

# Re-Scripting the Stage: Performance and Interactivity

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Fig. 1 Katsura Isobe [right] in organic Gingko leaves dress dancing the “creation scene” actuating 3D virtual landscape projected onto weather ball. *UKIYO*, Sadler’s Wells © 2010 DAP-Lab

## Interaction and graphic phantoms

Around the turn of the millennium observers of the performing arts noticed that the marriage of dance and technology had produced some significant stage works which startled audiences and drew attention to *digital dance* and *interactivity* in the theatre. Projections of virtual dancers appeared on screens in Merce Cunningham’s *Hand-drawn Spaces* and *BIPED*, emanations or graphic phantoms that fluttered in space while the real dancers performed the choreography on stage. In *Ghostcatching*, Bill T. Jones’s animated figure danced a virtual solo, at times alone and then with multiple copies of “Jones” spawned from the data extracted (motion-captured) from the performer’s body. The virtual Jones was heard talking, grumbling and singing, which gave the animation an eerie sense of the surreal. In Trisha Brown’s *how long does the*

*subject linger at the edge of the volume...*, projected graphic creatures interacted with the dancers on stage as if drawn to the human bodies and their movement. The jagged geometric creatures as such (irregular triangles, squares, rectangles, lines) remained indeterminate images hovering between abstraction and figuration, unaware that they were acting. Yet the graphic phantoms, sometimes referred to as digital doubles, have become supplements, algorithmic emergences allowing us to reflect upon the mediations between bodies and technical beings.

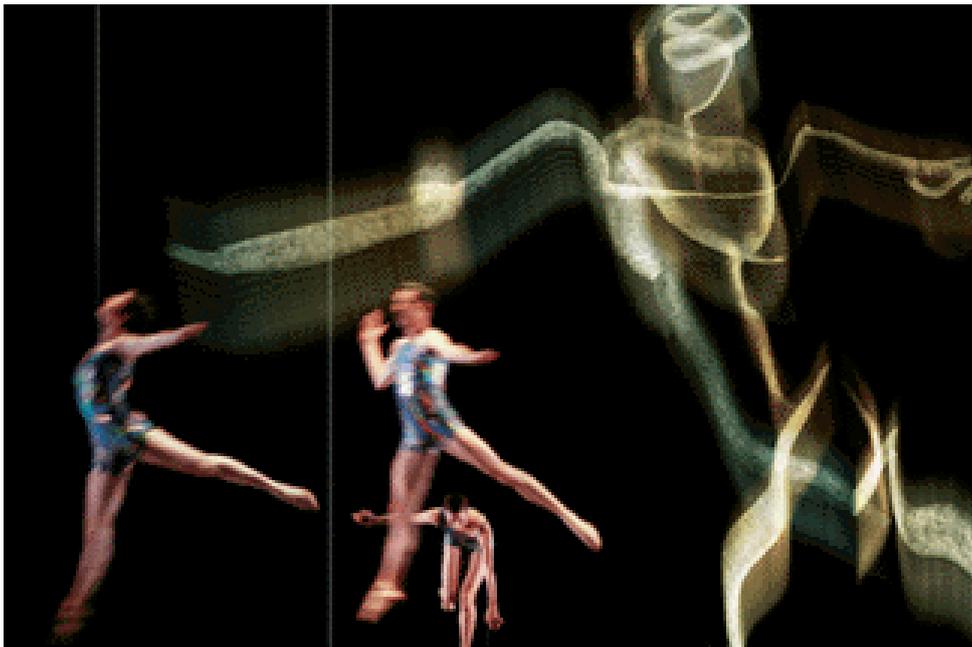


Fig. 2 Merce Cunningham Dance Company, with Paul Kaiser/Shelley Eshkar. *BIPED*, 1999. Photo: Archive/Stephanie Berger

