*’ expansion of embodiment can be found in the work of Loie Fuller, whose late 19th and early 20th century solo performance works synthesized physical choreography with patented technological innovations in lighting and wearable luminescent sculptural forms. Fuller’s performance artworks utilized projections of multi-colored lights onto dynamic silk costumes, evoking images such as a lily blooming, a butterfly unfolding its wings, and the rise and fall of flames. Fuller was regarded as an embodiment of the changing perception of human physicality and described as “a scientist and inventor, a woman of the future, charged with the energies of an age about to dawn.” She embodied a zeitgeist that could concurrently and subsequently be found in the multifarious syntheses of body and machine that characterized Futurist performance forms. Loie Fuller is uniquely influential to *Corpus Corvus’* articulation of embodiment because she pioneered poetic new, technologically-facilitated expansions of the body in time and space – and simultaneously incarnated a compelling, sensuous, kinesthetic spine at the core.

Figure 26: Loie Fuller. Photo by Frederick Glasier.
Archetypal Gesture & Mythic Embodiment in 20th Century Sculpture

Several significant 20th century sculptures have influenced Corpus Corvus’ articulation of embodiment and choreographic approaches: Naum Gabo’s Kinetic Construction (Standing Wave), Constantin Brancusi’s Bird in Space, and Alberto Giacometti’s L’Homme qui Marche. All three of these great sculptures are original yet archetypal gestures of physical form that poetically resonate between materiality and immateriality.

Naum Gabo’s Kinetic Construction (Standing Wave) was created in the aftermath of the Russian Revolution, in a time of scarce materials. A steel rod is made to oscillate using a small motor, an electromagnet, springs, and a circular adjustable balance, creating the illusion of volumetric space when activated. Kinetic Construction made motion a necessary component of the sculpture, and engaged temporality in that the virtual volume produced by the vibration can only be perceived through persistence of vision, as an effect of motion over time. The work was originally conceived to demonstrate principles of kinetics, and reflects Gabo’s fundamental pursuit of new forms of sculpture that interact fundamentally with space and time. Kinetic Construction interfaces with Corpus Corvus in its dynamic gesture of material form that both creates and evokes an immaterial temporal spatial composition in direct relation to its physical motion. Arguably, Corpus Corvus’ physical-virtual choreography is more directly related to Kinetic Construction than to traditional physical dances.

Figure 27: Naum Gabo, Kinetic Construction (Standing Wave), 1919-1920.
Constantin Brancusi’s *Bird in Space* is a series of sculptures created between 1923 and 1940 that meditate on a bird in flight, abstracting and distilling the essence of this primal and poetic motion to a singular form that transcends the physical attributes of the bird and captures the essence of its corporeal form in flight. The sculptural gesture that ensues is archetypal, revealing an expression of the whole that unites its constituent parts, and evokes the expanse that contextualizes the form. *Bird in Space* offers metaphors and foundations to *Corpus Corvus* that are simultaneously obvious, generous, and deeply challenging. *Bird in Space*’s basic premise in relation to physical choreography – particularly the raven’s foundational gesture lifecycle – incites a process of exploration that penetrates deeper and deeper into embodied form until it arrives at the singular, essential expression of a sensate spine.

Alberto Giacometti’s *L’Homme qui Marche*, or *The Walking Man I* is Giacometti’s quintessential bronze sculpture depicting a single man walking mid-stride with arms hanging at his sides. It has been referred to as both a humble image of an ordinary man, and as a symbol of humanity. It is unquestionably an influential and transformative articulation of embodiment. Comparable to Brancusi’s *Bird in Space*, *The Walking Man* is an essential, archetypal abstraction of physical form in its primal motion. Accordingly, it offers comparable foundations and challenges to *Corpus Corvus*, while resonating in relation to the human aspect of the raven’s embodiment.
Motion Capture

The final foundational influence for Corpus Corvus’ choreography is motion capture, and the translation of physical movement into animated data. Corpus Corvus’ choreography is not confined to the physical body, but is fundamentally a dialogue between physical movement and the dynamic immaterial form that surrounds the body in time and space through stereoscopic projection, much of which is generated from motion capture data. Thus echoing foundational influences ranging from Erick Hawkins’ spine-centered technique to Naum Gabo’s Kinetic Construction, the intangible dimension of the work is a sensate extension and expansion of movement in the physical structure.

Motion capture data is commonly applied to a realistic character skeleton, and used to create true-to-life animated movement. While this is a highly effective and impressive technical process, its artistic potential is limited by the motion data’s encapsulation in a contrived, literal form. Corpus Corvus’ motion data is not applied to a skeleton, but rather revealed in its pure, raw form as physical/visual motion data patterns, and presented in resonance with the choreography as executed by the performing body in live performance. The motion capture data reveals the choreography in ways that cannot be perceived by the naked eye, and offers a compelling foundation for resonant exchange between material and immaterial form.

Figure 30: Corpus Corvus motion capture session in the CRCA Performative Computing Lab, University of California San Diego. Photo by Heather Raikes.
Elements of Form & Technical Processes

Overview of Choreographic Composition Workflow and Processes

Corpus Corvus’ choreographic composition process involves both physical and media aspects. This section offers a choreographic composition overview, and detailed description of the physical manifestation process. Comparable specificity with respect to the media manifestation process can be found in the next chapter.

