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The Martian Rose (2007): Exposing a rose to the Martian Environment

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Our cultural concept of Mars has historically been entrenched with its possibilities of life since Percival Lowell gazed at Giovanni Schiaparelli's ***canali*** over a century ago. Perhaps a small misinterpretation of language, an optical illusion, or the dream of an optimist, unlocked the myth of a war torn planet where unrivalled irrigation skills implied markings of intelligent creatures (Lowell, 1909). With new discoveries and the development of technological tools, Mars has become reduced from inhabiting man-like creatures to worms, plants and gradually only the potentiality of microbes. Indeed, many scientists shared this disappointment as the Mariner orbiters first laid their eyes on a hostile planet engulfed in dust. Beginning with the Viking mission, the raging dust storms' settled and its two Landers unravelled for the first time the alien world of Mars—a dry rocky desert covered in iron oxide yielding the ochre-red hue as well as its name, the "red planet". Hitherto the only set of tests for carbon life probing Martian soil showed incomplete but daunting results. Its controversy sparked a complete re-thinking of "what life is" and "where we can find it". The robotic invasion of Mars has since re-awoken its potential, catalyzing a range of new research disciplines drawn to the possibilities of finding life. The red planet remains a frontier for life through its history both as a cultural and scientific space. Our

engagement attempts to open artistic areas in primarily scientific spaces and to address cultural aspects and experiences that also take place. ***The Martian Rose*** is an artistic investigation into boundary conditions of life beyond terrestrial settings.

The Martian Rose developed from a previous work that provocatively examined notions of culture and nature by introducing genetically modified plants into pristine wildernesses. A journey deep into Mexico opened a hyperreal and bioinvasive exploration aimed at investigating genetically altered living systems and their interaction with our culture and ecosystem; thereby, challenging frontiers surrounding constructions of nature, belonging and otherness. Keeping within this bearing, we turned our attention to more recent frontiers and production of life in these realms. This led us to a world beyond our own, researching possibilities of life outside Earth. Mars is often referred to as our final frontier because it evokes a sense of wonder and mystery that science fiction valiantly tries to capture (De Goursac, 2005).

Whilst scientific research has become increasingly sensitive to questions of "what life is" and "where can we find it" by probing new chemical and atmospheric configurations; interdisciplinary fields combining genetics, space- and nano-technology have emerged posing a challenge to the search for life and consequently to trajectories of an extraterrestrial dream. The question "of life" in this context is all of a sudden reconfigured: Can we create life outside of Earth?

Our interest started with the long leaping idea of creating life for Mars.

A rose for Mars is perhaps a symbolic delve into poetic imagery whose beauty merges with the harsh conditions of its destination. What does it mean to create life for Mars? Is it our goal to make Mars habitable?

The dream of extraterrestrial life, the alien, is amongst our oldest longing for otherness. Science fiction as well as our faith in imaging technologies expresses a desire to metamorphose these dreams by creating spaces, cultures and virtual species outside our terrestrial life. Interestingly, it is Earth's own extreme environments where the closest fit to 'aliens' are found. Thriving in conditions otherwise detrimental to life, extremophiles are found in many improbable settings. Even the driest area on Earth, Atacama Desert in Chile, harbours life such as bacteria, algae and fungi. Hidden within rocks

and below the surface, these places are training grounds to understand why it is difficult to find life "out there". As K. H. Nealson (1999) points out, "I don't recall in my entire career anyone handing me a rock and asking: 'Is it alive?' " (1999, 31).

Our idea of genetically engineering a rose to withstand Mars' harsh environment aimed at staying within the framework of botany and reconstructing life for extreme conditions. Envisioning this proposal involved the potential aesthetic breakdown of a rose, through its genetic manipulation and importantly, the romantic idea of giving that rose to Mars. Projects

Images 1 2
A Martian greenhouse, rose grown in a simulated Martian micro-ecosystem, London

Image: ©2005 c-lab used with permission.

Bio chamber (a planetary simulation chamber), at The Mars Simulation Laboratory, University of Aarhus, Denmark

Image: ©2005 c-lab used with permission.

on synthetic biology funded by NASA Institute for Advanced Concepts include redesigning plants to withstand increased stress; and experiments have been successfully carried out using techniques of gene splicing to incorporate genes from the extremophile, Pyrococcus furiosus (microbes living in deep sea vents) into tobacco plant cells (Boss & Grunden, 2005). Modifying a rose, not just to better cope with the stress of Mars (radiation, lack of oxygen, water deficiency and low light), but perhaps to thrive in these settings, offered a pathway to investigate ideas of reconstruction. From an ornamental perspective one might ask what would such a plant look like? Would it still have petals? Would there be changes to its colorations? What

does this change in ornamentation tell us? Genetically modified organisms have become a model of the perfect industrious machinery whose lush ripening tomatoes grows as an Aristotelian ideal to its counterpart—the natural. Our influence on roses' morphology goes back thousands of years. For roses themselves, the impossible dream (for breeders) was fulfilled using gene silencing technology—unfolding the first roses with blue petals and further boosting their ornamental production in biotechnological industries. Immutable barriers of life on Earth are being transformed through recombination, preparing the existence of life in new conditions. In agriculture, strategies are already in place for engineering stress tolerance.