While the growth of computer-based art and the paradigm of interactivity are accepted phenomena in today's art world and everyday culture, the genre of "digital performance" is still barely defined.(1) Digital performance art has also run into limitations that concern both compositional practice (e.g. the dramaturgical placement of interfaces for trained performers in a stage work) and the participatory promise of interactive design for audiences (who have not trained with the interfaces or cannot intuitively navigate the programmed parameters). In artificial intelligence research, engineers are working hard towards toward instilling learning capabilities into their creatures: intelligent technical organisms might learn from the behavior of the audience or the processual systems (artificial life, multiagent populations) develop their dynamic (self)reconfigurations – their emergence.(2)

The question whether participatory design and emergence are actually achievable or desirable in stage-centered performances was recently addressed by the *Pixelspaces* symposium “Re-Scripting the Stage” at the 2011 ars electronica:

Interactivity and participation have been core elements of media art since its very inception. In performances and installations produced in recent years, more or less successful attempts have been made to put this immanent interactive element in the hands of the audience attending the performance – for example, through the use of various tracking technologies. In addition to the attendant problems associated with people’s inability to grasp the connection between cause and effect, the process of enabling audience members themselves to generate sounds or visuals often quickly results in the exhaustion of the performance’s aesthetic, emotional or intellectual quality. In the spirit of our contemporary Age of Participation in which social media and a digital lifestyle set the tone, we will conduct a transdisciplinary discussion on innovative participatory scenarios for the multimedial stage-audience context ...in the future (*Pixelspaces* program).

If it is euphemistic to speak of the “age of participation,” it is certainly pertinent to inquire about the aesthetic, emotional or intellectual quality of performances that deploy technological interfaces to generate new methods for bringing interaction and audience participation into stage performances. In the following, I sketch some ideas that have informed my recent work – the mixed reality installations *Suna no Onna* and *UKIYO [Moveable Worlds]* – to illuminate some of the problems inherent in interactional design,

### **Trackback: Experimentation through Visualization/Vibration**

Before one can re-script the relations between performance-system and audience, a focus on performer techniques helps to advance critical reflection on how design and capture technologies (e.g. audio and camera recording, editing, motion capture) have evolved over the last hundred years, if we recall early modernist experiments with sound instruments and moveable design (the *intonarumori* of the Futurists; the motion designs of Schlemmer’s Bauhaus dances; the constructivist experiments of the Russian avant-garde around the time of Malevich’s collaboration with Khlebnikov, Matiushin and Kruchonykh on *Victory over the Sun*) as well as early developments of

chronophotography and film (Marey, Méliès, Muybridge, Vertov, Eisenstein). Today's graphic animations and digital projections are indebted to the long history of cinema, cine-danse, *anime* and multimedia performances which incorporate projections of animations and motion pictures. The projection media showed the compatibility between live dance and the moving image, between the polyrhythmic components of movement and the fluid digital behaviors of images and sound.

Felicia McCarren's historical study of the close connection between dance and the developing technology of the cinema provides evidence of the many convergences of movement and machines during the industrialization of images. Her focus on early machine culture (and Taylorist optimization of labor) also helps to situate "performance" and animated images within the context of work-science and studies on the economization of movement, designed to increase worker output and to distill the movements of the body to an energy-efficient productivity.(3) In her chapters on "Economy of Gesture" and "Choreocinema," she explores how the preoccupation with movement implicated dance in the field of work-science and the development of early cinematic technologies, pointing at Étienne-Jules Marey's time-motion movement studies using sequential chronophotography. She unearths a fascinating poster from 1896 advertising the then-new cinematic technology: a Loïe Fuller-esque dancer figure spreads her voluminous skirts providing a surface for the projected image of a train. Fuller's own innovative electric performances – with light projected onto her whirling fabrics in *Serpentine Dance* – represent an early example of "wearable" technology still relevant to today's smart clothing and interaction design.(4)