In summary, the processes involved in creating Corpus Corvus’ choreography encompassed the following stages and steps:

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**Research and Experimentation**
- foundational research
- brainstorming/text for Corpus Corvus nervous system
- physical exploration of Corpus Corvus nervous system

**First Draft Choreography**
- exploratory gesture lifecycle choreography
- refined and kinetically expanded gesture lifecycle choreography
- construction of phrase material
- assembly and refinement of first complete draft of choreography
- motion capture of first draft choreography
- exploratory animation with first draft motion capture data
- exploratory integration of animation and movement in physical-virtual choreography
- structural notes and refinement of intentions for second draft choreography

**Second Draft Choreography**
- construction and refinement of second draft choreography (structural spine of final work)
- motion capture of second draft choreography (final motion capture data)
- composition of animation with motion capture data and physical gesture techniques
- composition of sound with second draft choreography and work-in-progress animation
- integration of performer into second draft choreography and composition process
- integration of second draft choreography, animation, and sound
- structural notes and refinement of intentions for final forms

**Third Draft Choreography**
- exploration of physical characterization
- integration of physical characterization with structural choreography
- composition and refinement of third (final) draft choreography
- completion of all media elements
- final integration of choreography, animation, and sound
---
Corpus Corvus’ concrete composition process began with a text-based narrative brainstorming of the Corpus Corvus “nervous system.”

**Corpus Corvus Nervous System**

1. **formation:** a skin awakens. shifting topographies of sensation. a surface ignites in prickling, percussive lightenings. noctilucent eyes – otherworldly, half-seeing, intensifying – open and close in flocking waves across the skin. awakening accumulates in crescendo. sensation increases in saturation. a nervous system is present, alive, emerging. it penetrates under our skin.

2. **throat:** the nervous system blinks open. an exteriorization of awareness into a dark, cavernous space, slowly churning. a sudden and alarming primordial vibration, a first word sounds from within, quaking every cell of the exterior. the space convulses, vibrates violently around its epicenter. the vibration is a portal. we are subsumed.

3. **wing:** synapse fires. the points of illumination introduced by the formation ignite and interconnect in fulgurating webs. levitating flashes. celestial daggers. we are inside of the synapse of flight.

4. **birdseye/dreaming:** the fulgurating web stabilizes as a synaptic rhizome, an optical nerve. we traverse its web to a circular lens, a portal. through the lens we glimpse momentary vistas of the dreaming. the space of the body we encounter is a landscape, a topography.

5. **claw:** time elongates. an earth-bound time is extracted from synaptic time. the corporeal reflections of the birdseye stabilize and emerge in successive prolonged, coherent spaces. as a space becomes coherent, the raven attempts to touch, claw, possess, consume its reflection and the space is devoured, destroyed. a reflective pulsation of formation and destruction.

6. **belly:** the binary dance of claw resolves into a devoured emptiness. fragments and traces of the corporeal landscapes appear in transient, reconfigured, mutating forms. hollow nothingness is punctuated by embers, digestion, mutation.

7. **heart:** a generative fire ignites. an expression of systemic algorithmic neural physiology. the heart of the nervous system. the raven in its blaze. pure animalic lifeforce. percussive, pulsating, cascading. its light intensifies and expands into a fully embodied mythic organism. a consummate crescendo.

8. **brain:** the fire becomes the mind of the raven. a neural, solar landscape. it is a definitive topography that the raven awakens into and inhabits. as the raven moves deeper and deeper into the space created, time slows to a singular pulse.

9. **spine:** a fluid complexity of darkness and light, an incandescent dynamic architecture of formation and dissolution. raven dances.

10. **dissolution:** the final pulse becomes the dissolution. the architecture of the spine fades into points of incandescence, darkening in flocking wave patterns, a dynamic night sky. it gradually brings itself to black.

The nervous system served as the concrete starting point for manifestation of the gesture lifecycle, which became the structural spine of the choreographic vocabulary, in combination with three phrases, referred to as A, B, and C. The gesture lifecycle, based on the primal, animalic expressions of the raven’s body, was constructed first as a series of singular, static gestures, then extrapolated into movement sequences.
Corpus Corvus Gesture Lifecycle

1 - raven caws
2 - raven stands
3 - raven takes flight
4 - raven flies
5 - raven lands
6 - raven walks
7 - raven sees
8 - raven attacks its prey
9 - raven eats
10 - raven dies

Corpus Corvus Phrases

A - cumulative kinetic gesture lifecycle
B - generative algorithm
C - raven’s spine

Retrograding, a choreographic technique in which a movement sequence is reversed, was also applied to phrases A and C. And, Processing software was used to create a sequence for phrase B. The seed sequence code randomly generates a series of gestures, along with parameters that control variations in duration, dynamic, and direction.

