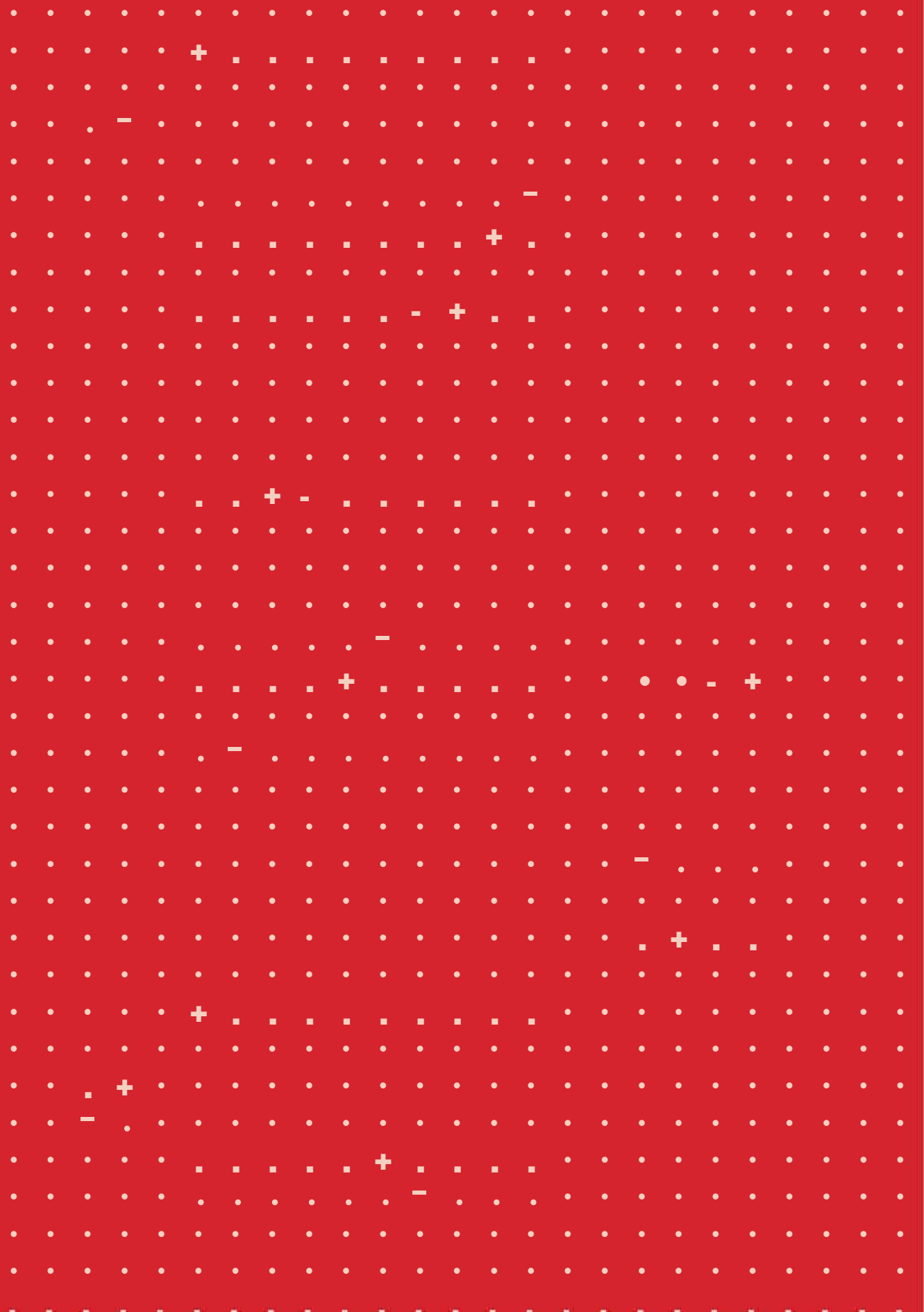


Manufacturing Life Systems

Laboratory for Artificial Life



avokiuszak



Manufacturing Life Systems:
Laboratory for Artificial Life

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Contents

Origins

- 6 **Hologenoma – Laboratory for Hologenome Research**
Jurij Krpan

Three Laboratories and Their Art Practices

- 16 **Manufacturing Life Systems: The Terms of Coexistence**
Valerija Intihar

- 48 **Developing CreaTures Projects in BioTehna, Rampa and Vivarium**

Creative's View

- 58 **A Visionary for Every Laboratory**
Interview with Oron Catts

- 68 **Is the Artistic Idea of Designing Life a Smokescreen in the Neoliberal Biotech Revolution?**
Interview with The Critical Art Ensemble

- 76 **The Power of Art Lies in Hacking Technology and Science**
Interview with Shu Lea Cheang

Insider's View

- 84 **BioTehna: Developing Our Attitude Towards Living Beings in Art**
Jana Putrle Srdić

- 90 **The Process of Transformation From Community Lab to Wetlab**
Kristijan Tkalec

- 94 **Vivarium – a Laboratory Shaped by the Emerging Necessities of Art Projects**
Simon Gmajner

- 100 **New Investigative Learning Models in Rampa**
Petra Vanič

- 106 **SlimeVenture**
Eva Pondrk

Equipping Laboratories

- 110 **Equipping Laboratories**
Simon Gmajner, Jana Putrle Srdić



Origins

HOLOGENOMA – LABORATORY FOR HOLOGENOME RESEARCH¹

✎ JURIJ KR PAN

CreaTures

The initiative for this book emerged within the framework of the project CreaTures – Creative Practices for Transformational Futures, in which the Kapelica Gallery was involved as a partner in a research art production that inspired various accompanying activities in the gallery's investigative and creative laboratories. The purpose of these accompanying activities, in the form of workshops for children, youth and adults, was to show how informative and transformative art can influence the critical understanding of the processes in contemporary society and the changes in the natural environment that are accelerated by rapid technological progress.

