**Editorial: Eirini Nedelkopoulou and Mary Oliver**

At the Edinburgh Television conference McTaggart lecture in 2011, Erik Schmidt, Chief Executive of Google proposed that the next great innovations in the digital field would only come if the ‘luvvie’ and the ‘boffin’ begin to work together by bringing art and science back together. Although this may have ignited sparks of interest across the corporate sector, Schmidt’s comment reveals a limited post-Fordian creative capitalist view, unaware that such collaborations have been in existence for centuries. As a result of the digital revolution a proliferation of joint research activities has been underway since the 1960s and currently innovative collaborations between performance artists and scientists are thriving.[[1]](#endnote-1)

The collection of articles in this edition illustrate and test new and current conceptual frameworks that allow us to discuss the impact of performative digital media arts on the human experience. Performance is placed as a key component in maintaining and expanding human agency within a critical field that has been dominated by a largely cyborgian subjectivity. The authors coming from a wide range of performance and scientific fields of enquiry engage with methodologies and discourses determined by their associated canons of knowledge. It is however helpful to establish that within the context of this discussion, performance is broadly defined as a process that creates an action. It is this act of *doing* that permits a broad range of activities to occur, identified by the specific encounter and knowledge base that each participant brings to the union.

In this issue productive interactions between performance and mathematics, physics, neuroscience, biology and computation bring attention to the question of how science nourishes, moves and changes performance and performance studies, largely through the development of digital tools. Through such collaborative discussions and exchange of methodologies, the contributors of this special issue are at the vanguard of a struggle to establish fruitful working relationships. This struggle is evident as the collaborators search for compatible languages in order to co-exist and co-create. Struggle is evident too in the desire to comprehend another language and field of knowledge with which to capture data and analyse their joint activities. The aim of this issue is definitely not to devise methods that allow performance to acquire scientific knowledge and deal effectively with scientific objectivism, but to test and explore scientific enquiry as it is performed and tested in whatever site this takes place whether this be in nature, on stage, in the streets, or in the laboratory. Such a desire informs the concept of hybridity as opposed to interdisciplinary working methods. By hybridity in this specific context we mean practice, theory, and languages which attempt to bring humanists, scientists and technologists (as humanists and scientists) to work across forms. We echo Bruno Latour’s sentiments that “scientific inquiry is always a study of composites: quasi-objects/quasi-subjects” (Latour 1999 in Pluta 2010, 186) and that it is in the shift from the representational to the actual performance of ideas that is key to our understanding of how it has been possible for the performance maker to impact on the research process of the scientist and vice versa.

Within performance studies the cross-fertilisation between performance, science and technology has been debated in the work of Sue-Ellen Case (2007), Johannes Birringer (2008) Steve Benford and Gabriella Giannachi (2011) and Chris Salter, (2010) to name just a few contributors to this growing field of enquiry. In robust and enquiring ways performance research methodology reveals that it has the means to contribute fully to scientific research. The studies that make up this issue describe performance as a process, training, practice and methodology that communicates and embodies experiences, bridging knowledge with insight.

In spite of evidence to show there is a shrinking distance between arts and science research, C.P. Snow’s two distinct cultures (the humanities and the sciences) that he warned of in the 1940s still remains, and the question of how educational, societal, economic infrastructures are defining and reinforcing the gulf between different disciplines and cultures is still one that needs to be addressed. Often these tensions are pragmatic, Sue-Ellen Case writes from the perspective of a performance studies scholar about how ‘Humanities continue to feel the economic and institutional sting of Science’ (…) ‘While the sciences and their technologies’ withdraw ‘into their own specialised styles of articulation, consorting exclusively with their chosen form of so-called facts and figures and actively rejecting any “humanistic” tracking of their ideas as ‘uninformed’ (2007,1). While Case expresses a concern for the two-culture reality, Bruce McConachie offers the impassioned proclamation: ‘Theatre and performance scholarship are built upon unstable foundations’ that ‘will render them vulnerable to irrelevance in the coming decades’ (2006, xii). Although, cognitive studies have being widely and interestingly used in current critical work and are touched upon in this issue, cognitive science is not a panacea to theatre and performance’s ‘vulnerability’. Interestingly, Chris Salter reminds us that ‘Performance Studies has been a largely human-centred affair that with few exceptions has remained conspicuously silent on issues of machines, technologies, object and matter’ (Salter 2010, xxv) and that this has left the critical subject field without impact, even though evidence in the practice assures us that performance practitioners are at the forefront of new technological innovations.