![Figure 32: Screenshot of Processing code that generates a choreographic phrase.](image)

This was an interesting, exploratory part of the choreographic process, although, in the end, only an adapted fraction of this material was included in the composition.
Once the gesture lifecycle and phrase material were constructed, these foundational movement sequences were then interpolated with the abstracted narrative of the raven myth to produce the underlying scaffolding for the piece. The compositional structure that ensues is divided into eight segments. Their names and timings, in time code, are:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
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<tbody>
<tr>
<td>1</td>
<td>&quot;formation&quot;</td>
<td>00:00;00 - 01:40;00</td>
</tr>
<tr>
<td>2</td>
<td>&quot;throat&quot;</td>
<td>01:40;00 - 03:25;16</td>
</tr>
<tr>
<td>3</td>
<td>&quot;wing/eye&quot;</td>
<td>03:25;16 - 05:09;10</td>
</tr>
<tr>
<td>4</td>
<td>&quot;dreaming&quot;</td>
<td>05:09;10 - 06:57;28</td>
</tr>
<tr>
<td>5</td>
<td>&quot;claw&quot;</td>
<td>06:57;28 - 08:54;16</td>
</tr>
<tr>
<td>6</td>
<td>&quot;belly&quot;</td>
<td>08:54;16 - 10:41;14</td>
</tr>
<tr>
<td>7-8</td>
<td>&quot;heart/brain&quot;</td>
<td>10:41;14 - 14:11;14</td>
</tr>
<tr>
<td>9-10</td>
<td>&quot;spine/dissolution&quot;</td>
<td>14:11;14 - 16:30;00</td>
</tr>
</tbody>
</table>

**Movement 1**

Section 1, *formation*, is based on phrase A, an abstracted retrograde of the raven’s cumulative gesture lifecycle, along with retrograded sequences from phrase C, raven’s spine. In sections 2-6 (*throat* through *belly*), the raven’s gesture lifecycle is enacted in its totality, punctuated by an inception of the mythic raven in *wing/eye*, where the animal raven sees the sun and dreams/becomes the *dreaming*. In the first movement, the immaterial dimensions of the body assume a diversity of forms, ranging from abstracted streams of motion capture data to kinetic structures evocative of the body’s inner landscapes.

**Movement 2**

Section 7-8, *heart/brain*, is the raven’s apotheosis, as it is reborn in mythic pursuit of the sun. Section 7-8 begins with phrase B, an accelerating assemblage of fragments from the gesture lifecycle which, in conjunction with motion capture animation, fills the space with flickering synapses that grow, expand, and connect to become an immersive solar landscape. The raven completes phrase B with a gesture of self-sacrifice, placing itself on a pyre, then proceeds in pursuit of the sun through a retrograde of the static, foundational gesture lifecycle, arriving at the heart of the sun wide mouth wide open, in its first gesture, raven caws. Then, raven swallows the sun.

**Movement 3**

Section 9-10, *spine/dissolution* is phrase C, raven dances. Fragmentary puzzles of movement presented in phrase A now unfold in fluid, lyrical motion as streams of particles emanate from the raven’s body, filling a night sky.
Notes on the Physical Choreographic Composition Process

Corpus Corvus’ choreographic process was undertaken in collaboration with dancer/choreographers Eric Geiger and Julie Funk. Eric Geiger, a faculty member at the University of California San Diego, was primary collaborator and performer for the initial phases of the choreographic process, from initial explorations of the gesture lifecycle through refinement of second draft choreography and final motion capture. Julie Funk, a Canadian freelance performer who has previously performed my work, was primary collaborator and performer for the exploration of physical characterization; third and final draft of choreography; and final integration of choreography, animation, and sound. Geiger performed the work for motion capture. Funk performed the work for both its theatrical premiere and documentation in stereoscopic cinema form.

This unique manifestation process oscillated between physical dance studios, motion capture labs, animation suites, render farms, stereoscopic animation studios, and physical forums that afforded the integration of all artistic elements contributing to the final choreographic composition. Completion of the work would not have been possible without the support of DXARTS, the University of Washington Dance Program, the University of California San Diego Department of Theatre & Dance, the Performative Computing Lab in the Center for Research in Computing & the Arts (CRCA) at the University of California San Diego, and the Motion Capture Lab in the Department of Computer Science & Engineering at the University of Washington.

It is also worth noting that because this work was assembled between physical locations, and integrated multiple layers of visual information, video assemblage was an essential tool used to refine and edit the choreography. Video assemblage was first used for integrating material generated between Eric Geiger and myself in the early phases. Key phrases and moments would be extracted from longer sequences and arranged with other material in a montage format. A draft composed in this manner would then be re-introduced in the physical studio and the process would repeat. In the middle stages of the process, experiments in timing, spacing, and direction, as well as retrograding, were all primary tools used to manipulate and evolve the choreography in video format. In the later phases, choreography was composited with animation to simulate the temporal-spatial integration of the physical and virtual dimensions of the dance. Appropriately, the final choreography, accessible in the pocket materials, is documented in video format.
For motion capture, *Corpus Corvus* utilized the Vicon iQ 2.5 system, which is installed in both the CRCA Performative Computing Lab at the University of California San Diego and in the Department of Computer Science & Engineering at the University of Washington. The optical system includes 12-16 infrared cameras that register reflective markers affixed to the body with velcro, and triangulate the three dimensional position of a physical subject in real time. Movement is sampled at 120 frames per second, retained as a .fbx file, then exported to Maya via Filmbox where the motion data is converted into animation. Although technically effective, one of the shortcomings of the Vicon iQ 2.5 system is interface design and clear user documentation. Through *Corpus Corvus*’ motion capture sessions, I was able to develop and document a workflow that is now utilized both at CRCA and DXARTS. It is also significant to note the impact of the motion capture system and process on the physical choreography. The primary implication was the necessity for extreme precision in time and space in order to sync the captured motion with the live motion. In addition, the Vicon iQ 2.5’s use of reflective markers limited some movement options, as the markers had to remain visible and affixed during movement execution.
Physical Characterization & Final Choreographic Form

The final phase of Corpus Corvus’ choreographic process revolved around the development of physical characterization and theatrical embodiment of the mythical raven character. Although the synthesis of theater and dance are a natural hybrid within my approach to performance, this is not commonly the case, and it requires a uniquely skilled performer at this moment in history to successfully execute exacting physical choreography in combination with theatrical characterization. Fortunately, I have had the opportunity to develop this approach to theatrical embodiment with performer Julie Funk over the course of several artworks and physical theater laboratories.