The main contribution of the Kersnikova production platform that houses laboratories in which artworks are created for presentation in the Kapelica Gallery, was made by Maja

Smrekar and Gjino Šutić, the authors of the art project reProductive Narratives. In the research they have isolated stem cells from Smrekar's menstrual blood and with the use of biotechnological procedures described in published scientific research, transformed them into oocyte-like cells, i.e. cells that are similar to the egg cells in the ovaries. The purpose of this project was to draw attention to one of the possibilities of female emancipation, by applying a tactical use of biotechnological procedures, with which an individual can dispose of her biological body at her will and in this way exempt it from the strictly controlled system of medicine, which is far too imbued with the interests of neoliberalism and biopolitics. Maja and Gjino successfully developed oocyte-like cells in the BioTehna laboratory, thus legitimizing them, from the point of view of proof of concept, to advocate the possibility of emancipating the individual from the regulated medical system. Of course, the appropriation of a biotechno-

logical process is not a work of art in itself, but rather the work of the artist, which legitimizes her to transgressively claim ownership over her female body in a future sensitized to the freedom of individuals. Backed by this legitimacy, the authors designed a hands-on workshop for women in which the participants in the BioTehna laboratory were introduced to the biotechnological procedures that are available to their consideration and give them the right to demand free decision-making regarding their reproductive options.

It is possible that this book about the laboratories in the Kapelica Gallery would not have seen the light of day, if reporting on the reProductive Narratives project, which was created within the framework of the CreaTures project, had not failed in the interpretation of the name of the project, which, according to the auditors, referred to illegal uses of biotechnology for human reproduction. Technically speaking, we at Kapelica were in violation, as we did not state in the tender application that we intend to use cells of human origin in the project. In fact, at the time we were writing the application, we did not know which artist we would collaborate with in the project, as we relied on the tradition of past scientific and artistic research in our laboratories and the fact that we take ethical issues extremely seriously. This is why, during the interpellation of the auditors, we were given the opportunity to critically juxtapose the technological determinism of the academic and real sectors with the artistic freedom of expression in the semantically charged materiality of the discharge of the human body. We solved the issue, not without difficulties, with the help of consultations with numerous ethical commissions on different levels, which above all helped us articulate the intermediate between strict medical and legal definitions and the artistic creation of experiences and meanings, which help us pursue and understand the newly emerging fields of

meaning. The reProductive Narratives project and the complications surrounding it, helped us see precisely what the CreaTures project predicted: artistic work and creative research activities in laboratories in which artists and scientists work side by side enable us to see the possible (and impossible) future forms and the necessary changes that can lead us there.

We never doubted the successful resolution of the misunderstanding in Kapelica, as we trusted our long-term experience gained in walking along the edges of various legalities and legitimacy, which were questioned by artists in the past.

What encouraged us to write this publication is the systemic and a priori mistrust that public institutions and institutions of knowledge automatically ascribe to anyone who is not a part of their systematization. Public services, which were created by the social consensus regarding the values these services provide, have shown to be a rigid fortification of privileges that do not best reflect their own commitment to research, critical thinking, and the dichotomy between morality and ethics as the driver of the creation of values that connect and make sense of society.

Therefore, we consider this publication to be an opportunity to present the conceptual viewpoints of an artistic research platform in which we strive for in-depth reflection and radical experimentation, an opportunity to legitimize artistic-research practices as a necessary social activity through which individuals and communities can emancipate themselves from various deontologies as well as professional and moral dogmas. With a brief description of the history of artistic research laboratories, we want to gain an insight into the necessities that led us to

the decision to support the gallery activities with dedicated, well-equipped spaces in which works of art are created.

In the following paragraphs, we will present the production levers that promote scientifically and technologically informed artistic creation and provide artists with a relatively good insight in the subject of their interest and an ethical stance that can rightfully question any privileged, legitimate and legal social agreement.

Kapelica – Gallery for Contemporary investigative Art

From its very beginnings, the Kapelica Gallery actively helped artists find contractors for demanding constructions and solutions in the creation of works of art. As a rule, these works were carried out by smaller specialized companies, sometimes also by laboratories and workshops within the University of Ljubljana. We usually ordered only individual services that helped the execution of artworks, and we regularly faced a lack of space and time for research and the opportunities for long-lasting prototyping, since the process of artistic creation is also sensitive to coincidences and nuances that arise in the interactions with the materials and methods that are used in the creation of the individual parts of the artwork. The companies and institutes with which we cooperated devoted only as much space and time to these collaborations as the financial resources that we, as an art institution, could allocate to each project. Compared to the budgets available in the economic and scientific sectors, these funds are quite a few levels lower, thus the niches in which we could use the public institutions' research infrastructure were considerably reduced.