McCarren's account of how cinematic precursors made the visual analysis of the components of movement possible made me re-think the adoption of motion capture technology for dance I experienced in my studio around 2001. Computational mapping of gestures allowed breaking movement down into bits of assimilable and manipulable data.(5) Both the neuroscientific context of analyzing sensorimotor activity, providing new phantoms of movement through visualization techniques such as functional magnetic resonance imaging (fMRI), and the newly available figure animation (LifeForms, Maya, 3D Studio Max, Character Studio, etc) and real-time interactive software (Max/Msp, PD, Isadora), induced my ensemble to look back at

earlier movement-sensitive machines and perceptual techniques. For early rehearsals on *UKIYO* we looked at Aleksej Kapitanovich Gastev's engineering experiments in his Moscow Institute at the beginning of the 20<sup>th</sup> Century.(6) Gastev used early graph-writing machines that could quantify motion, and two images stood out which we used for our rehearsals, one showing the measuring of a woman worker with a prosthetic arm wielding a hammer, the other displaying a diagram of the strike force of the hammer.

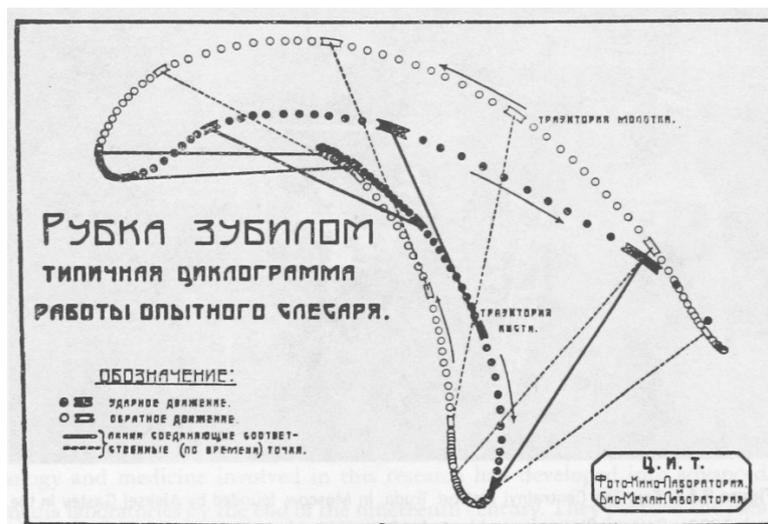


Fig. 3. Top: Strike and pressure: A demonstration of the chronocyclographic method in Gastev's Moscow Institute (C.I.T) by a female worker with an artificial arm. Two photophorescent dots are fixed on the hammer so that the movements can be recorded photographically as curves. On the right side of the picture an assistant holds a measure to provide a scale. Bottom: Diagram of the movements of a worker wielding a hammer. Photos: Reprinted courtesy of Siegfried Zielinski.

The force of a movement takes visual form, plotted into dots and lines, curves and trajectories, seemingly abstracted but also visibly drawing a temporal event, curves of movement that evoke the kinegraphic and kinesiological method Rudolf von Laban would use in his studies of human movement, or that Oskar Schlemmer, following Kandinsky, used for his drawings/choreography of “Figure in Space” and “Space Dance” – compositions which consisted primarily of dancers moving from point to point and assuming pose after pose.

While Erin Manning argues that we always feel or perceive whole activities of undifferentiated experience – experiential duration that is not divided into actual objects – the method we see depicted in Gastev’s diagrams or in Muybridge’s rapid-movement stills indicates discrete “frames” of perception, measures *of* movement and not *in* movement, and thus a representation of movement in its discrete elements becomes possible, and succession of (sometimes imperceptible) movement shapes can be made visible. The diagrams trace movement analogous to drawing movement, but they also function in the sense of early analogue technologies of recording, for example when phonograph records were created to reproduce sound through the vibrations made as the needle moves along the grooves on the record: the grooves are analogous to the sound waves originally produced. Edison’s first recording of the sound of his voice was made by the indentations the vibrations of his voice made on a sheet of paper passing over a rotating cylinder. Observing Gastev’s diagrams we began to ask how movement gestures could be made audiophonic instruments, embedding an analogue process visibly and sensually into the environment of our interactive systems, cracking the computational parameters a little or subjecting them to the corporeal: to more unpredictable eventfulness and dexterity, especially as we focus on wearable devices, garments and accessories for a kinaesonic choreography. The auditory and synaesthetic vibrations of movement, and the enhancement of the vibrational sensing body in movement, became the core of our artistic work.

