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From sTEAmulus to Simulus

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Abstract

Cell cultures have been at the forefront of biomedical research for over a century and have known, as any research-associated practice, their ups and downs. In recent decades, they have been the source of inspiration and the subject of debate and sometimes concern for artists as well. Georg Mühleck explores the recesses of the fold in the virtual narrative with his elegant and intelligent works, raising philosophical and ethical issues. Holding the cell culture dish as a mirror through which scientists can gaze and reflect on the past, explore the present, ponder on the future, Georg with the help of Sylvia Niebrügge's cultures addresses issues that researches may have ignored. This paper will survey and examine the place of these works of art in the current scientific, cultural and technological context.

Introduction

The project discussed in this paper is the result of collaboration between artist and scientist, with the “conventional” roles reversed: the artist was posing questions and suggesting hypotheses and the scientist was marveling at the outcome and reveling in it. It is a complex project, that developed over a couple of years and it involved Sylvia Niebrügge's cell cultures and Georg Mühleck's analyses of the visual data obtained through mathematical means with the end result of a dialogue between disciplines and a rich topic for discussion and debate. Dolores Steinman reflects on the implication of the overlap of the methods and methodologies involved as well as the role played by technology in these particular projects as well as the consequences of the knowledge acquired in scientific practice in general.



Plate 1.
sTEAmulus pond 2 by Georg Mühleck,
archival pigment ink on Arches 108 x 151cm, edition of 3.

Methodology

The collaboration originated during the Subtle Technologies Festival organized workshop on cell culture for artists and it is a reflection of Georg Mühleck's long interest in both technology and its impact and relationship with live cells.

For the “sTEAmulus pond” part of the project, tea leaves were placed deliberately mimicking still frames of neuronal network images. The leaves are performance relics, recycled from the ceremony of brewing tea. They are dried and collected until needed for production when they are scanned for shape. They are placed to appear to communicate with one another.

For the “CELL-CELL” part of the project, murine stem cells were cultured on Petri dishes for seven days, at which point the position of the cell culture was captured as still frames (directly through an optical microscope). Based on it, the image was translated into algorithms that allowed for a computer-generated simulation of the evolution of the cell colony as well as a prediction of their behaviour. In other words: at the very beginning of the animation, organic cells and simulated cells have the same starting point. The video¹ captures their changes in fast motion (12 hours recording / 1 min play).

Communication in its Micro and Macro guises

Cell culture as a complex process of growing live cells outside their natural environment has been a mainstay of the biological research since the 19th century. During the last part of the 20th century however, cell culture practices as well as bio-medical research sprung to the forefront of the ethical arena and artists joined in the effort of establishing new ways of conducting experiments both at the laboratory bench as well as in the laminar flow hood and animal facilities. Their curiosity knew no bounds and their approaches were new and unbiased by traditional scientific training. For some cell culture became a medium, for some it became a tool. Both art works presented here relay the message of communication: be it between cells within or outside bodies or between bodies and their surroundings.

“sTEAmulus pond” in its use of tea-leaves mimicking the configurations of neural structures relies on the idea of cell-cell interactions that have as ultimate goal communicating impulses and ideas throughout our bodies (see Color Plate 1). Georg emphasizes the organic nature of this relationship by bringing up the fact that it is a matter that he ingested: the tea – and a matter that was used in the work: tea-leaves symbolizing a matter at the base of our internal signal communication: neurons). Thus, the move is made seamlessly from the micro to the macro level as well as from body to mind, in a way giving another materiality to our feeling and thinking process.

“CELL-CELL” also addresses communication but from strictly a material point of view: each cell in its individuality takes a certain path in its growth and development and ultimately communication with the neighbouring structures (primarily other cells)². The communication, in this case, is analyzed in a mathematical way, thus the road back into the realm of the mind is travelled through the generation of algorithms. From a mimicry of

¹⁺² <http://vimeo.com/17583904> password: georgmue

randomness in an attempt to underlie its objective basis to the mathematical translation of cell motility the connection between the physical / biological phenomenon and the process of mapping are approached from a visual angle.

Furthermore creating a communicating and interacting system by combining both biological and artificial cell structures might lead to a level of higher organization defined as a metasystem. A metasystem is known as a system about other system(s) which depicts, analyzes or even represents the other system(s), a collective of biological and artificial life structures which acts in a coordinated way and mutually models behavioral traits. Being organized as complementary, neighbouring individual cells would be directed to act in a more complex and potentially even more intelligent way.

If the hypothesis of an emerging metasystem steering the interacting individuals comes true the co-culture would support and enhance / elevate the behavior and interactions of each individual within the system.

Would merging systems and technologies be conducive to enhanced intelligence of the individual structures and even influence cell fate by creating new niches?



Plate 2.
sTEAmulus pond 2_Subculture 1 by Georg Mühleck
archival pigment ink on Arches 74 x 54,4 cm, edition of 3.

Research and Technology

The premise under which both our scientific research and artistic practice operate is rehashing Gaimbattista Vico's principle, according to which we can only understand what we create ourselves, only temporarily relying on a Cartesian approach to unveiling truth, through observation.