If Mars is found dead, its only option for life may be genetically engineered.

Alas, Mars' extreme environment is beyond the limits of what plants can survive. Its surface is photochemical and highly oxidative on organic material, as evident from the Viking mission tests and more recently, in the dark belt tracks left behind by the rovers. A more practical approach to this environment would be to totally or partly shield the plants. Indeed, any long-term colonisation of another planet would need to consider the option of using existing abiotic factors. Experimental proposals have suggested utilizing Martian soil as a source for nutrition when designing future greenhouses for Mars (Wheeler & Martin-Brennan, 2000). By building a composition of various mineral layers we produced a primitive version of Martian soil used in a jar greenhouse.

A rose was planted inside the greenhouse sealed for self-containment. As time went by, the pressure inside the jar increased, and due to a small possibility of explosion, we terminated the experiment.

To further understand the impact Mars would have on a rose we consolidated relationships and collaborated with several university laboratories. (Direct contact was made with scientists as liaising through UK artistic bodies proved difficult). Our aim was to gain practical insight to how organisms are exposed to Martian conditions and the research behind this.

Perhaps more likely than at first thought was our candidate, a rose, our most eloquent exchange symbol, brought forward to Mars. We stopped again to ask ourselves: What would Mars do to a rose? An inviting gesture to a romance, simulated doubly with the help of scientific tools found in these very laboratories.

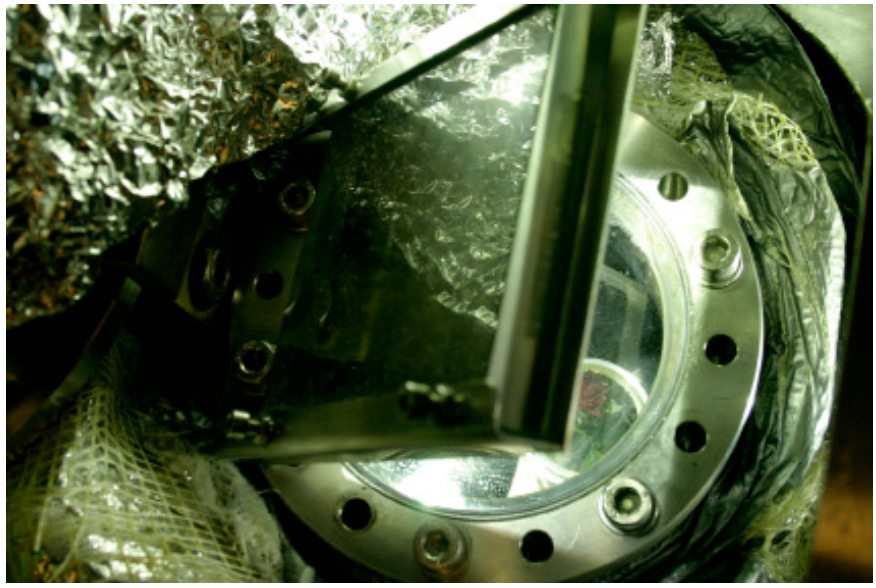

Image 3
The rose in a bio chamber during exposure to Martian conditions, at The Mars Simulation Laboratory, University of Aarhus, Denmark

The Mars Simulation Laboratory at the University of Aarhus has constructed a planetary simulation chamber, called a bio chamber, used to expose biological samples under proxy Martian conditions. The main focus of the lab's research is the study of processes on the surface of Mars. It is recognized as one of the European Space Agency's (ESA) Mars Express Collaboration Laboratories. Our discussions with the scientists at the laboratory started in 2005 when we first visited to investigate possibilities of using the bio chamber for artistic purposes. The bio chamber is a steel container with several ports used to produce vacuum suction, relevant gas compositions and flow of liquid nitrogen to cool the chamber. The environment inside (abiotic parameters such as pressure, temperature, gas composition and radiation) and its mechanics are controlled from a computer. The chamber has two docks, by placing a sample in the first dock and equalizing the pressure with the main dock; new samples can be added and lowered into the chamber whilst in operation.

The rose was subjected to Martian parameters on Tuesday (Marti) the 27th March (Martius) 2007. As experiments using plants in the bio chamber had not been performed before, our unusual sample caused difficulties—particularly in terms of locating a rose small enough to fit the tight constraints of the metallic tubes. For six hours the rose was living (or dying) in temperatures below -60˚C, atmospheric pressure of only a hundredth of Earth's,

Image 4 5
The frozen rose minutes after exposure to proxy Martian atmosphere at The Mars Simulation Laboratory, University of Aarhus, Denmark

Image: ©2007 c-lab used with permission.