In unpredictable and limited time segments, it was extremely difficult to plan the realization of projects and the opening of exhibitions, so we often had to rely on the ingenuity of our sound and lighting designers/technicians, who were technically capable of understanding the basics of electrical and electronic devices. With these trained professionals, artists often succeeded in upgrading and integrating semi-finished products developed in institutes and companies into the final artwork, which led us to think that our gallery needs its own workshops and own engineers with a feeling for art created with the aid of science and advanced technologies.

The skills of our light and sound technicians, who are generally exceptional improvisers, brought us closer to the model of trained experts, trans-disciplinarity, the imperative of ingenuity and, if necessary, hacking, where nothing is impossible until you try or until something finally breaks or burns.

Their passionate desire to create something that could not be bought or commissioned as a product from established institutions was so infectious that we soon realized that in order to systematically enable artistic production, we cannot count on the limited access to the real sector, and we ascertained that we need to establish our own research and development department.

The first outlines of such a department emerged from our cooperation with the Kiberpipa community, which contacted Kapelica when organising all-night student demo-parties within our gallery space. When the community sprung to life in an independent space on Kersnikova 6, we were able to realize numerous projects in which the artists needed computer help, knowledge of telecommunication protocols of telepho-

ny, radio waves and the Internet that was provided by the young autodidacts who ploughed the field of positive hacking practices. Amongst other things, we encountered the first conceptual dilemmas of legality, legitimacy in data spaces, and the issue of authorship between various professional collaborators in the creation of artistic projects. It was necessary to redefine the institution of authorship, and to open the process of creating a work of art to the public space.

This meant that the collaborators in the project participated equally in the authorship, and their parallel - privileged - space of representation was not a gallery, but the transfer of knowledge and hacking frivolity (workshops) that they carried out together with the artists and thus became a key part of the process of sensitizing the audience to the themes related to works of art. Laconically, we today call this audience development, but if we leave this patronizing term aside, we can agree that allowing the audience to enter behind the scenes of the creation process of a work of art is an important step towards demystifying artistic creation and empowering workshop participants, which improves their technical, structural and substantive understanding of the artistic poetics.

From the point of view of legitimacy and legality, the help of technically literate freelancers was invaluable, since their participation in art projects was not regulated and controlled by superiors in institutions committed to profit and general social acceptance. Therefore, artistic projects were created in circumstances that allowed a high degree of free and critical thought and action. This soon led us to situations in which the freedom of artistic expression had to be defend-

ed even outside the discourses of aesthetics and privileged artistic frameworks. The dichotomy between ethics and aesthetics in the newly emerging telecommunication spaces required new considerations and the constant questioning of rights, freedom, privacy, legitimacy, legality, etc. Thus, we spent the first fifteen years addressing the interdependence of man and technology, while critically observing the changes in society that occurred as a response to the rapid technologization of everything.

The fatal impact of digital technology development on the individual and society was mainly caused by the miniaturization of electronics, which thereby became ubiquitous. Artists working in the field of new media only occasionally needed help in their work, mainly in the form of larger and more powerful devices, however, with the appearance of electronics in a close, visceral connection to living beings, where it was necessary to connect electronics to the processes of living, the needs of creators changed radically, as it became necessary to provide equipment that has not yet reached miniaturization and spaces that ensure asepticity if one wished to ensure the vital functions of living systems. Thus, it is no coincidence that we dedicated the first space to the laboratory for the research of living systems, BioTehna, which we named in reference to the long-defunct Slovenian factory Mechanotehna, with which we grew up as proto-hackers in the 1970s.

BioTehna – Laboratory for the Artistic Research of Living Systems

The idea to establish a laboratory for the artistic research of living systems was born from the challenges that emerged when presenting art projects in the Kapelica Gallery. We got a vague idea of how the work in an artistic research laboratory should

take place through three several days long workshops/hackatons, that were initiated between 2010 and 2013 by Stefan Doepner, a German artist living in Ljubljana, as some sort of a social sculpture. As an experienced creator in the field of robotics (he co-established the f18institut group), he brought together scientists, engineers and artists in one-week workshops that we organized in the temporarily occupied premises in the old city centre of Ljubljana. At these workshops the participants created innovative hardware and software from discarded electronics solutions (Open Hardware), which could later be used for artistic projects that could not afford expensive industrial devices. The artistic research in Stefan's workshops took on a form that opened our eyes as to where scientific and technological research in the field of intermedia art could reach. These research and creative processes revealed the necessity for cooperation between different experts who know how to listen to each other and extract clues from the cacophony of different professional skills, thus opening completely new possibilities of expression for creative people.

