

Corpus Corvus:

Stereoscopic 3D Mixed Reality Dance Performance

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ABSTRACT

Corpus Corvus is a 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. Formally, the work 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 contextualizing *Corpus Corvus* is a practice-based exploration and discovery of an emerging poetics that extends the human sensory system into immersive media perceptual hyperspaces. This document illuminates the process of research, manifestation, and discovery that informs the artwork and its poetics.

INTRODUCTION

Corpus Corvus is a 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. 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 completed by a sound score based upon ravens' vocalizations abstracted through human imitation and technological processing.

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.

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.

Corpus Corvus is performed by a solo dancer. The performance space consists of a 9' diameter circular scrim with stereoscopic projection, theatrical lighting, and stereo sound. The artwork premiered in Seattle, Washington, USA, on February 5, 2011.

Corpus Corvus was developed as a doctoral dissertation at DXARTS, the University of Washington's Center for Digital Arts and Experimental Media. The piece was created by physical/media artist Heather Raikes in collaboration with composer Richard Johnson Logan-Greene, sculptor James Ryan, lighting designer Peter Bracilano, and dancer/choreographers Eric Geiger and Julie Funk. Manifestation of the artwork encompassed an array of collaborative research infrastructures, including DXARTS, the University of Washington's Department of Computer Science & Engineering, the University of Washington School of Forest Resources, the Performative Computing Lab in the Center for Research in Computing & the Arts at the University of California San Diego, the University of Washington Dance Program, and the Department of Theatre & Dance at the University of California San Diego.

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*, 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 aesthetic.

The art/research process informing and contextualizing *Corpus Corvus* is a practice-based exploration and discovery of an emerging poetics that extends the human sensory system into immersive perceptual hyperspaces. Four primary research trajectories constitute the technical and artistic foundations for the artwork: *mixed reality performance*, *contemporary mythos*, *expanded embodiment*, and *immersive media composition*. This document summarizes the process of research, manifestation, and discovery within each of the four trajectories – toward the macrocosmic objective of illuminating the technical, aesthetic, and intellectual underpinnings of this 21st century artwork. 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 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 *Corpus Corvus* represented here provides a comprehensive account of its process of becoming – with the intention of both articulating groundwork for its ensuing poetic system, and evoking a sensate understanding of its experiential intent.

MIXED REALITY PERFORMANCE

“... a human being struggles in space. The theatre is the art of the human being in space.”
– Jean-Louis Barrault [1]

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.

Research Foundations

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. [2]

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, and the audience is immersed within the 3D spectacle of a mixed reality performance myth.

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 [3]; the *Circular Total Theatre*, a theatrical system consisting of twelve round stages and a suspended apparatus that dramatized the sun and moon [4]; 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.[5] 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.

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.” [6]

Further, 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.” [7]

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. [8]

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. [9]

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. [10] 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.” [11]

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 pioneered and gestured toward.

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.

Elements of Form & Technical Processes

In its February 5, 2011 premiere, *Corpus Corvus*' mixed reality performance environment consisted of a Christie Mirage HD6 stereo projector illuminating a 9' diameter circular scrim on a freestanding frame. 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 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.