Corpus Corvus’ process of integrating theatrical characterization with physical choreography involved substantial exploratory dialogue leading to definition of an abstract poetic narrative through-line that would define the performer’s psychological engagement with the piece; matching intentions and action verbs to specific movements; defining and scoring qualitative feeling states in the different sections; and creating character-based postures and nuances in the execution of movement. The resulting choreography is a synthesis of material and immaterial form; physical, virtual and theatrical embodiment.

Figure 33: Heather Raikes, Corpus Corvus, 2011. Photo by Julia Bruk.
VI. Research Trajectory: Immersive Media Composition

“I say that the stage is a concrete physical place which asks to be filled, and to be
given its own concrete language to speak. I say that this concrete language, intended
for the senses and independent of speech, has first to satisfy the senses, that there is
a poetry of the senses as there is a poetry of language…” 21

“...this naked language of the theater must permit, by its use of man's nervous
magnetism, the transgression of the ordinary limits of art and speech, in order to
realize actively, that is to say magically, in real terms, a kind of total creation in
which man must assume his place between dream and events.” 22
– Antonin Artaud

Corpus Corvus’ final research trajectory is an exploration of immersive media composition, encompassing
animation, sound, and orchestration of its visual, aural, and kinesthetic elements. This exploration is an
evolutionary articulation of theatrical poetics, connecting historically to the pursuit of an immersive
theatrical language and performative sublime that extends across millennia.

Somatic Media Architectures

Corpus Corvus’ media composition and integrative gestures incorporate and build upon its other three
research trajectories: mixed reality performance, contemporary mythos, and expanded embodiment.
The dominant technique utilized in the composition is the construction of somatic media architectures –
dynamic stereoscopic animations that immerse and contextualize the body of the performer in time and
space. Use here of the word architecture is influenced by media artist/architect Marcos Novak who
expresses the notion of “liquid architecture,” evoking a fluid, three-dimensional sense of space that is not
frozen in time. Within Corpus Corvus, somatic media architectures are extracted from the body using
motion capture data in conjunction with animation techniques that articulate the negative spaces of its
motion through time. These immaterial architectures are three-dimensional temporal constructions that
accumulate and decompose spatially in response to the body’s movement. Physical gesture animation
techniques are also used to compose a visual space in resonance with a sustained expression of the body.
Sound by Richard Johnson Logan-Greene completes the multi-sensory composition. Influences
informing this research trajectory include chronophotography, Futurist painting, constructal theory,
Zaha Hadid’s architectural works, Stephanie Andrews’ accretion, Michael Chekhov’s psychological gesture
technique, use of gesture in the paintings of Caravaggio and Jacques-Louis David.
**Chronophotography**

A historical genesis for the development of *Corpus Corvus*’ somatic media architectures can be found in chronophotography, a term coined by French physicist Etienne-Jules Marey that refers to a conjunction of “time” and “photography.” A photographic technique dating back to the Victorian era, chronophotography is defined as “a set of photographs of a moving object, taken for the purpose of recording and exhibiting successive phases of motion.” Chronophotography is considered to be an important predecessor to the development of film, but it was originally developed and used for the scientific study of movement. Significant chronophotographic contributions were made by scientist Etienne-Jules Marey, photographer Eadweard Muybridge, photographer/medical researcher Albert Londe, and inventor/filmmaker Georges Demeny.23 Chronophotography offers fascinating, beautiful, and historic revelations of the moving body and abstracted patterns of motion – as well as an impressive 19th century instantiation of art-science innovation.

Figure 34: Etienne-Jules Marey, *Pole Vaulting*, 1867.

Figure 35: Etienne-Jules Marey, *Bird Flight*, 1886.
Futurist Painting

A subsequent historical anchor can be found in the Futurist painting of the early 20th century, specifically the works of Italian artists Giacomo Balla, Carlo Carra, Luigi Russolo, Gino Severini, and Umberto Boccioni. The basic premise for Futurist painters was dynamism. They believed that in order to be alive, form must be seen as continuously evolving. To this end, the Futurists conducted many experiments with techniques and principles that shattered the concreteness of form, focusing especially upon use of light and motion. They defined two types of motion: “that which moves in on itself, suggesting in its centripetal force the internal mass of an object; and that which moves outward into space mingling its rhythms with those of outer objects and eventually merging with space itself.” They believed that there is no such thing as a definitive, isolated object – there are only intimations of objects within the continuous flux of color and form that we perceive. The Futurist painters largely sought to depict neither the object itself nor its motion, but a synthesized image of both. With respect to Corpus Corvus, Futurist painting offers articulations of kinetic form that spin dazzling tapestries of color, rhythm, light and motion. Moreover, they juxtapose an interpretive layer of expressive, subjective, emotional theatricality with the formal depiction of motion.