The workshops were attended by several scientists and engineers from the international group Hackteria, whose spiritus movens is Marc Dusseiller, a nomadic scientist for micro and nano systems, an erudite in the field of informal learning and an excellent social engineer. In collaboration with him we successfully obtained financial assistance from the Swiss mechanism in 2012, through which Switzerland, as a country, was involved in the development of the capacities and competences of the European area, and established a laboratory called BioTehna. Initially, the laboratory was a space equipped with merely generic furniture, in which we held workshops for children, youth and the elderly and incubated the first art projects for exhibitions in the gallery. However, as the bio-media used by artists to cultivate

cells is relatively expensive, and difficult to grow, we soon realized that the bare space and do-it-yourself hardware created in educational and hacker workshops would not be sufficient for systematic artistic research and production, which required reliability and sustainability. Thus, the production at BioTehna spontaneously began to develop through two complementary practices: educational activity and artistic production, which also became the norm for the other two laboratories that were created later.

Educational activities are based on hands-on, do-it-yourself or do-it-together workshops, in which participants assemble more or less simple technological miniatures in a hacking manner.

The primary aim of these workshops is to transfer knowledge as regards scientific inventions, engineering and substantive solutions and their creative, usually unexpected use. Alongside the technical challenges they solve, the participants also develop values that promote community dynamics, a sense of help and solidarity. As a rule, workshops are created as a content derivative of various artistic projects in which artists use advanced technologies to express their imaginary worlds. In terms of content, the inspiration lies in the artistic narrative of the artwork, while the materials, technologies and procedures with the help of which the artwork is created, offer various approaches and solutions through which the contours of science and opportunities for a different, non-productivist use of technologies can be seen. The knowledge and inspiration derived from artistic projects are translated into workshops by the artists, or the mentors or hackers with whom we collaborate.

The transfer of the experience of guest creators who developed their projects in BioTehna to other artists and researchers

requires professionals who are constantly present in the laboratory and preserve the acquired information, experience and knowledge. Due to this we have employed a biotechnologist and a producer, both of whom actively collaborate with the creators in the creation of new works of art and connect artists with other institutions and scientists who have the knowledge and equipment that is not available in BioTehna. With the addition of a biotechnologist to our team, we have also made it much easier to negotiate with other scientists, engineers and research institutions in the fields of biology and biotechnology, as well as accumulate and enrich the knowledge and experience brought to the Kapelica Gallery programme.

Over recent years, BioTehna has experienced several relocations and upgrades, which were created as a result of the new, increasingly complex art projects. A better equipped laboratory, improved knowledge and numerous contacts with outstanding artists and scientists have led to the creation of an almost completely emancipated production unit, which is no longer dependent on favours provided by scientific institutions, which even today (in cases when we need more than BioTehna allows) represent the production bottleneck.

The systemic support of the employed biotechnologist enables artists to continuously develop their projects, as the laboratory in the immediate vicinity of the gallery is available to them all the time (24/7).

After almost ten years of laboratory development, we have come to the conclusion that the equipment is also suitable for demanding laboratory work, as in recent years scientists from the institutes we asked for help have repeatedly suggested that the collaboration take place entirely in BioTehna.

Vivarium – Laboratory for Plants, Animals and Robots

In order to ensure optimal conditions for working with somatic cells, we established a Vivarium in another room in 2017. This is gradually developing into an independent laboratory in which less rigorous hygiene standards apply. The laboratory is suitable for working with model organisms, which are primarily subject to veterinary and biological rules of ethical work. It explores the coexistence between different living systems and technology, which conceptually limit to singularity.

Unlike the artistic research and project development in BioTehna, where the research and cultivation take place on the genetic, molecular or cellular level under aseptic conditions, the Vivarium projects are vitally visceral with all the metabolic entropy and weakness that living organisms and cybernetic mechanisms release into the environment.

In the Vivarium, various forms of coexistence and coevolution between the biological and technological are explored, whereby the boundaries between biological (zoe) and technological life (tehné) try to get as close to each other as possible. The potential connections between humans, plants, animals and robots are tested in the laboratory, and research and development projects may involve new materials, food or various bio-cybernetic components.

The strategic importance of the Vivarium lies in the research of the possible scenarios of coexistence between humans and other living beings, which we, as a civilization, have to consider when the balance in nature is disturbed, i.e. in a deep ecological crisis, which is manifested in the change of climate

conditions on the planet and the sixth mass extinction of living beings.

The enlightened part of humanity has realized that the problems that have arisen on planet Earth cannot be solved with the technologies and methods that caused these problems.

Therefore, a radical rethinking and a shift towards a different non-extractive conception of eco-systemicity, different technologies and their uses are needed.

BioTehna and Vivarium do not represent independent operations, but need to be considered in close connection to the gallery production and educational activities carried out on Kersnikova. Only together do they form an important cross-section of social practices, in which art and education enable the thematization of life science, biopolitics, post-humanism and artistic production. The intersection of these in connection with the activities carried out in the field of information technologies, mechatronics and artificial intelligence, which take place in the Rampa Laboratory, enables the exploration of new possible forms of life, which are not rationalistic, productivist and anthropocentric, but syncretic, hybrid and symbiotic.

The ground-breaking artistic creations that were presented in Kapelica Gallery were also possible due to the eco-systemic connection of the aforementioned two laboratories. Through excess artistic productions, we can understand the importance of creating a rounded support environment that is capable of creating a critical contribution to the scientific, engineering and economic production through sensitizing, education, public debates and promoting the poetics of singularity, embedded in the mechanisms of neoliberal capitalism and the economy of crises, which ruthlessly exhaust the planet

regardless of the awareness that their actions also mean the end of everything, i.e. also the end of their operation.