The rose twelve hours after exposure to a proxy Martian atmosphere, London

Image: ©2007 c-lab used with permission.

a prevalence of carbon dioxide, and the penetration of unshielded ultra-violet light.

During the rose's exposure something happened inside, a strange inanimate descent on Mars, capturing an interesting experience we wanted to bring back. The instruments and functional effects surrounding the bio chamber; the reflecting aluminium jacket, flashing LED lights and bubbling liquid nitrogen, evoked a spectacle found in space exploration—further reconnecting us to Mars.

On returning to Earthly parameters, the chamber was dismantled and from the inside we collected a frozen rose. The crystallized water indicated that cell membranes had been crushed and no precautions were taken to prevent

this. Plants that make it through hardy winters, manage by pumping sugar into their cells preventing the formation of crystals and slowing down all activity until they enter a state of hibernation. The darkened petals of the rose were wrinkled and, once thawed, it could not hold itself up, collapsing like a limp wire. Plants have little adaptation to low-pressure conditions, which interferes with turgidity, and the collapse of the rose was probably a combined effect of thawing after being suspended in low pressure. It was, however, when the exposed rose was brought 'back to Earth' (taken

Image 6
The Martian Rose, installation, at the BIOS 4 opening at Centro Andaluz de Arte Contemporaneo, Seville, Spain

Image: ©2007 c-lab used with permission.

out of the chamber) that we realised the stress these parameters had. It's questionable if plants could ever be revived after such a test. One option was to use glycerol to preserve them at an earlier stage but we were eager to see if the rose could be resurrected.

Our attempt was not successful and it quickly dried out. The death of the rose was important (even though we had hoped the opposite) in reminding us of Mars' inhospitality.

By exposing a non-modified rose to a proxy Martian environment, we can see and experience what is produced.

The Martian Rose aims to open discourses and communicate ideas of what we are left with and reflect on both the Martian atmosphere and how technologies are used to simulate this space. *The Martian Rose* has been exhibited in a custom built chamber made of steel and suspended from

Image 7
The Martian Rose, installation, suspended from the ceiling at BIOS 4 exhibition at Centro Andaluz de Arte Contemporaneo, Seville, Spain

the ceiling; influenced by the aesthetics of the high-tech objects found in these labs - their rawness, solidness and design for precision with integrated functionality. The rose was planted in a mound of Martian soil—iron oxide—and rested on a glass plate, lit from below. The explicit image of "a rose in Martian soil" contrasted with the chamber's precision and hardness.

Suspended from the ceiling the installation alludes to a probe in space…a floating grave.

With ***The Martian Rose***—although the rose morphology remained surprisingly intact—our outlooks of a cryogenic frozen rose in an unprotected atmosphere led us to develop a new work—***The Mars Project***—which considers more suitable biological specimens—extremophiles. This is perhaps less romantic but it may allow life under these conditions.

In hostile settings, bacteria are able to produce incredible sets of response patterns as a result of adaptation. Evidence has shown that bacteria are prone to self-engineering and social structuring as survival strategies (Ben-Jacob & Levine, 2005). Biological interdependency found between bacterial organisms can allow necessary ecological nutrient exchange. An important aspect of our work involves changing the parameters of the bio chamber—currently based on the surface conditions of Mars. We are interested in modifying these values to find a starting point for life, for us this is perhaps

where otherness begins. ***The Mars Project—Biosynthesizing Otherness*** continues our artistic investigations into the boundary conditions of life beyond terrestrial settings. Our interest lies in what happens inside the bio chamber, such as response patterns produced by bacterial colonies and finding openings for interacting with these samples. The exopod is our proposed tactile platform—using a bio chamber with modified parameters to allow functional life, moving from the surface to the deep underground setting of Mars. Life may be slow in this environment, but we are interested in the formation of patterns and their potential as feedback loops, creating interactions with "aliens" and, perhaps, our abduction by them.

Our projects and experiments form explorative journeys through scientific spaces. ***The Martian Rose*** is a romantic play to initiate strategies of engagements, experiences and interactions with life and death inside the bio chamber conditioned to a Martian environment. It is a bizarre narrative construction giving a rose for Mars, a simulation in a simulation. The ground we covered is also worth mentioning, our path moves through the field of genetically modified organisms and the desire to produce a rose for Mars borrowing from our toughest life. Extreme conditions never come alone, on either Earth or Mars. Thinking about engineering life for these environments is part of thinking about our future, wherein plants will remain an essential life support system. The story of Mars is a wonderful journey which is still ongoing. And the planet is predicting our destiny—a dead world rolling through space. Perhaps this is part of our installation. But the thought does not end here, and we keep looking for new ideas in a new area of understanding and producing life. Our longing for 'the other' somewhere out there is deeply rooted. Whether we gaze at the stars or into a chamber—it is our seeking to bring aliens and extreme life closer to our experimental sphere.

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