Figure 36: Carlo Carra, The Red Horseman, 1913.
Constructal Theory

The constructal law of design in nature was developed and introduced in the 1990s by Adrian Bejan, renowned Duke University Professor of Mechanical Engineering and Materials Science. Also referred to as “flow theory,” constructal theory is a complex set of engineering principles that stems from a study and understanding of how motion creates form in nature. “Constructal” is a word coined by Bejan, derived from the Latin verb *construere*, to construct, in order to “designate the natural tendency of all flow systems to construct flow configurations, such as rivers, trees and branches, lungs and also the engineered forms coming from the constructal design-generation.”

Constructal theory is fundamentally influential to *Corpus Corvus* in its approach to the construction of form – that is, the visual forms that comprise *Corpus Corvus*’ animation are largely natural, uninterrupted patterns, shapes and structures that emerge from the captured motion of the body. In addition, constructal theory identifies several “archetypal” expressions of flow-based form, including the branching tree structure and the round cross-section of blood vessels, which echo throughout both the macrocosmic and microcosmic visual dimensions of *Corpus Corvus*’ animation.

![Figure 37: Landsat satellite photo of Lena River Delta, illustrating constructal theory principles, 2000.](image)
**Zaha Hadid**

From a specifically architectural perspective, the works of Zaha Hadid have been influential to the development of *Corpus Corvus’* somatic media architectures. Hadid’s architectural structures are physical forms that express remarkable juxtapositions between form and fluidity, and often evoke aspects of abstracted embodiment. Art historian Germano Celent describes her work:

"In the end, the ‘architectural’ object is broken down into parts in such a way as to allow one to understand the mechanisms anatomic ally, then put back together according to a complex, dramatic juxtaposition and collision between its primary components. The circularity lives in a transitory state between fullness and emptiness and makes Hadid’s architecture an unstoppable stream, a sequence of points and viaducts, of volumes and surfaces that flow into one another, juxtaposing mutability and stasis." 27

I began to study Hadid’s work when introduced to 3D modeling and animation, and her dynamic expressions of architecture have been a foundational influence in my approach to Maya, motion capture, and the construction of three-dimensional form. Specific to *Corpus Corvus,* Hadid’s gestures in the liminal space between body and structure offer articulations of space and form that resonate kinesthetically, visually, and experientially – while simultaneously delineating a framework for the organization of sensory perception.

![Figure 38: Zaha Hadid and Patrick Schumacher, Still Frame from *Parametric Urbanism,* 2007.](image-url)
Ultimately, within a longer trajectory of my research, somatic media architectures are developing into dynamic spatial-temporal frameworks for the orchestration and organization of multi-sensory perception. Rooted in expanded embodiment, somatic media architectures are the sensorial instrumentation of an extended, expanded nervous system unfurling and expressing itself across time and space.

*accretion*

Stephanie Andrews’ *accretion*, created in collaboration with me in 2008, served as a concrete starting point for the development of *Corpus Corvus*’ somatic media architectures. *accretion*’s process began with an abstract narrative choreography composed specifically for motion capture. The motion capture data then served as the basis for translating movement into a set of extruded sculptural forms, or “shells,” evocative of the embodied experience that produced them. Exploring the growing pains in the co-evolution of human body and machine body, *accretion* is a series of somatic architectures that evolve sculpturally through time and space in fluctuating symbiosis between humanness and machination. The piece served as an important foundation for *Corpus Corvus* in terms of concept, choreographic process, motion capture workflow, and technical processes in working with motion capture data.

![Figure 39: Stephanie Andrews with Heather Raikes, *accretion*, 2008.](image-url)
Physical Gesture Animation

In conjunction with the use of motion capture data, Corpus Corvus also utilizes physical gesture animation in its construction of somatic media architectures and overall approach to immersive media composition. Physical gesture animation is used to compose a visual space in resonance with a sustained expression of the body. This approach to gesture has foundations in both theatrical and visual art.

Psychological Gesture

Theater director Michael Chekhov’s psychological gesture is a performance technique that uses a singular, fully embodied gesture to unleash the essence of a character in an actor. It is an essential, distilled, and transformative physical expression through which the actor accesses a character’s psychological body and enters the theatrical realm of the play. Within Corpus Corvus, this approach to gesture not only evokes feeling within the somatics of the performer, but becomes an expression of the sensate spine of the expanded body that reverberates through its media extensions.

Figure 40: Michael Chekhov, Psychological Gesture.

Gesture in Visual Art

In visual art history, vivid use of gesture in painting, including the works of Caravaggio and Jacques-Louis David, create portals into abstracted theatricalities that coalesce the elements of visual composition around the pathos of the body. Specific paintings that informed Corpus Corvus’ research process are Caravaggio’s The Entombment of Christ (1602-1603) and Jacques-Louis David’s The Death of Socrates (1787). In both of these works, physical gestures evoke heightened emotion,
define characterization, and provide a structural skeleton to the formal composition of the painting. Moreover, as clearly evidenced by walking through the Louvre, Musee d’Orsay, or Metropolitan Museum of Art, mythic dimensions of the human body have been virtuosically portrayed in visual art through dramatic gesture in countless forms throughout history.
The final element contributing to the groundwork for Corpus Corvus’ physical gesture animation is my 2007 work, futuRasa. This 9-minute solo work, premiered by Julie Funk, is performed by a dancer covered completely in white clothing and body paint positioned in front of a white vertical rectangular canvas. A 3D animation is projected onto the hybridized surface of her body/canvas. The dancer performs a series of slow, archetypal movements based on Michael Chekhov’s psychological gesture that correspond to four rases. Rasa, arguably an archetype of sensate emotion, is a term from Hindu aesthetics that defies precise translation, but can be described as “juice”, “flavor”, “emotion”, or “essence.” The gestural rasas are utilized as the basis for both physical choreography and 3D animation, which is projected back onto the canvas of the body, creating a poetic interfusion of sensate embodiment across a physical-digital spectrum.