Rampa – Laboratory for Mechatronics

The search for ideas and possible scenarios for a more sustainable and ethical future led us very early on to the future of work as forms of - not only human - creation. The tools we use in non-creative work are increasingly becoming more developed, automated and optimized, and in their developed forms they are turning into robots and robotized processes. From the very beginnings of the Kapelica Gallery, mechanics, electronics and programming have accompanied artistic production as the fundamental elements used by artists in their work. These have changed incredibly quickly over the past thirty years, and we are now facing completely new challenges due to the prospects of new technological solutions brought by quantum mechanics, physics and biology.

The social fabric, saturated with ubiquitous computing power and mechatronics, is changing rapidly without true critical reflection, with which we could avoid harmful uses. Therefore, digital and media literacy and education, and especially the creative use of these powerful tools, are fundamental in solving the challenges of various forms of biological and technological singularity.

However, even though electronics and programming are activities that we have been involved with since the gallery was established in the mid-1990s, we have experienced only a handful of rather modest attempts at artistic robotics and automation in the almost thirty years of our operation, thus we have recently started encouraging

artistic, hacking and workshop production in the direction of developing more integrated solutions. As the rapid development of artificial intelligence has made it clear that robotic systems will increasingly emancipate themselves from humans, we want to raise the playfulness, tinkering and hacking, which have always been at home at Rampa, to a level that will enable more complex robotic solutions. At the same time, this means that the empowered coexistence with robots will only be possible if we gain sufficient knowledge of cyber systems. With this in mind, the Rampa laboratory has been acquiring additional hardware for processing robust materials (laser cutter, 3D printers, CNC, milling machines) as well as implementing additional programming activities through which we can transfer knowledge on the different architectures of artificial intelligence, its creative use and potential, which might be developed by artificial intelligence in the future.

Rampa is thus gradually developing into a mechatronics laboratory in which new robots can be created and in which components that will be connected to biotechnological fragments in the spirit of singularity can be developed and upgraded into new bionic art projects.

Three Laboratories as One

Through the artistic projects that are currently being created in the laboratories at Kersnikova, one can see artistic attempts, which, paradoxically, with the aid of technology, try to transcend scientific determinism, which has, as a result of the constructed humanistic superiority, been transformed before our eyes into the economic, social and ecological collapse of the Anthropocene. The digitization of everything and artificial intelligence as the ultimate tool of data economy are increasingly seen as the last stage of

biopolitics, in which living organisms (including humans) are understood only through data quantification. Life sciences seem to have collided with their own premises and face questions that cannot be answered by measurements alone.

The post-humanist exploration of non-hierarchical ecosystem relationships between different types of living beings has led us to the use of machine learning and various uses of artificial intelligence, with which the authors create artistic situations in which co-evolutionary relationships between humans and plants or between humans and animals can be experientially perceived. The holobiont, as we understand it through the work of our three laboratories, is not only different in its biological liveliness, but also in its programming and hardware liveliness.

Machines that behave like animals or plants can thus be shown as a great contrast to the machines into which we, humans, have programmed our understanding of the reverse engineering of nature and our cultural paradigm. The poetics of coexistence, and perhaps even coevolution, emerge from the differences between the machine-plant and/or machine-animal and/or machine-man relationships.

The next big topic that excites us in our synthetic Lab for Artificial Life today is the premises of quantum biology, which, like all quantum phenomenology, represents a functional limit for our senses and reason. These technologies hold the promise of something that could complicate the definitions of the living and non-living world known to us today. The research and artistic endeavours that we are interested in, increasingly expose us to mental and spiritual positions that allow us to feel the impotence of rationalistic and tech-

nical understanding and the insufficiency of scientific determinism and loudly demand more hybrid intelligence.

Hybridization, hymerization, parasitism, symbiosis and other forms of possible cohabitations are the imperative of artistic research processes powered by the latest scientific achievements from one project to another, however, they, at the same time, try to escape the mental framework within which they were

created. In art research projects, numerous opportunities arise for epistemes that do not rest on logic, agreements and laws, thus we, in the CreaTures project, were given the opportunity to turn the entanglement with the understanding of legality and legitimacy of a work of art into a precedent case defending the necessity of including artistic creation as one that offers a way in-between or outside the well-trodden paths of thought and leads us towards possible future forms of coexistence.

¹The hologenome theory of evolution recasts the individual animal or plant (and other multicellular organisms) into a community or a "holobiont" – the host with all of its symbiotic microbes. Consequently, the collective genomes of the holobiont form a "hologenome". https://en.wikipedia.org/wiki/Hologenome_theory_of_evolution This title was chosen instead of the more generic Laboratory for Artificial Life that we use in our everyday talk.

²CreaTures (Creative Practices for Transformational Futures) is a project that has received funding from the European Union's Horizon 2020 Programme for Research and Innovation.

³Here we have in mind Foucault's conceptualization of biopower and the resulting instruments of perfidious regulation of society, which justifies the ruling values through the eyes of capital, power and domination. Družbo je treba braniti (Society Needs to be Defended), Studia humanitatis, 2015

⁴The aim of the workshops usually transcends mere transfer of knowledge, and is primarily meant to empower and emancipate individuals from corporate and mainstream thinking.