### **Wearable space and wearable sound**

Like *Suna no Onna*, which was inspired by Hiroshi Teshigahara’s 1964 cinematic interpretation of Kobo Abe’s novel *Woman in the Dunes* and resulted in a choreographic installation with three live performers, *UKIYO [Moveable Worlds]* is a

transcultural project, collaboratively developed with butoh dancers and artists in Japan. “Floating” became the conceptual metaphor for our installation, inspired by Hokusai’s drawings and the Japanese *ukiyo-e* tradition of the Edo period, especially the landscape prints, the smaller drawings (*ryakuhitsu*) of working men or women showing industrious activities, and the “actor prints” depicting portraits of well-known Kabuki actors. Art historians suggest that these prints were created in direct reference to the actors’ appearance in particular scenes that could then be recalled and re-heard by audiences who knew the performances of characters thus making the prints “audible.” In our conception of an interactive performance, the dancers perform intricate gestural relationships to images and sounds, drawing the audience into/inside the dramaturgy to open up a collective space of hearing.

In order to create our audible moveable world, we worked with three primary dimensions; (1) an intricate *hanamichi* movement environment (spatial design); (2) movement of sound (from macro to micro levels) and engineering of sound devices to be worn on the body; (3) movement images (projections of digital objects and virtual spaces). Floating the audience inside the performance space implied dissolving any borders between stage and auditorium. We used this concept along with the ideas behind our wearables (intelligent garments) developed in previous design-in motion performances.

To some extent, *UKIYO* takes the idea of Loïe Fuller’s electric dance literally, using the fabrics of costumes as projective and reflective/resonating materials but also integrating small acoustic instruments into them. In *Suna no Onna* (2007-08), our ensemble had experimented with the concept of “wearable space,” transposing visual characteristics of the dancers’ wearables onto the projected environment – the landscape of dunes that framed the action. The particular physical form of the garments, existing in the real world, influenced the movement choices on the material level, and the designer (Michèle Danjoux) was concerned with the cut and the fabrication, the detailing, finishes, overall silhouette statements, the structures of the garments and how the bodies behaved in them, i.e. how they were *choreographed into movement*. On the iconic level, the wearables were transposed to the screens where they morphed into the graphic images and animations – artificial spatialities and *anime*-like “decorative” surfaces that were clearly digital. We used suspended paper

scrolls which had gaps between them, small intervals that broke the seamless landscape and allowed it to breathe as the (seated) audience was invited to perceive the dancers actuating the projected images through the slow or sudden displacements of the real.(7)



Fig. 4. Katsura Isobe with the morphic SandCoat and fish skin alone in the digital dunes landscape.  
Photo © 2007 Hans Staartjes



Fig. 5. Olu Taiwo with Katsura Isobe as the duneswoman, wearing rhythmic textures of the movement sensitive SandCoat. Photo © 2007 Michèle Danjoux

In the new work, we wanted the garments to project *sound*, and the choreography to be directed at *sounding gestures* with the audience intermingling in close proximity, and this required a shift from digital processing, and complete reliance on sensortized garments and MIDI transmission of kinetic/physical displacements (i.e. through the accelerometers), to a wider range of analogue techniques working through micro- and macro-sonic articulations. The audience was invited into the interior, immersive environment, and could experience the “recording” techniques and the conceptual fashion design more directly.