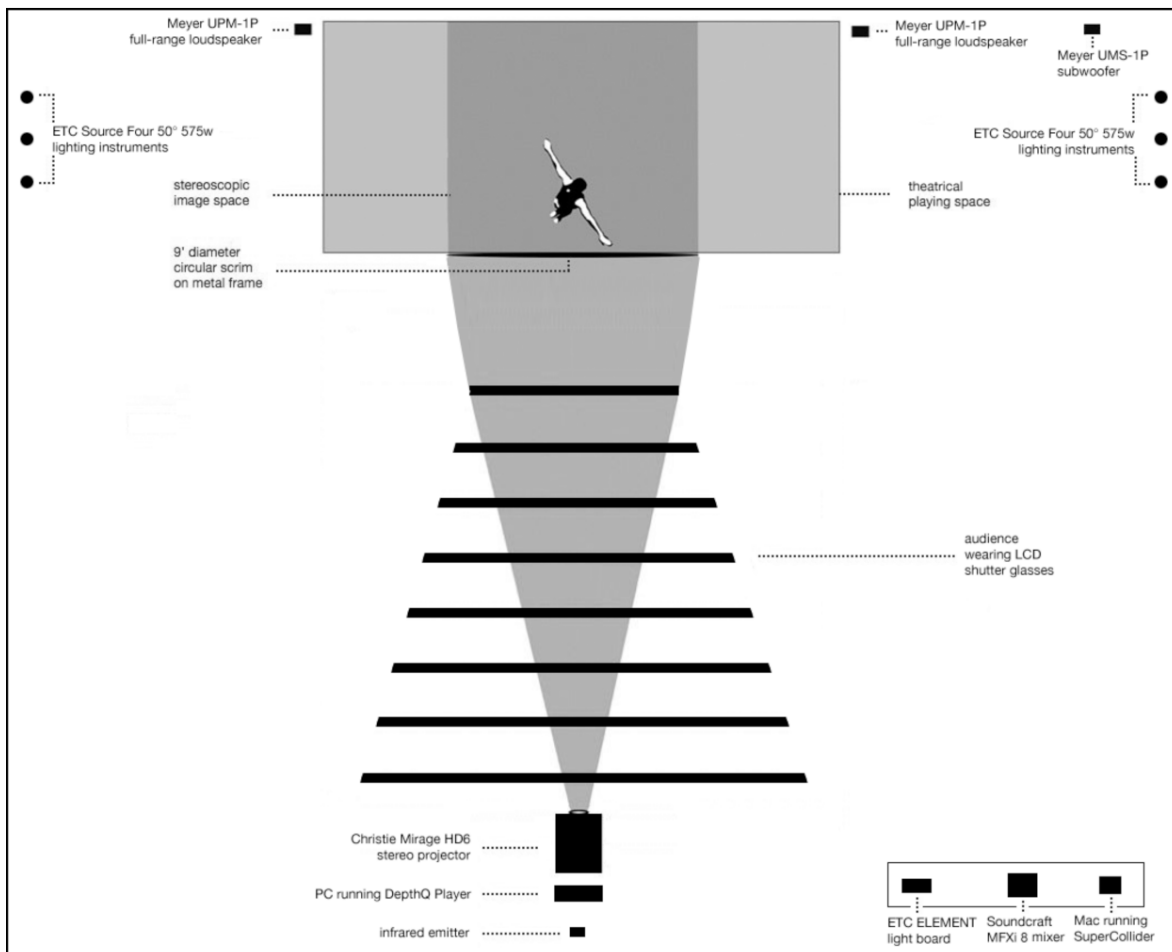


Figure 1. Diagram of *Corpus Corvus* Mixed Reality Performance Infrastructure. (© 2011, Heather Raikes. Used with permission.)

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.