⁵On the initiative of the Student Organization of the University of Ljubljana, the gallery was established in 1995 in the space of the desacralized chapel of the Apprentices' Home on Kersnikova 4 in Ljubljana. Its name emerged from the architecture of the space, which has the form of a catholic chapel (Slovene kapelica translates to chapel, translator's note).

⁶At the time the Kapelica Gallery was a part of an organization within which the nightclub K4 also operated, which needed lighting, sound and stage technicians for its functioning.

⁷Kiberpipa was established in 2001 within the framework of the Kersnikova Institute, which was at the time known as Institute K6/4, as it, alongside the premises on Kersnikova 4, also included the premises of Kiberpipa at No. 6.

⁸At the week-long hackathons titled NanoŠmano, laboratory equipment (microscope, PCR, shaker, micro-fluid tweezers, biochips...) that is in its industrial versions inaccessible to non-scientific or artistic use due to their price, were created. Apart from Dopner the workshops were also led by Marc Dusseiller, PhD, Boštjan Leskovšek, Bengt Sjöln, prof. Erik Reimhult, PhD, Paula Pin and other occasional participants. https://www.hackteria.org/wiki/Nano%C5%A0mano_-_LifeSystems#Participants

⁹The art projects presented in the Kapelica Gallery are predominantly created in the BioTehna, Vivarium and Rampa and focus on the cohabitation and co-evolution of living organisms and machines. The curatorial interest of Kapelica is therefore oriented towards the complex ethical issues of active human shaping of life and the possibilities that are manifested for people through various forms of artificial life. Although the artistic research practices result in projects that gain life merely in simple forms, materials, processes, hybrid and chimeric coexistences, the curatorial vector is almost always oriented towards more complex artificial life forms. These forms of artificial life are not yet within our reach, but they are artistically embodied in artistic projects that lead to possible forms of coexistence (holobiont: an assemblage of a host and the many other species living in or around it, which together form a discrete ecological unit through symbiosis, though there is controversy over this discreteness. The components of a holobiont are individual species or bionts, while the combined genome of all bionts is the hologenome. <https://en.wikipedia.org/wiki/Holobiont>) and in the developed form to singularity. In this case singularity represents the merger of biology and technology into an inseparable life of the two – into artificial life.

¹⁰Kersnikova Institute is a legal and formal umbrella institution within

which the activities of Kapelica Gallery, BioTehna, Vivarium and Rampa take place.

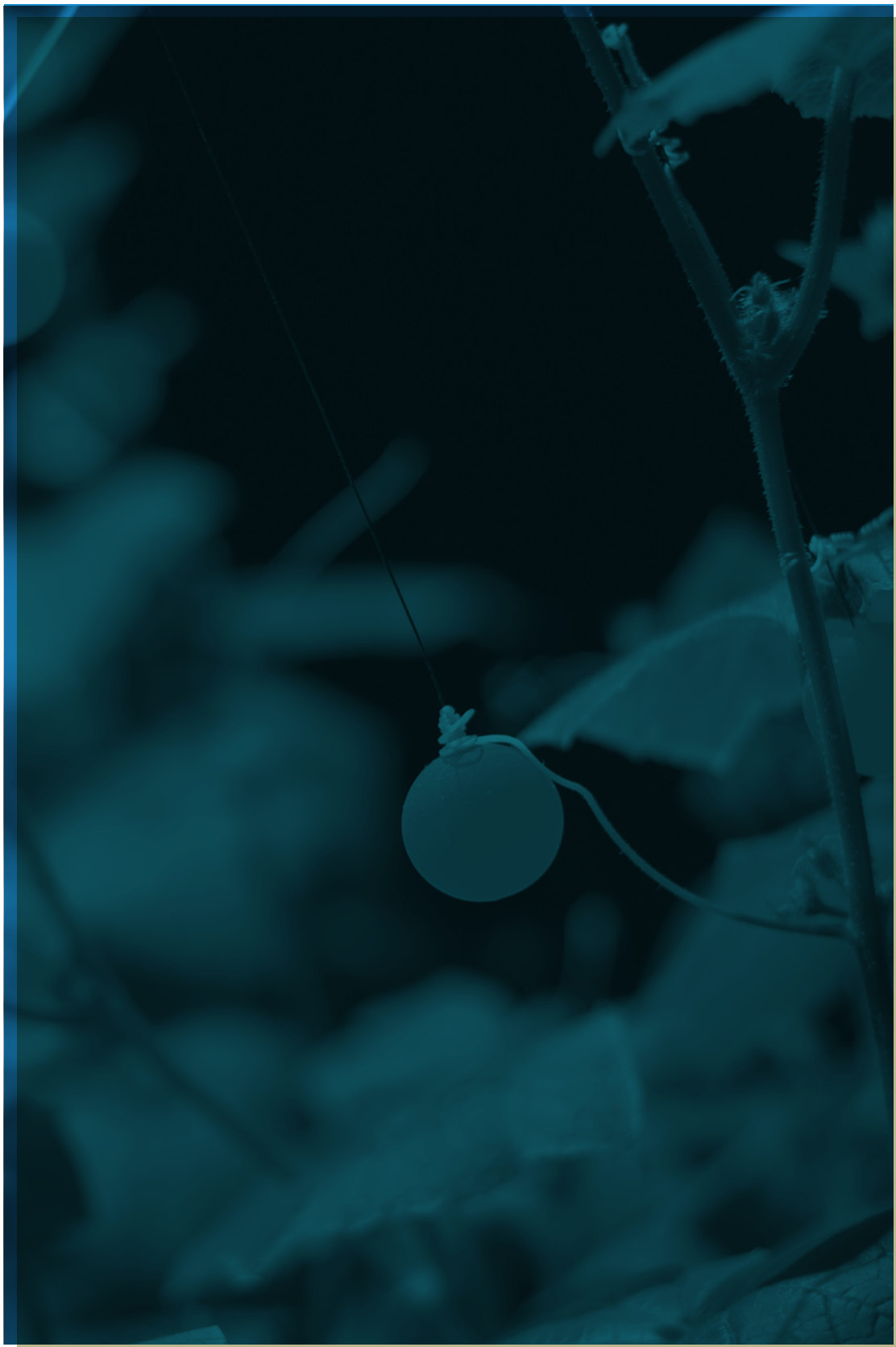
¹¹It will never be possible to present numerous artworks with their internal technology, an established idiolect and polished poetics as a compact whole, and yet they represented an important contribution to the establishment of the Kersnikova art platform. At this point I would like to mention only a few of the more discussed and internationally awarded works of art: Art objet Oriente: May the Horse Live in Me (AE Golden Nica Award, 2010), Koen Van Mechelen: Mechelese Styrian (AE Golden Nica Award, 2013), Saša Spačal, Mirjan Švagelj, Anil Podgornik: Myconnect (AE Honorary Mention, 2015), Maja Smrekar – K9_topology (AE Golden Nica Award, 2017).