The idea of mapping thought along side other biological processes, in a very democratic way, I would say, is a long fascination with Georg, expressed as early as his "LIFE Rules Over Historic Ground" work, in which cellular formations are either overlaid or placed alongside archival photographs from the Royal Infirmary in Edinburgh. For that piece, the cellular images are considered and used as representations of scientific thought. Albeit a bit restrictive, this approach does set the stage for using the cell and its processes as metaphor, allegory or, better yet, synecdoche for science with the ultimate goal of drawing attention to either a particular phenomenon (be it physical or physiological) or to a cultural phenomenon (referring particularly to the scientific culture or, more generously and generally, to the culture a large).

Georg's work doesn't boldly engage in the ethical questions of biomedical research practices, issue usually raised by bio-artists/ bio-art; in his works he addresses bio-technology from a philosophy of science perspective by questioning the importance we attach to technology, the control technology may take over the biological systems and suggest a return to organic ways of organizing our knowledge sifting through data. The metaphor of the tea-leaves suggesting both reflection (a quiet, solitary cup of tea), dialogue (a "tea for two") as well as the regeneration, the transformation of one form of life into the other, the chance of both life and information collected. Last but not least, it may allude, subconsciously, to the implicit chaos in every biological event and toys with the idea of using machines to extract and interpret data is sometimes as reliable as fortune reading.

Tissue culture is indeed displayed in "non-utilitarian ways" but not with the scope of "the realization of technological utopia" (Hauser 2005) as much as for emphasizing (underlying) the flaws of such techno-utopia. Playing with algorithms, Georg actually gave another dimension to the randomness: he mimicked the actual motion of cells, their interactions and communications, drawing attention to the "dangers" of such total dependence on technology to translate for us the natural phenomena. We need to know in detail the conditions and to understand the system before a simulation can replace it. The visual takes the lead and dictates the frames. The trick is not to forget that what we see is a virtual reality and the players are cell look-alikes.

Reconsidering Truth and Reality

"The 21st century's complex reality makes a lot of things in the world appear surreal. The terms "truth" and "reality" need to be reconsidered and redefined. It is in this field of tension that I see my artistic work", says Georg in an artist statement, and this is the premise at the basis of his attempts of reinterpreting nature and our attempts to reconsider our ways, as scientists, of investigating and interpreting natural phenomena.

Images think and talk but what they communicate to an artist maybe significantly different from what they convey to a scientist. Either audience is just as enthralled by them



Plate 3.
sTEAmulus pond 2_Subculture 2 by Georg Mühleck,
archival pigment ink on Arches 74 x 54,4 cm, edition of 3.

and Alexander von Humboldt –the authority in both areas– was inclined to use images to impart knowledge of the unseen/ unknown (Grau 2003).

In “sTEAmulus pond” the theme is that of the pathway as followed by the thought. From the ability to track the brain function through functional MRI (fMRI) to the replica of the process using the tea leaves (known to contain caffeine, substance able to alter the function of our brain and of our body) the connection is that of mapping the otherwise invisible path of thought as it is initiated, travels through anatomical structures and is finally stored. The leaves may suggest, both to the initiated and to the naïve, patterns of activity for the magic time machine called memory.

In “CELL-CELL” the emphasis is on the complex nature of organic cell division and growth that cannot be mimicked in a realistic way by any algorithm. By generating a cellular automaton (a computer model mainly composed of identical cells arranged in a regular grid, where each cell can assume certain states and interacts with a definite number of

neighbouring cells) based on the natural process is this time mapped by mathematical means, with a similar visual and conceptual goal, that of mapping a pathway.

Georg's use of cells for his "own" artistic practice becomes an inspiration rather than a tool, and technology a subject of critique rather than a medium. The ideology is distinctive as it becomes less of a critique of biomedical research and more of a critique of society and its mores. He remains a participant in the cultural debate on the life sciences.

Both projects address the materiality of the invisible and the embodiment of the ephemeral. Georg's elegant and discrete works challenge our scientific visual competence in two different, almost opposite, ways: the organic and the technological one. Conceptually reminiscent of the frescoes in the Villa dei Misteri, in Pompeii, his visual renditions of the physiological process observed make the barriers between the real and the represented to fall. This is obvious particularly in the "Cell-Cell" project, where the overlap between the images of real cells with those of computer animated ones are virtually imperceptible, the setting and behaviour being unsettling close to the boundaries of perception.

The mixed reality is a subtle combination of the physical and virtual components that alert us to the traps posed by mimetism of phenomena (simulations without a solid foundation) and draw attention to the complexity involved in generating such simulations.

Conclusion

From a scientist stand-point, both works are defining and delineating the tension between impenetrability and visibility by almost thrusting mind and mathematical function, body and machine. It is to us, as researchers, to question our practices, our growing dependence on technology and our biased interpretation of the scientific data collected. "As a social object technology ought to be subject to interpretation like any other cultural artifact" suggests Andre Feenberg (Feenberg 1992) and this is exactly what the two projects presented shine a light upon.

Our involvement with Subtle Technologies allows for a free flow of ideas as well as work environments between arts and sciences. The project presented is a step in a possibly more developed path towards establishing new ways of collaboration as well as novel insights in the way we examine and recreate the world around us.

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