Macrocosmically, Corpus Corvus’ use of gesture also serves as an expansive and integrative compositional tool rooted in performative embodiment and extending into every aspect of the immersive media composition. From the choreographic gesture lifecycle to the stereoscopic animation to the sound score, each element within the work is gesturally sculpted both in terms of its articulation and its negative space, which enables it to function in compositional resonance with the other elements. A macrocosmic objective for this work is to achieve a balanced, virtuosic integration of visual, aural, and kinesthetic elements. Moreover, Corpus Corvus seeks to create a composition that, as a totality, offers sufficient negative space that it is completed by the audience or observer. I understand a work that functions in this way to be an expression of an artist’s essential gesture.
The final foundational research component for Corpus Corvus is Trevor Wishart’s Red Bird, in tandem with his writings on sound image and sound landscape. Corpus Corvus’ visual-kinesthetic composition is completed by a sound score based upon ravens’ vocalizations abstracted through human imitation and technological processing. The sound composition manipulates, constructs, and deconstructs sounds evocative of the human body, the raven’s body, and an abstract atmospheric/environmental body. It must be clearly stated here that sound for this work was composed by Richard Johnson Logan-Greene. Therefore, my research foundations influencing the sound composition interfaced with the actual work on a conceptual, directorial level – as opposed to the concrete process of manifestation.

Fundamentally, Corpus Corvus’ sound composition is an assemblage of sound-images and sound-objects that reflect and interpolate the temporal-spatial patterns of the physical choreography and stereoscopic animation in the macrocosmic construction of a sound-landscape. From a directorial standpoint, the essential premise is that aural gestures function within the same compositional framework as visual and choreographic gestures. Corpus Corvus’ cumulative composition is the product of orchestration and resonance between stark and distilled – yet sensuous and evocative – gestures in these three sensory dimensions.

Wishart’s description of his process composing Red Bird is significant for Corpus Corvus:

On the one hand, sound-images of the voice, or animal and bird cries, have an intrinsic gestural content. More distanced sound-materials, for example, textures developed out of vocal syllables, may be gesturally articulated by appropriate studio techniques. Transformation now becomes the gradual changing of one sound-image into another with its associated metaphorical implications, and a landscape can be seen as a particular kind of timbre-field applying to the space of sound-images. These parallels are not, of course, precise, but they do form the basis of a meeting ground between musical thinking and a discourse using sound-images as concrete metaphor. 28

– Trevor Wishart, Sound-Image As Metaphor: Music and Myth
Elements of Form & Technical Processes

Overview of Animation Workflow and Production Processes

The production processes involved in creating Corpus Corvus' stereoscopic animation encompassed the following stages and steps:

**Pre-Production and Source Material**
- import motion capture data from Vicon iQ 2.5 system through Filmbox into Maya
- video production of choreography for abstract rotoscoping use in physical gesture animation

**Research and Experimentation**
- stereoscopic animation technique research and experimentation
- refinement of motion capture animation techniques
- refinement of physical gesture animation techniques
- refinement of stereoscopic techniques
- compositing research and experimentation
- refinement of compositing techniques

**Production of Stereo Animation**
- production of animation in Maya
- render 800x600px left and right camera .tiff files for draft compositing and output

**Stereo Animation Post-Production**
- import left and right .tiff files into AfterEffects
- create AfterEffects 1600x600px stereo composition
- apply circular mask
- produce final form of animation using AfterEffects/compositing techniques
- output rough draft stereo file to .avi

**Stereo Testing and Refinement**
- stereo testing with DepthQ player
- stereoscopy refinement
- AfterEffects output final 1600x600 file to .avi

**HD Stereo Production**
- Maya rendering of 1440x1080px left and right camera .tiff files
- import left and right .tiff files into AfterEffects
- create AfterEffects 2880x1080px stereo composition
- apply circular mask
- produce final form of animation using AfterEffects/compositing techniques
- output to uncompressed 2880x1080px Quicktime File
**HD Stereo Compression and Output**
- research and experimentation in HD stereo compression and playback
- consultation with Chris Ward and Dan Lawrence of Lightspeed Design, Inc.
- compress Quicktime file using PICVideo M-JPEG codec from Accusoft Pegasus
- output final file

**Overview of Animation Technical Processes**

The following techniques were the dominant technical processes used in constructing the animation.
A section-by-section analysis follows.