¹²Here we have in mind the attempts by Slovene artists, who have only rarely and for short periods of time tried to work in this field, but gave up sooner or later. Even though Kapelica has hosted most globally recognised artists in the field of robotics and we have endeavoured to transfer their knowledge and experience to the Slovene intermedia scene, our intention was unsuccessful.

¹³The various types of techniques such as hacker modified commercial applications or technologies that are used in a completely non-scientific manner.

¹⁴In the current projects of the Kapelica Gallery, various forms of machine learning are used in rather unusual ways. These require a lot of hacking knowledge, which is capable of changing the purpose of the used algorithms.

¹⁵Mojca Založnik's project Infinite In-Between is being created within the programme of the Kapelica Gallery, in cooperation with BioTehna and Rampa. In the third iteration, in which an instrument for the sonification of quantum changes in a cancerous tissue cell is being artistically assembled, the project was joined by Gregor Krpič.



Three Laboratories and Their Art Practices

MANUFACTURING LIFE SYSTEMS: THE TERMS OF COEXISTENCE

✎ VALERIJA INTIHAR

Introduction:

How does a successfully set-up system for undisturbed research of living inter-kingdoms function?

Artists working in the field of investigative art contemplate the potential forms of living systems in the present and the future, and place into the visible field what is often invisible. They reflect intensified visions of symbiotic and hybrid life and harder-to-imagine futures in the easier to understand languages of the art form. The implemented projects reveal the cooperation of living entities, established in a very specific temporality, in which questionable anthropocentric ethics are created and consideration for new ones established. The resulting taxonomies that juxtapose human and micro entities have the power to discuss the established concepts that shape our society and lead us to the very basics of the human: physicality, gender, race, class, and life itself.

The production spaces of these sensitive coexistences are artificially established environments that replace the original ones and provide the infrastructure for maintaining the aforementioned liveliness. The contexts in which hybrid investigative art takes place are laboratories set up under precisely defined conditions, among which sterility, temperature and light are merely the most obvious parameters. On the other hand, the artist who strives to establish the mentioned micro-utopias is exposed to countless other influences. He emerges from them and into an environment dictated by capitalist-oriented policies on a daily basis. They drag him into the fields of bureaucracy, liberally change the fundamental conditions of work and pierce the uniformity of the process, space and time necessary for the artistic process.

Due to its specifics, which we have described in a more detailed review and theoretical context in this year's publication Arc-hive: Life as an object, investigative art cannot be logically integrated into the existing art canon, system and market. This is why, at the moment of writing, the most suitable frameworks for working are still being sought and established. In the following paragraphs, we will allow ourselves to think about the future. We discussed the working conditions and dilemmas with three Slovene and three foreign artists who work with living organisms and who, in cooperation with the Kersnikova Institute, developed and/or presented ground-breaking art projects. We talked to Špela Petrič (Reading Lips, PLA), Maja Smrekar (K9 Topology), Zoran Srdić Janežič (Biobot), Theresa Schubert (mEat me), Guy Ben-Ary (CellF) and Charlotte Jarvis (In Posse).