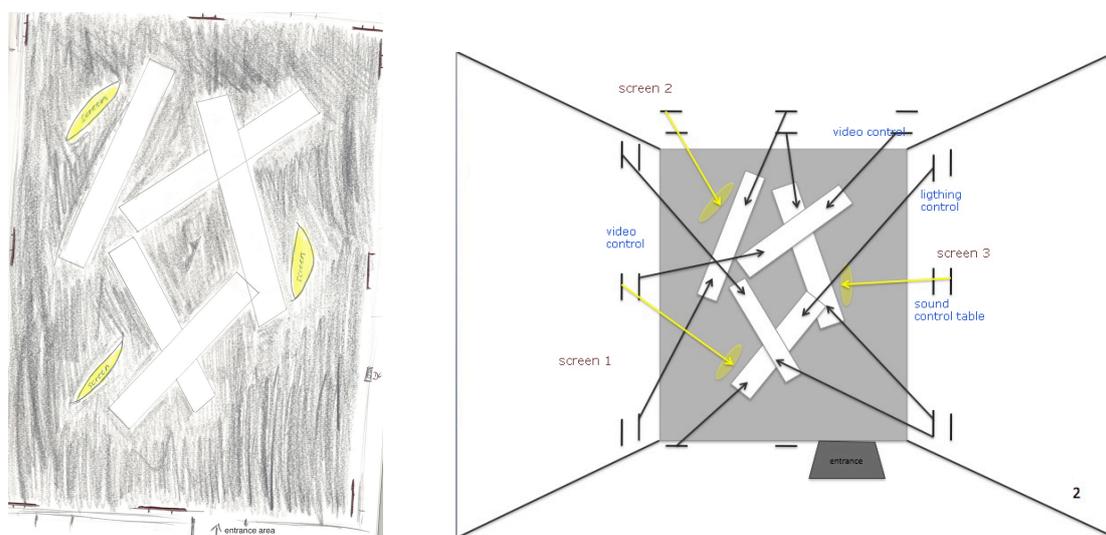


Fig. 6 Drawing and computer rendering of *hanamichi* for UKIYO performance environment © DAP Lab, 2009.

From a bird’s eye view, the five *hanamichi* were a symbolic character in itself: I wanted to evoke an abstract labyrinth that drew the audience into a system of corridors. The flat and curved screens were raised 2.5 metres from the floor and suspended from the grid, forming an irregular triptych for rear projection. On these screens the projected still/moving images unfold, in black and white and in color. Many of the images we shot are “portraits” of the performers, composed inside the studio or in outdoor locations. Some of the images are historical photographs – found objects recomposed into short animated films or layered into composite landscapes. The runways are white and allow special lighting to illuminate them or color them for the scenes of the dancers’ performance, which we choreographed as a series of solos (following a particular code of costume colors – red, white, black/grey, silver,

golden), and then as increasingly overlapping and simultaneous duets, trios and quartets that phased in and out of the fluid action as well being woven into the sonic environment created by the composer and the performers themselves.

In the scenographic process, projected “audible prints” and our performed characters build the narrative structure and subtexts (20<sup>th</sup> century revolutionary communist history, adapted from Christian Kracht’s dystopian novel *Ich werde hier sein im Sonnenschein und im Schatten*.(8) Our “wearable” sound score connects engineering history (industrial science linked to the transrational poetry/onomatopoeia of Khlebnikov, Gastev, and Kruchonykh) to audacious protective space suits of Cold War fashion, and the fictional language investigated by the African Kommissär in Kracht’s novel. Since our ensemble had worked with dresses incorporating wireless sensors before, their garments affecting the digital environment, we became fascinated by the communication system the engineer Brazhinsky calls “smoke language” (*Rauchsprache*). Here is the scene (with inter-titles) in the short *Entr’acte* film that bridges Part 1 and Part 2, with two actors appearing on facing screens:

Language is a collection of symbolic sounds, it originates in a cosmos of unrecognizable forms – which are above all, never knowable.

But please explain to me – how does the smoke language function?