**Maya**
- parenting objects to motion capture markers
- parenting particle emitters to motion capture markers
- converting motion capture markers to curves using MEL scripting
- parenting curve emitters to curves generated from motion capture data
- particle dynamics
- particle MEL scripting, including custom attributes controlling radius, size, and rotation
- particle instancing
- soft body dynamics
- deformer animation
- shader manipulations of color, transparency, texture, glow, and incandescence
- animation of paint effects

**AfterEffects**
- basic manipulation of color values, curves, brightness and contrast
- basic blur functions using gaussian and compound blurs
- basic manipulations of opacity
- temporal manipulations using time remapping, wide time, echo, and time reversal
- layer compositing and blending
- circular masking
- assemblage of stereoscopic compositions

As detailed in the first chapter, stereoscopic techniques utilizing zero parallax and positive parallax are applied throughout the animation.
The sound composition process began with collaborative conversations, accompanied by consultations with Wildlife Science Professor John M. Marzluff, who gave us his field recordings of ravens for use in the composition. Composer Richard Johnson Logan-Greene describes the sound production process:

“I began working on the sound for Corpus Corvus by trying to understand Heather’s goals for the piece. She gave me an impressive amount of documentation about her intentions, inspirations, research and motivation. I worked through this material to get a feel for the whole piece, as well as how each section fit into the whole. Once I had done this, I basically forgot about it all for awhile as I began working on the details.

My first goal was to develop a library of sound files to use. I digitized four cassette tapes of recorded raven sounds that we received from John Marzluff. I removed the significant noise from these and selected about thirty short sounds (0.5 - 3 seconds) to use.

Because many of Heather’s ideas for the piece were based on human conceptions of ravens, I thought it would be very interesting to include an aural human element. I recorded Heather, John, and myself vocally imitating the sound files I had selected. Then I combined these recordings with the original raven sounds, in such a way that I could control the amount of human contribution to the whole. This proved to be a valuable sound library for the piece, despite the fact that there was less variety than I expected, as Heather and John were quite skilled at imitating the sounds.

Once I started working on composing each section, my first step was to create a foreground layer that audibly represented the dominant visual element (choreography and/or animation) as closely as possible. This meant placing specific raven sounds (often quite distorted) at specific times to fit a particular movement. This process was painstaking, and rather uninspiring, but it created a foundation for the other sounds, and a strong connection with the visual elements and overall integrated composition.

After this foreground layer was in place, I added background layers to achieve the appropriate feel for each section, and to address other visual elements that were not a part of the first composition layer.

At one important stage, I made ten or so sound ideas that were not connected to any animation or choreography, and Heather played with these ideas for sections that I hadn’t composed yet. Though I did quite a bit of work after she made her suggestions, most of the ideas remained in the piece and were very effective. This was a valuable step in the process.

Once the first draft of the entire sound composition was complete, it became clear what was working and which sections were lacking, and the last two or three months were spent refining each section and adding sounds and textures to fill out the whole.

The audio processing involved in this project was very straightforward. A large percentage of the sounds used (perhaps 70%) were the original sound files, slightly or drastically modified. The manipulations to these files included playback rate modifications (sometimes significantly), percussive envelopes added to the sound files, and large textures created with huge numbers of playbacks.

Most of the rest of the sounds came from ATS 29 analyses of the raven sounds. These were either played back directly (often transposed or with increased durations) or used to control filters. These processes enabled me to maintain the spectra from the original recordings, while getting unearthly, distorted sounds that worked with Heather’s animations nicely.

My process for this piece was very different from what I am used to for a pure composition because all of the large formal decisions were made by Heather, often before I started work. I found it very liberating to be free of these questions. Also, working with Heather forced me to break out of some of the regular composition ruts that I like to use. The collaboration was a tremendously enriching experience for these reasons.”

–Richard Johnson Logan-Greene
Construction Processes

**Animation:** The *formation* animation was constructed by parenting spheres of three different sizes to randomly selected motion capture markers. Shaders oscillated in saturation and luminosity values. Subsets of the markers were then rendered from four different camera angles. In AfterEffects, temporal manipulations including echo, wide time, and reversal processes were applied, as well as color value manipulations, and extensive layer compositing and blending. In performance, the motion capture animation is largely synchronous with the physical choreography, but also contains indirect elements as a result of the four different camera angles on the motion capture data.

**Sound construction notes from Richard Johnson Logan-Greene:** *formation* begins with a number of ATS sounds filtering a background of random raven sounds. For the first part of the section, the filters were synced with the stream-like animations. For the second part of the section, they were synced with the dancer’s movements.


*Media Composition – Section 2: throat*

**Figure 45: Corpus Corvus Section 2: throat.**

*Construction Processes*

**Animation:** The *throat* animation was constructed using soft body dynamics and deformations on a concentric series of torus shapes. It is worth noting that this primitive shape is one of the archetypal forms identified by constructal theory. The soft bodies were manipulated by lattice deformers in temporal synchronization with the gestures of the physical body. The animation is also affected by gravity and turbulence fields. AfterEffects processing involved wide time and blur functions, in conjunction with layer blending. In performance, this animation functions as a physical gesture animation, entangling around sustained expressions of the physical body and evolving in subtle symbiosis with the physical choreography.

**Sound construction notes from Richard Johnson Logan-Greene:** The sound for *throat* was primarily percussive envelopes on raven sound files.
Media Composition – Section 3: wing/eye

Construction Processes

**Animation:** The *wing/eye* animation was constructed largely from controlled lightning-based paint effect objects. Again, it is worth noting that this irregular, branching tree structure is the dominant archetypal form identified by constructal theory. The animated synapse-like structures grow and accumulate over time. Modeled geometries with dramatic shaders are then introduced when the eye forms. In performance, this animation functions as a physical gesture animation, piercing the spine of the performer during the *wing* section and converging into her head during the *eye*.