The individual contributions of this special issue revisit and challenge such concerns by proposing that the potential for change, (self) reflection and innovation comes partly through the development of new critical frameworks. The writing illustrates a clear shift from a performance studies model through its expansion towards a hybrid subjectivity needed to describe new materialities. As performance studies reconsiders its relationship with things, networks and human entities we are seeing the reintroduction of a phenomenological approach to the interpretation of often abstract scientific principles. Scientific experimentation is shifting too as it turns to performative, bodily and corporeal applications of their findings. Paraphrasing Stephen Wilson, it could be argued that these collaborations evidence our difficulty in distinguishing ‘between techno-scientific research’ and performance – ‘a sign that broader integrated views of’ performance and research are developing (Wilson 2002, 4).[[2]](#endnote-2)

Expressing a similar sentiment regarding, professor of visual computing, Philippe Bekaert, in discussion with the performance company CREW, underlines the role of artists and their ability in solving problems in ways that are quite different from those of scientists and engineers by adding new perspectives and drive to the research process and at all its stages. In a challenge to an assumed scientific superiority Bekaert underlines the vulnerability of scientific innovation, which lies in the lack of free space and time to experiment and the inability to escape from corporate limitations and production methods that impose very strictly defined timeframes in which to achieve results.

Science and performance seem to meet most comfortably at the confluence between technology and human-ness in the creation of works that questions what it *is* to be human. Technology in this case is the accommodating environment and process that can facilitate and preserve ‘human and non-human relationalities’ (Bates) and in this new shared context, scientists have become increasingly mindful of the need to change and experiment differently. We do recognise that there is a distinct difference between theory and practice in science as much as the differences that exist between research driven and corporate environments. Yet science does need to *perform* in order to serve innovation and development of human as well as non-human concerns. Echoing Jon McKenzie’s, “we all need to perform…or else” (2001), the contributors of this edition demonstrate that this includes scientists, humanists, technology and even nature (see Bleeker and van der Tuin).

The articles presented here include discussions between performance makers and scholars, computer scientists and programme developers, biological art practitioners and computational artists, science historians and science philosophers, each of whom ponder over performance, science and digital technology intersections. Paul Johnson historically contextualises the relationship between theatre and science, before moving on to discuss the broader implications of digital culture which, he proposes, provides a model for more productive forms of exchange and hybridity between performance and science through simulation, virtual reality and integration into ‘live’ activities in augmented and intermedial performance. Mathematical principles and processes have been employed to examine the understanding and construction of performance often through the use of digital computation in the articles to follow. Nicolas Salazar Sutil’s article conceptualises the notion of performance-mathematics as a paradoxical relationship with the construction of Truth, which he proposes is shared by both theatrical and mathematical performance. While Salazar indicates that computation could exemplify how machines perform ‘operations within algorithmic designs based on basic binary functions like input-output, or truth-false evaluatives’ (page), Sarah Fdili Alaoui, Cyrille Henry, and Christian Jacquemin discuss a physical model’s capacity to simulate and visualise patterns and qualities of physical behaviour and human movement. The authors reflect on four different examples of digital environments where Physical models (specifically mass-spring systems) have been used to enhance mappings between human movement and digital rendering.