Well, we begin to speak what we think, we place it into the space. Then we can look at the spoken, we can walk around it, and finally we can move it. Since it exists, we can move it.(9)

The plasticity of design lies at the heart of our performance; developing the characters (RedMutant, SpeakerWoman, HammerWoman, FactoryWoman, InstrumentWoman, Engineer, Kommissär) took many months of rehearsal, and thus it would be nearly impossible, given the narrative substructure of the dance, to involve audience participation directly. We relinquished any overt reliance on direct interactivity that needs software programs registering data transmission (input) and generating reactions (output). Such a system of mapping is indeed limiting to the complex wholeness of visual, kinetic and auditory/vocal movement, as the dancer in interactive systems needs to give too much attention to quantitative motion or acceleration/deceleration. *UKIYO* questions the stability of causal patterns of emergence that a software might operate upon within the overall system. When we

thought of data or numbers, we tended to imagine them in plastic and musical terms. Heterogeneous design inspirations were brought to the scenographic, choreographic, filmic and musical process our ensemble engaged. Composer Oded Ben-Tal conducted early tests with percussive gestures that we motion-captured to obtain data for sonic output.



Fig. 7. Olu Taiwo (front) and Yiorgos Bakalos (back) dancing amidst the audience in *UKIYO*, Sadler's Wells 2010 © DAP-Lab



Fig. 8. Anne Laure Misme as WorkerWoman with dysfunctional speaker bra, mini metal cage crinoline with tiny speakers, ostrich leather armlettes, rag wristbands, leggings, transmitter, contact mike and old vinyl record. *UKIYO*, Sadler's Wells, 2010 © DAP-Lab

Such kinetic data could be combined with physical recording gestures the dancers performed, but we decided not to use motion capture data since the acoustic and live electronic performances created much stronger plastic and sensual rhythms than we could achieve by triggering digital effects. We concluded that kinaesthetically and proprioceptively, gestural interactivity with real-time environments can deflect both from the physical virtuosity or embodied expressiveness of the performer and from the unpredictable qualities and metaphoric richness of moving scenographies (films, layered animations, networked video streams). In the poetic context of our performance, we preferred not to work with direct mapping and causal feedback. Our audience experiences “moveability” as a virtuality that was not overdetermined, in the sense in which digital programs determine, for example, the principal directions and speed of images: forwards, backwards, slow, fast, freeze.

In *UKIYO*, surprising and indirect relationships happen in a polyphonic manner: sounds and voices counterpoint, and also decenter, the visual medium. Interfaces require the “between” – the sense of convergence, grasping and letting go, a facing of one another, a touching and listening that also imply proximity, a closeness as in an

embrace when I allow the body to touch another body, sensing the other through the clothes. A continuity is experienced in such moments, perhaps in an intimacy we don't immediately know. We don't think of being intimate with technological devices, or being physically close to someone at a remote distance, even as our senses obviously extend into space and connect us to what we cannot see. In our design, garments and accessories become both intensive and extensive instruments of performance that are played in midst of the audience crowding the installation.



Fig. 9. Helenna Ren as HammerWoman wears lycra all-in-one body, necklace of tiny speakers and hinged polypropylene prosthetic arm with integrated bend sensor, eyelets and lacing feature, talon extended hand clutching hammer. *UKIYO*, Sadler's Wells, 2010 © DAP-Lab

The crowding also amplifies the space, and connects all of us, through the particular ways of walking, hearing in, and looking, pausing, moving about.(10) Speaking of “engineering” in our design, therefore, implies a touch of irony insofar as we are concerned more with social choreography than human factors design, hard-wiring or transduction. Obviously, the dancers wear functional as well as dysfunctional or obsolescent sound devices, but the aesthetic emphasis is always on the particular character of movement, not on the technology. One particular idea for the design was to build small speakers of various sizes as sound transmitters into the garments, and to explore the visual aesthetic of audio technology. Dancer Anne-Laure Misme was given a set of inverted, dysfunctional speakers to wear on her breasts; Helenna Ren performed a choreography with two larger, sound emitting speakers which she balanced on a yoke placed on her shoulders. Caroline Wilkins performs live on an