*Sound construction notes from Richard Johnson Logan-Greene:* *wing/eye* included many recordings of humans imitating the sound of ravens’ wings, with some percussive envelopes and filters on top of that. The emergence of the eye is a combination of three ATS raven sounds, slowed down significantly.
Construction Processes

Animation: The *dreaming* animation was constructed by parenting particle emitters to seven motion capture markers: clavicle, left finger, left knee, right back head, right finger, right front waist, right metatarsal. Emissions rates were animated based on the rate of physical movement. MEL scripting was used to randomize particle radius and control change in color value across the duration of particle lifespan. Animated turbulence and gravity fields were applied to the particles. At the end of the section, the particles collide with a soft modified plane surface functioning dynamically as a hard body, as the particles settle on the ground. Spherical particles were chosen based on the irregular circular forms that comprise most Australian Aboriginal Dream Paintings. Basic fine-tuning of color values and textural manipulations achieved through layer compositing were completed in After Effects. In performance, this animation functions in relatively precise alignment with the physical choreography, although it is rotated in slight discrepancy from the directional facing of the dancer.

Sound construction notes from Richard Johnson Logan-Greene: *dreaming* was simply a series of ‘chords’ made by filtering a wash of raven sounds.
Construction Processes

**Animation:** The *claw* animation was constructed from motion capture data of the *dreaming* choreography. Two consecutive particle structures form, then dissolve with turbulence. The particle structures are generated from emitters parented to one motion capture marker (part 1: right foot and part 2: left hand) then concentrically duplicated 30-50 times. MEL scripting was used to randomize particle radius. Extreme, animated turbulence creates the dissolution as the raven appears to attack or dive into the particle field. The animation is rendered from a birdseye view. Again, spherical particles were used based on their resonance with Australian Aboriginal Dream Paintings. Basic fine-tuning of color values and textural manipulations achieved through layer compositing were completed in AfterEffects. Although this animation is generated from motion capture data, in performance, it functions primarily as a physical gesture animation. Overall, it is largely asynchronous with the choreography, but shifts dramatically at the key gestural moment of the raven’s attack.

**Sound construction notes from Richard Johnson Logan-Greene:** *claw* consisted almost entirely of straight raven sounds with percussive envelopes.
Construction Processes

**Animation:** The *belly* animation was constructed largely in AfterEffects, compositing material from sections 1, 3, and 7-8: *formation*, *wing/eye*, and *heart/brain*. The resulting animation was the product of an interesting, experimental compositing process that synthesized and composed pre-existing material both two-dimensionally and three-dimensionally. In performance, the *belly* animation functions largely as a physical gesture animation. The pre-existing *formation* layer is generated from motion capture data, and positioned so that it traces the body in space, but the choreography is asynchronous with the animation. Overall, the composition is gesturally aligned in time and space.

*Sound construction notes from Richard Johnson Logan-Greene:* *belly* included a foreground of ‘bad digestion’ sounds made up of raven sounds played back slowly, and ATS versions of the same sounds. The background for this section was made of percussive envelopes and filters.
Construction Processes

**Animation:** The *heart/brain* animation was generated from motion capture data in combination with particle instancing and animated paint effect objects. Particle emitters were parented to seven motion capture markers: left thigh, right forearm, thoracic vertebra 10, right ankle, left back hand, left elbow, and clavicle, generating particles for the first portion of the animation. Particle instancing was used to create tiny synapse-like tree structures, evocative of the *wing* animation, in the wake of the body’s motion. MEL scripting was used to generate and control custom size and rotation attributes. The paint effect objects grow and branch over time, until they converge in a stereoscopic neural, solar landscape. Substantial layer compositing in AfterEffects produces the color manipulation and textural complexity. The animation resolves with a condensation that dissolves, metaphorically, into the mouth of the dancer as the raven swallows the sun. In performance, this animation functions both with loose motion capture synchronization and as physical gesture animation.

**Sound construction notes from Richard Johnson Logan-Greene:** *heart/brain* included all of the material from the first six sections. As the dancer revisits various movements, the sound objects from these movements return. There is a greatly expanded ‘eye’ sound from the *wing/eye* section, with thunder and other environmental sounds added to create the climax.
Construction Processes

**Animation:** The *spine/dissolution* animation was constructed from motion capture data converted into curves through MEL scripting. Four curves were created: right arm, left arm, right leg, left leg. A curve emitter was parented to each curve. The particles have a random range lifespan of 10-15 seconds. MEL scripting controls both random variation in radius size, and reduction in radius over the duration of the particle’s lifespan. Spherical particles were used, and texturally manipulated by gaussian and compound blur processes in AfterEffects. The final image of the night sky is a paint effect object created in Maya. In performance, this animation functions with precise synchronization between choreography and motion capture animation. The dancer is the spine of the animation, which articulates particles with the curves of its extremities. The final moment is a physical gesture animation, as the raven opens its arms and unfolds a night sky.

**Sound construction notes from Richard Johnson Logan-Greene:** *spine/dissolution* included the chords from the *dreaming* section, and heavily filtered single raven sounds. The end is straight, unprocessed recordings of ravens.
END NOTES


30. Richard Johnson Logan-Greene, email message to author, April 21, 2011.


David, Jacques-Louis. The Death of Socrates, 1787.


Gabo, Naum. Kinetic Construction (Standing Wave), 1919-1920.

George Coates Performance Works. 20/20 Blake, 1997.