Moving from the computational to the choreographic perspective of the dancer’s movement, Jonathan Clark and Taku Ando reconsider the broadly-researched negotiation between choreographic praxis, technology and theories of perception. They examine how choreographically structured movement material can be generated using different types of mental imagery that can be classified geometrically. The digital here serves as a tool for the representation of certain geometric and spatial structures. Choreographic praxis is informed by, and in turn informs current ideas on embodied and enacted cognition. Piotr Woycicki uses neuroscientific theories as a lens to provide insight into the role of the audience/participants in Blast Theory’s *Can You See Me Now?*. In particular, Woycicki focuses on the tension between the physical and virtual aspects of participation in mixed-reality performance environments.

In his contribution, Judd Morrisey from Atom\_r reflects on a different application of mixed-realities within the company’s ongoing work *The Operature: Anatomical Theatres of Mixed Realit*y. The work is an augmented reality poem that brings performance in dialogue with anatomical science. The company attempts to create a fluid connection between the anatomical, computational and political body through the use of technological systems that literally and metaphorically read the heavily coded and transgressive male body.

Having explored the tensions and interactions between the physical and the virtual, the human and the computational, Tarsh Bates, a biological art practitioner investigates the relationships between human and non-human relationalities in her work *in vitero*. The article discusses how the technoscientific use of human and non-human organisms is recontextualised to focus on the aesthetic experiences of interspecies care through the lens of alterity. Maaike Bleeker and Iris van der Tuin follow with their call for an understanding of how matter and meaning are completely entangled. The authors raise the question of whether in scientific experiments not only are scientists and technologies put under pressure, but also nature itself is required to ‘perform, or else’. Using the hunt for the Higgs particle at the European Organisation for Nuclear Research, (CERN) as their case study, Bleeker and van der Tuin offer a challenge to both the humanities and science to reconsider our methods of knowledge production.

Completing the time cycle we end with a discussion on dialogues between performance practice, science and the digital. Members of Belgian-based immersive performance company CREW, Eric Joris, Philippe Bekaert and Kurt Vanhoutte, converse with Eirini Nedelkopoulou about their experimentations and experience of working on the borders between artistic practice, science and technological innovation for over a decade. The second part of this final section elaborates on a CREW’s forthcoming collaboration. Kurt Vanhoutte and Charlotte Bigg showcase the creation of immersive Planetarium performances through digital re-enactment and go back in history where performance of spectacle and scientific methodologies have been entwined for centuries. The Digital here functions as a nostalgic mechanism reflecting on the pre-renaissance era of science/theatre/art unity

The hybrid dialogues included in this issue have no intentional hierarchical relation that privileges performance over science or vice versa. The contributors of this work have been clearly interested in the relevance and networks created between heterogeneous components and methodologies to demystify human and non-human experience and processes. The majority of the authors including us, the two editors come from a humanities background and celebrate the new and current turns and forms that performance is taking to inform, resist and co-operate with the challenges of everyday experience, in ways that can impact on our current economical, social and academic circumstances. At this point in time, (inter)national funding councils are defining what themes we as both humanists and scientists should be addressing for the next decade. This issue presents a small proportion of performance and science scholars who have collaborated and reflected critically on the dialogue between performance and different scientific branches. They also interestingly illustrate the breadth of enquiry that occurs when not responding to a singular international strategy or research agenda with its limited capability for consultation and inability to respond with any speed to actual need. What it clear is that there is untapped potential in the meeting point between science and performance and that we all need to *perform*.

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1. The number of artists, projects and organisations who have been instrumental in developing performance and science research is too extensive to list here but they include Hexagram and BNMI (Canada), ZKM and Transmedia (Germany) Eye-Beam, EMPAC, Entertainment Technology Center (USA), Waag Society Media Lab, (Netherlands) Media Lab Prado (Spain) IShed, FACT, NESTA, The Wellcome Trust, NIDMS, (UK) as well as International Festivals Siggraph, ISEA and Ars Electronica. [↑](#endnote-ref-1)
2. Although Stephen Wilson refers to art here, we could suggest the same for performance, especially taking into account the current advances in digital practices and performance (as/of science and vice versa).

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