amplified bandoneon in Act 1, while in Act 2 her entire dress is designed as a bandoneon opening up and revealing, down her spine, a black leather strip with built-in speakers. Ren and Wilkins thus perform with wires, their amplified body/instruments connected to the sound system and into the sonic and image processing environments performed live by Ben-Tal, Sandy Finlayson, Doros Polydorou and myself on the laptops. Analogue and digital processes, in which the sound-gestural choreography interacted with the visual and audible scenography, with sonic diffusion, progression and image-movement in the projected environment as a whole, combined to create what we thought of as the ‘curved atmosphere’ of UKIYO.

Website: [www.people.brunel.ac.uk/dap/ukiyo.html](http://www.people.brunel.ac.uk/dap/ukiyo.html).

Label: [www.danssansjoux.org](http://www.danssansjoux.org)

## Notes

(1) Cf. Steve Dixon, *Digital Performance: A History of New Media in Theater, Dance, Performance Art and Installation* (Cambridge, MA.: MIT Press, 2007); Johannes Birringer, *Performance, Technology, and Science* (New York: PAJ Publications, 2008).

(2) Cf. the exhibition *Process as Paradigm – art in development, flux and change*, curated by Susanne Jaschko and Lucas Evers, for LABORAL Centro de Arte y Creacion Industrial in Gijon, Spain (23 April - 30 August, 2010). The exhibition catalogue can be found at <http://www.laboralcentrodearte.org/en/714-catalogue>

(3) Felicia McCarren, *Dancing Machines: Choreographies of the Age of Mechanical Reproduction* (Palo Alto: Stanford University Press, 2003). For a discussion of Marc Downie’s algorithmic creatures (which his collaborator Paul Kaiser described as “thinking images”), see Johannes Birringer, “Thinking Images: Conversation with Paul Kaiser and Marc Downie,” *PAJ* 89 (2008), 17-37.

(4) For research on wearable fashion and performance, see Xiaoming Tao, ed., *Wearable Electronics and Photonics* (Cambridge: Woodhead Publishing Ltd., 2005), and Jane McCann and David Bryson, eds., *Smart Clothes and Wearable Technology* (Cambridge: Woodhead Publishing Ltd., 2009).

(5) For a critique of mapping gestures and a defense of “unmappable” organic movement, see Erin Manning, *Relationcapes: Movement, Art, Philosophy* (Cambridge, Mass.: MIT Press, 2009), pp. 61-76.

(6) Cf. Siegfried Zielinski, *Deep Time of the Media- Toward an Archaeology of Hearing and Seeing by Technical Means* (Cambridge: MIT Press, 2006), pp. 227-53.

(7) See Johannes Birringer and Michèle Danjoux, “Wearable Performance,” *Digital Creativity* 20:1-2 (2009), 95-113.

(8) The choreographic installation we created uses no spoken words, but references a conversation between the Kommissär and Officer Favre, filmed in silent black & white/film noir style and projected as an entr'acte with inter-titles between Act I and Act II. *UKIYO*'s template combines several historical and narrative layers, for example the physical gestures reflecting Russian engineering (Gastev's motion experiments, as they are excavated in Zielinski's *Deep Time of the Media*, and some of the sound gestures referring to Khlebnikov and *zaum* as well as the Japanese ukiyo-e tradition and Hokusai's manga drawings; the film noir scenes were inspired by Kracht's novel.

(9) Kracht, pp. 43-44, my translation.

(10) The phrase "hearing in" is indebted to Tim Ingold's persuasive account of the experience of sound *in* movement, experienced, like breath or like the wind, as a movement of coming and going, inspiration and expiration. See "Against Soundscape," in Angus Carlyle (ed.), *Autumn. Leaves: Sound and the Environment in Artistic Practice* (Paris: Double Entendre, 2007), pp. 10-13.