

# Performance, Art, and Cyber- Interoceptive Systems [PACIS]

MARK-DAVID HOSALE, York University

ERIKA BATDORF, York University

KATHERINE DIGBY, Kansas State University

ALAN MACY, Biopac Systems

## About

Performance, Art, and Cyber-Interoceptive Systems (PACIS) research-creation uses bioinformatic sensing technology to create regulatory feedback systems in the pursuit of new forms of embodied performance, embodied human computer interaction, and embodied cognition. This research explores how technology can help us expose and augment non-volitional, autonomic processes of the body using performers who have developed advanced interoceptive awareness and an ability to recreate emotional states using The Batdorf Technique (TBT). We use the term Cyber-Interoceptive Systems to describe a feedback connection between performer, computer, other performers, the audience, and the environment facilitated by bioinformatic sensors. The formation of this research is drawn from the belief that human intelligence is an embodied intelligence, inclusive of the body and the environment. A view that is aligned with current trends in psychology and brain science. (Van der Kolk 2014; Damasio 1999)

Norbert Wiener, a pioneer in the field of cybernetics, describes cybernetics as the study of the communication and control of regulatory feedback both in living beings and machines, and in combinations of the two (Wiener 1948). In *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics* (2008), N. Katherine Hayles describes the rise of human-machine integration through the history of cybernetics. Through this history Hayles provides a critique of technology as moving us culturally away from a natural self, to a disembodied self, losing subjectivity as our intelligence is co-produced with intelligent-machines (a.k.a. the posthuman condition). The incorporation of cybernetics with interoceptive practices is done in conscious resistance to this tendency. Through our research we challenge the notions of disembodiment and technology by engaging somatic awareness practice to explore questions of human and machine integration. This research has the potential to help us increase our somatic awareness, make mediated emotive and somatic connections with each other, and help mediate the affect of an individual within an environment.

A unique aspect of this work is the incorporation of The Batdorf Technique (TBT). Developed by collaborator Erika Batdorf, TBT is an internationally renowned somatic education system that allows performers to access, catalogue and recreate emotional states and develop heightened presence through physiological awareness. This work relates to literature in

embodied cognition, which studies the empathic relationships between the observer and the observed that indicates that sharing the emotions of others is associated with activation in neural structures that are also active during the first-hand experience of that emotion (Singer 2009). The technique includes a carefully developed approach to emotional discovery during interoceptive awareness training. The technique organizes the practitioners access to located awarenesses related to involuntary systems (breath, blood circulation, temperature, relationship to gravity, etc.) that can be consciously modulated to vary the kinaesthetic state being. The training systematizes the full scope of a performer's work from the early stages of interoceptive awareness to the complicated juggling of somatic work with layers of external structure (from conscious exteroceptive musculoskeletal movement to choreography and memorized text) in the act of kinaesthetic communication with an audience.

The Batdorf Technique belongs to a class of somatic movement education techniques that focus on the re-education of the body to support holistic health, injury recuperation and prevention, and increased dynamic range of expression. The practice of somatics was defined and named in the 1970s by Thomas Hanna and others (Eddy 2009, 5-7) influenced by forms such as Yoga and Martial Arts and based on practices originating in the early 20th century. Somatics practice draws on several fields such as new interoceptive explorations in psychology (Ogen 2000; van der Kolk 2014; Payne 2015); body work (Rolf 1989; Rywerant & Feldenkrais 2003; Harer et. al. 2008); emotional work in actor training (Rix 1993; Schechner 2001; Adler 2002); and movement education (Hartley 1995; Hackney 2003; Groff 1995), with many techniques moving between these sub-areas.

This collaboration involves the application of qualitative methods of TBT with quantitative measures found in bioinformatic sensing applications for the development of cyber-interoceptive systems in the context of performance and human computer interaction. Our approach is to explore the question of whether or not there is a corollary between the experience perceived by the performer and the bioinformatic measures of the performer taken at the time of the experience. If there is a corollary, then several pathways for exploration emerge. Can the bioinformatic sensing be used as a feedback system to help train performers in TBT? Will it be possible to use somatic control as an interactive interface? If so, then can this system be used to develop new modalities of interaction between the audience and performer?

For these studies emotional state data will be gathered from Biopac's BioNomadix wireless sensing system (biopac.com) to gain physiological data from users, such as Blood Volume Pulse (BVP), Galvanic Skin Response (GSR), Facial Electromyography (fEMG), Electroencephalography (EEG), and situating these systems within an immersive performance context. The performance environment provides the ability to control the presentation of stimuli, monitor the physical reaction, and change the scene based on the reaction interpretation as nuanced by emotional state, blurring the line between high resolution auditory and visual virtual content and the physical experience (Chu 1997; Dani 1997; Bradley 2000; Nowak 2003; Västfjäll 2003; Takatalo 2008). The Biopac system is connected to Max (cycling74.com), a versatile tool that can be used in a variety of contexts, such as performances and installations that engage computational arts practice. In our experiments TBT trained performers, along with Digby, are assisting Batdorf and acting as participants in our research activities. Hosale and Macy are developing software in consultation with the performers and our research to date based on our work as a team including informal interviews that inform the empirical manipulation of parametric aspects of an audio-visual feedback system. This is resulting in the development of interactive performance systems that can respond to a performer's emotive state.