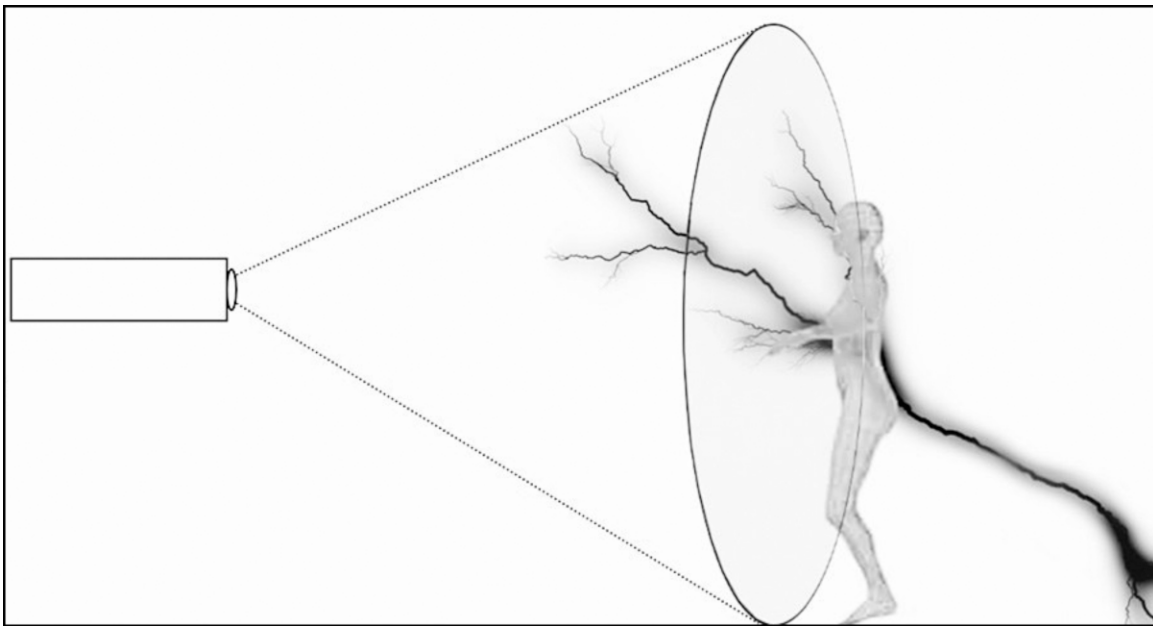


Figure 2. *Sketch of Stereoscopic Theatrical Composition.* (© 2009, Heather Raikes. Used with permission.)

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.

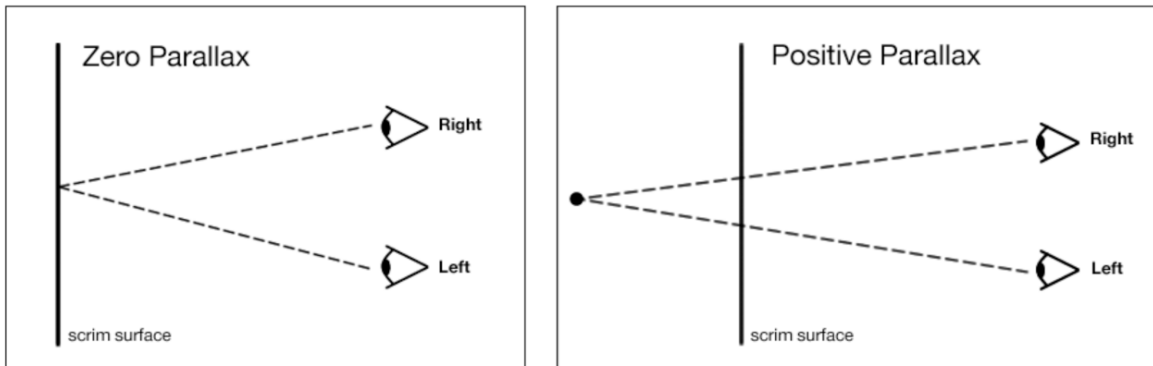


Figure 3. Parallax Diagram. (© 2011, Heather Raikes. Used with permission.)

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 freestanding 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 scrim, a standard piece of white sharktooth 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 4. *Corpus Corvus* Lighting Design. (© 2011, Julia Bruk/Heather Raikes. Used with permission.)

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. For the premiere, side lighting was used exclusively, which created an interplay of shadows and forms on the walls of the space, and brought another visual dimension into the work. 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.

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.

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

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.

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.



Figure 5. *Corpus Corvus*. (© 2011, Julia Bruk/Heather Raikes. Used with permission.)

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. 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. [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.

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." [14] –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 body of the raven, *Corvus corax*; the dances of Loie Fuller; the choreography and embodiment ideologies of Erick Hawkins; archetypal gesture as articulated in 20th century sculpture by Naum Gabo, Constantin Brancusi, and Alberto Giacometti; and movement abstracted into data through motion capture.



Figure 7. *Corpus Corvus*. (© 2011, Julia Bruk/Heather Raikes. Used with permission.)

Research Foundations

A 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." [15] 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.

The mid-20th century work of dancer/choreographer Erick Hawkins provides arguably the deepest, most fertile ground from which this 21st century expression of embodiment arises. I began my career as a modern dancer with the Erick Hawkins Dance Company. 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.

Several significant 20th century sculptures also 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 embodied physical form that poetically resonate between materiality and immateriality. *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. Both *Bird in Space* and *L'Homme qui Marche* abstract and distill the essence of primal, poetic motion to a singular gesture that transcends the physical attributes of the body captures the essence of its movement in space – revealing an expression of the whole that unites its constituent parts, and evokes the expanse that contextualizes the form.