It should be noted that the integration of computational arts and performance practice has a rich history. However, the bulk of existing work in computational arts performance is primarily gestural based and relies on kinetic interfaces that the body using a variety of sensors ranging from simple (switches, slides, buttons), to complex (motion capture systems, real time 3D scanning) (Dixon 2007). Recent methods involve the use of techniques such as eye tracking (Bellucci, et. al. 2010) and muscle movement (Electromyography/EMG) (Tanaka 2000), which are kinetically focused. Recently, there has also been a rise in works that use low cost Electroencephalogram (EEG) devices that can read brainwave patterns (Pressing 1990; Tanaka 2000; Le Groux, et. al. 2010; Eaton et. al. 2014). While EEG's perform various kinds of mental state tracking, consumer level EEG's are primarily good at detecting the differences between concentration and meditation states (Dunn, et. al 1999). Previous work in this direction was realized by Philip Beesley in collaboration with Hosale and Macy (see Evening of... Philip Beesley / protoCell Field, Beesley 2012). Works that look at the use of interoceptive methods as a means of interfacing with computational art are rare, but becoming more common. The scarcity of this research presents a unique and novel opportunity to develop systems that

integrate aesthetic experience and affect to develop a co-collaborative creative suite of tools and applications that are able to anticipate the inclination of the performer/artist/designer in real time. The potential for this research is the development of new modalities for human-computer interaction that hold the promise for the seamless integration of emotive and rational control over complex computing systems.

## Current Activities

The collaboration team, lead by Mark-David Hosale, was awarded a SSHRC Connection Grant to hold an inaugural intensive Workshop on Movement and Emotion as Computational Interfaces (MECI 2016, [ndstudiolab.com/meci](http://ndstudiolab.com/meci)) at York University in June 2016. The workshop explored bioinformatic sensing technology with modes of physiological awareness found in somatic performance practice. The workshop consisted of a diverse audience and participants with varying backgrounds in computational arts and performance, coming from both academia and industry. Knowledge gained from this workshop helped us establish first principles of the research agenda. To maintain our network we have established a working group in Toronto. In addition, Macy has continued development with his extensive network within the community of consciousness hackers, and other like-minded individuals. It is our intention to continue the workshop series as an ongoing bi-annual event, with plans for it to be repeated in 2018 and 2020 already in the works.

Every May, Batdorf and Digby hold a two-week long intensive workshop on TBT in Toronto in order to train advanced performers to consciously work with awareness of systems connected to interoception as part of their practice. Future versions of the Batdorf Intensive will be used to advance our work and include students as participants and teacher trainees. Already, the workshop in 2016 was used to work on advanced interceptive techniques to prepare for MECI, as well as a presentation made at the 4th annual International Somatics Conference & Performance Festival (SOMA 2016) in New York.

## Future Directions

The tools and techniques above are being used in the development and creation of two works, one ongoing (Burnish) and the other new (Simurgh). Currently in production, Burnish is a solo performance installation artwork set

in an immersive installation environment. Sound and light events dynamically responded to changes in the environment through custom computer interfaces that rely on conscious input from the audience (indirectly) and the performer (directly), as well as both autonomic measurements taken from Batdorf's heart rate during the performance and recently, muscle movement. *Burnish* was presented in the 56th Venice Biennale in an official collateral event with *9drag-onheads* (Batdorf, et. al. 2015a); and The Toronto Theatre Centre (Batdorf, et. al. 2015b), in addition *Burnish* was shown at the Summerworks Festival Toronto in 2016 (Batdorf and Hosale 2016). In future iterations we plan to add additional modalities in order to access further indicators of emotive valence and arousal as part of the work.

*Simurgh* will be developed in collaboration with the PACIS research team (Batdorf, Digby, Hosale, and Macy). Envisioned as an immersive theatre installation, *Simurgh* is inspired by the life and work of Roya Movafegh, a Montreal-based multi-media artist who escaped her homeland during the Iranian revolution and lived a rich artistic life until her untimely passing from cancer in 2015 at age 43. *Simurgh* explores the story of a child refugee's escape from her home as metaphor for the search to find our true selves. Themes of the work include identity, displacement, dissociation/re-integration and freedom. However, the primary creative praxis, into which these themes will be inserted, will be The Batdorf Technique itself.

Improvisation with TBT will occur with these themes as galvanizers and stimulus, versus using the narrative as something we will recreate. In this way the somatic research and the inclusion of technology will be as informative as the themes. The performance aspect of the project is critical to our goal to see the real time, live implications of the integration of somatics with computational art in the audience's physiological response.

Ongoing PACIS research will result in the development of new and novel interfaces that promise to be concise methods to communicate nuance based on the physiological measurement of emotional valence and arousal for the purpose of creating cyber-interoceptive systems in performance and computational art. We will develop novel ways to use the real-time emotional state of an individual in co-collaborative experiences that can be used to advance knowledge in the practice and training of performers by correlating quantitative biophysical measures to qualitative experience, optimizing methods in somatic movement practice such as The Batdorf Technique.

Outcomes will be immediately relevant for somatic performance practitioners, computational arts, entertainment, gaming, computer science, architecture, urban planning, and other art/science collaborations. We will use knowledge gained from this research to connect with the community at large through performances, lectures and demonstrations. We will provide advanced somatic training to performance professionals, enhanced by the methods discovered in this research. We will disseminate outcomes in a variety of scholarly contexts primarily through conferences, journals and public speaking events at academic institutions.

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**Mark-David Hosale** ([mdhosale.com](http://mdhosale.com)) is a computational artist and composer. He is an Associate Professor in Digital Media in the School of the Arts, Media, Performance, and Design, Toronto, Ontario, Canada. He is the founder of the nD::StudioLab, an adaptable space for research-creation based theoretical discourse, methodological development, and the production of works in the areas of ArtScience, Media Art, and Interactive Architecture. His research work emphasizes methodological development in the integration of hardware, software and digital fabrication with the goal of creating eversive works that blur the divide between the virtual and the real. He has given lectures and taught internationally at institutions in Denmark, The Netherlands, Norway, Canada, and the United States. His solo and collaborative work has been exhibited internationally at such venues as the SIGGRAPH Art Gallery (2005), International Symposium on Electronic Art (ISEA2006), BlikOpener Festival, Delft, The Netherlands (2010), the Dutch Electronic Art Festival (DEAF2012), Biennale of Sidney (2012), Toronto's Nuit Blanche (2012), Art Souterrain, Montréal (2013), and a Collateral event at the Venice Biennale (2015), among others. He is co-editor of the upcoming anthology, *Worldmaking as Techné: Participatory Art, Music, and Architecture* (Riverside Press, 2017).

**Erika Batdorf** ([www.batdorf.org](http://www.batdorf.org)) has written, created, performed, directed and choreographed original performance art, theatre and movement theatre since 1983. She has been a guest artist in universities and theatres internationally in Canada (including Luminato), Italy (Venice Bienalle 2015), France, Mexico, Greece, Indonesia (Salihara International Theatre Festival 2013 and 7th International Women's Playwriting Festival 2007 mainstage), Finland, Switzerland, Germany, Korea, Georgia and 14 US states (including the Smithsonian Institute, Harvard University, The Fine Arts Museums of San Francisco etc...) and this winter, India for Litfest in Mumbai. She is a Professor in Theatre at York University with over 25 years of experience, having taught at institutions such as Boston Conservatory, Brandeis University and Emerson College. Central to her research-creation activities is The Batdorf Technique, a performance education technique that systematizes the full scope of a performer's work from the early stages of interoceptive awareness to the complicated juggling of this somatic work with complex text, vocal work and choreography. The technique organizes the practitioner's access to specifically located awarenesses that can be consciously modulated to vary the kinesthetic state and includes a carefully developed approach to the inclusion of emotional discovery allowing for authentic, physically based, emotional recall in performance.

**Kate Digby** ([digbydance.org](http://digbydance.org)) is a choreographer, performer and Assistant Professor of Dance at Kansas State University whose teaching and research converge on embodiment. As Artistic Director of Digby Dance she has created over 30 works which have been performed across the US and in Canada, Ecuador, Italy and India. As a dancer she has been honored to perform with David Parker & The Bang Group, Erika Batdorf/ Moleman Productions, Prometheus Dance and the Bill T. Jones/Arnie Zane Dance Co. (as an apprentice). In addition to her creative work, Digby has pursued somatic training in a variety of forms. She is a certified Yoga instructor, Batdorf Technique instructor, and Moving for Life Dance Exercise for Health® instructor, and is currently completing certification as a BodyMind Dancing instructor with Dr. Martha Eddy. Digby has previously served on the faculties of The Boston Conservatory, the Conservatory Division of the Longy School of Music, Roxbury Community College, and New York University's Athletic Department. She holds an MFA in Dance from the University of Wisconsin-Milwaukee and a BFA from the Boston Conservatory.

**Alan Macy** ([alanmacy.com](http://alanmacy.com)) is the Research and Development Director, past President and a founder of BIOPAC Systems, Inc. He designs data collection and analysis systems, used by researchers in the life sciences, that help identify meaningful interpretations from signals produced by life processes. Trained in electrical engineering and physiology, with over 30 years of product development experience, he is currently focusing on psychophysiology, emotional and motivational state measurements, magnetic resonance imaging and augmented/virtual reality implementations. He presents in the areas of human-computer interfaces, electrophysiology, and telecommunications. His recent research and artistic efforts explore ideas of human nervous system extension and the associated impacts upon perception. As an applied science artist, he specializes in the creation of cybernated art, interactive sculpture and environments.