The final foundational influence for *Corpus Corvus*' articulation of embodiment is motion capture, and the translation of physical movement into animated data. 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 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.

Elements of Form & Technical Processes

Fundamentally, *Corpus Corvus*' choreography is not confined to the physical body, but is 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.

Manifestation of this unique choreographic expression involved both physical and media aspects, and 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. The 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 through refinement of 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; final 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.

For motion capture, *Corpus Corvus* utilized the Vicon iQ 2.5 system, both in 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. It is 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, use of reflective markers limited some movement options, as the markers had to remain visible and affixed during movement execution.

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...”[16]

“...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.” [17]

— Antonin Artaud

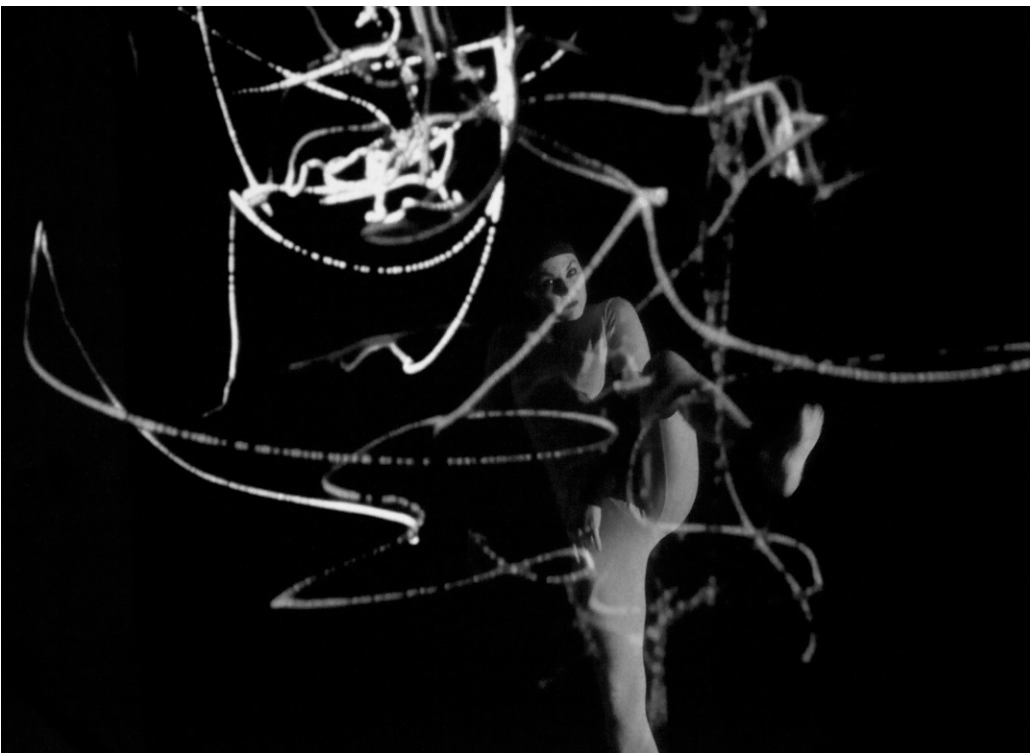


Figure 6. *Corpus Corvus*. (© 2011, Julia Bruk/Heather Raikes. Used with permission.)

Corpus Corvus' final research trajectory is immersive media composition, encompassing animation, sound, and orchestration of its visual, aural, and kinesthetic components. This research provides groundwork for *Corpus Corvus*' evolutionary articulation of a new poetics, and connects historically to the pursuit of an immersive theatrical language and performative sublime that extends across millennia.

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 the notion of ‘liquid architecture,’ as articulated in poetic histories ranging from Goethe to Marcos Novak, evoking a fluid, three-dimensional articulation 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. 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.

Within the context of a larger research trajectory that builds upon the research foundations discovered and developed in *Corpus Corvus*, somatic media architectures are 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.

CONCLUSION

In conclusion, the construction and aesthetic experience of *Corpus Corvus* provide groundwork for an emerging poetic system that extends the human sensory system into immersive transformative perceptual hyperspaces. The foundational ground for this system is the *Poetics* of Aristotle and its relation to the ancient Greek theater as a practical systemic ideology for the mythic Greek drama. As Aristotle’s *Poetics* posits six basic components for the construction of drama (plot, character, thought, diction, song, spectacle) this neopoetic system has six constituent aspects: *expanded embodiment*, *experiential metaphor*, *technoetic mythos*, *matrix architecture*, *perceptual resonance*, and the *rheomode*.

Expanded embodiment fundamentally refers to an extension of the sensate human body into dematerialized dimensions of experience, expression, and exchange. Expanded embodiment provides the foundation for *experiential metaphor*: a poetic dilation that is rooted in the physical body and unfolds metaphorically through its immaterial extended dimensions. A cumulative series of experiential metaphors creates the meta-body of *technoetic mythos*. *Technoetic*, referring to the merging of consciousness and technology, converges with the ancient history of human mythos through the prism of digital language.

The next two neopoetic aspects: *matrix architecture* and *perceptual resonance*, refer to the immersive media language structures through which the mythos is articulated. Matrix architecture provides the framework for the integration of visual, aural, temporal, spatial, and kinesthetic sensory experience. Perceptual resonance refers to the cathartic awakening of "the space between the senses" evoked by the alignment of perceptual elements through matrix architecture. From the immersive fluidity of perceptual resonance emerges the mythic, transformative experience of the *rheomode*.

A term coined by quantum physicist David Bohm, the *rheomode* is experiment in language that expresses reality in terms of movement, flow, constant transformation, and nondifferentiation. Bohm posits the rheomode in contrast to our customary mode of language and perception, which reinforces the static, discrete perspective of the particle. Revealing and describing the mirror aspect of material form, the rheomode is the language of the quantum wave.

Media documentation of *Corpus Corvus* can be accessed via www.heatherraike.com.

REFERENCES

1. Barrault, J. (1951) *Reflections on the Theatre* (Wall, B., Trans.). London: Theatre Book Club.
2. Wagner, R. (2001) The Artwork of the Future. In Parker, R & Jordan, K. *Multimedia: From Wagner to Virtual Reality* (pp. 3-9). London: Norton.
3. Kirby, M & Kirby, V. N. (1971), *Futurist Performance*. New York: PAJ Publications.
4. Kirby, M & Kirby, V. N. (1971), *Futurist Performance*. New York: PAJ Publications.
5. Kirby, M & Kirby, V. N. (1971), *Futurist Performance*. New York: PAJ Publications.
6. Kirby, M & Kirby, V. N. (1971), *Futurist Performance*. New York: PAJ Publications.
7. Burt, S. & Barker, C. Clive. (1999). IOU and the New Vocabulary of Performance Art. *Theatre Quarterly* 10, no. 37 (Spring): 70-94.
8. Dixon, S. (2007). *Digital Performance: A History of New Media in Theater, Dance, Performance Art, and Installation*. London and Cambridge, MA: MIT Press.
9. Shanken, E A., Ed. (2009). *Art and Electronic Media*. London and New York: Phaidon Press Limited.
10. Dixon, S. (2007). *Digital Performance: A History of New Media in Theater, Dance, Performance Art, and Installation*. London and Cambridge, MA: MIT Press.
11. Burian, J. (1971). *The Scenography of Josef Svoboda*. Middletown, CT: Wesleyan University Press, 1971.
12. Hawkins, E. (1992). *The Body Is A Clear Place and Other Statements on Dance*. Princeton, NJ: Princeton Book Publishers.
13. Sutton, P., Ed. (1988) *Dreamings: The Art of Aboriginal Australia*. New York: George Braziller Publishers in Association with The Asia Society Galleries.
14. Hawkins, E. (1992). *The Body Is A Clear Place and Other Statements on Dance*. Princeton, NJ: Princeton Book Publishers.
15. Brannigan, E. La Loie as Pre-Cinematic Performance – Descriptive Continuity of Movement. *Senses of Cinema: 28*. Retrieved March 30, 2011, ISSN 1443-4059, from http://www.sensesofcinema.com/2003/28/la_loie/
16. Artaud, A. (1958). *The Theater and Its Double* (Richards, M.C., Trans.). New York: Grove Press.
17. Artaud, A. (1958). *The Theater and Its Double* (Richards, M.C., Trans.). New York: Grove Press.