At this we should keep in mind that each living organism has specific hierarchies and organizational protocols. We are aware that they should not be placed under a single common denominator, as a text with the ambition to be comprehensible and uniform might require. Even though they are united by the excellence of the research method and artistic expression, the mentioned projects differ greatly from each other. In the text, conceived as a mosaic of insights and comments on individual artistic practices, we strive above all to discover the width of the field of investigative art and look for the points of intersection that would help us design a more appropriate art system. Kersnikova's production platform actively considers the dilemmas that commonly arise in the developing field of investigative art and, with numerous years of experience, participates in the establishment of this system, which would primarily convey knowledge and methods, as well as the tools for a better understanding of the technological world we live in.

Processuality in art: time is the issue

The main driving force behind my work with plants in the field of art is my desire to explore the tension between humans and plants, which is flat and single-sided in our cultural pattern. People perceive plants primarily as a resource that is there for us, and in general, establishing relationships is always about connecting to our lives. This puts plants into otherness. In my work, I explore the interaction between plants and humans, as well as a third, post-human element: the machine. I establish and observe a reciprocal perception. My process confronts the tension that arises when trying to use scientific methods to answer philosophical questions. In an art project, the answer will always elude us. The path to the answer is of greater importance for the understanding of conceptual algorithms and the performativity of plants.

- ŠPELA PETRIČ

Science approaches the posed questions with established methods and techniques, while in art we are able to cope with the anxiety of indeterminacy. The artistic field is open to the vastness of the concept of life. On the other hand, science is not, as its assumptions are based on measurability. Not knowing is a state that is welcome in art, and what makes it interesting and relevant.

- JURIJ KRPAŃ

The shared point of the discussed projects is that the author creates with the aim of providing an insight into new ways of organizing living entities in a technology-enabled and intensified future. They can also be seen as a resistance against the established anthropocentric arrangement of space and time and the current biopolitical situation, which often creates a profit from the biological processes it treats, while the individual, whose subjectivity is no longer important, is valued according to his biological abilities. One of these is the reproductive capacity of the individual, which is the focus of Maja Smrekar and Charlotte Jarvis's work. They both emphasize that it is necessary to modify the reproductive systems and create new, affordable and less invasive ones. They address the issue of the fundamental right of reproduction in the context of communities (Jarvis) and workshops (Smrekar), in which they open the door to DIY reproduction approaches and strive for better general scientific literacy.

In the end, I believe, it is the process that counts, and what is revealed along the way, not the finished outcomes. What does it mean to try to build "women's" seamen? That is the point, more so than having a test tube of ejaculate in the gallery. An important moment working with BioTehna lab was when I realized we needed the plasma of cows - but I did not want to incorporate animals. Thus, I suggested working with my own blood. That was possible, they had the lab, they had the nurse that helped with taking blood and it was really easy to extract plasma. When I suggested doing it with a large group of women, trans and non-binary people, Kapelica was up for that, immediately preparing the lab, and so it became a group project, a collaborative project. They provided amazing support - you go somewhere and usually they tell you to scale down, be less risky, safer, less controversial. Kapelica does the opposite. How to make it more exciting, edgier, bigger? How can you push this question?

- CHARLOTTE JARVIS

The existence of molecular sensibilities, as Maja Smrekar calls the laboratory microstructures, is made possible by sequences of micro performative

steps performed by all participants. At first glance, it seems that artists objectify life, in the sense that they separate living systems from their original context and position them for viewing in newly established artificial environments under specific conditions. If we put aside for a moment the objectification that superficial articulation is so fond of, we notice that these are distinctly equally established environments of coexistence. In them, the entity of micro-living becomes visible and encourages the aesthetics of care and maintenance. It is important to point out that it is not a one-way transition of spaces, as the artist is also the one who hands over and receives his cells, blood samples and tissues. Thus, equal exchanges occur and put both or several participants at risk of life. The cellular entity is not the only entity whose existence is threatened if the supply system is interrupted. The entity which we articulate with the 'artist' has to equally withstand the conceptual or physical input of something foreign into itself, and consequently adapt its biological system to it.

Maja Smrekar: K-9_topology

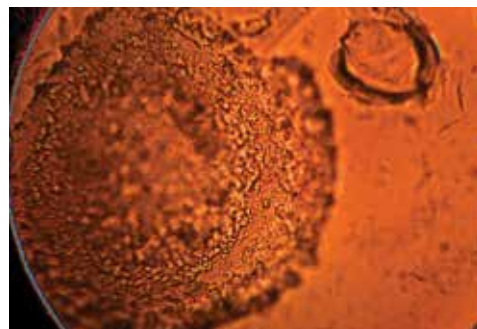
In her opus K-9_topology, the artist addressed the parallel evolution of humans and dogs as well as the various cultural points the two share, thus creating the conditions for contemplating the relation between humans and the non-human other. She confronted us with a dystrophic projection of a future inhabited with a progressive biotechnological hybrid species with a social status comparable to humans. One project within the opus, ARTE_mis, created in the BioTehna Lab, is based on the biotechnological potentials, a hybrid cell created from a human and a dog, set in a gallery space as an artefact, but also as a potential for life, which would have a better chance of survival in overpopulated conditions. K-9_topology is a true hybrid work of art with a deep bio-political message that opens new possibilities for the ethical reconsideration of biotechnologically designed life forms. (Golden Nica, Prix Ars Electronica 2017)

In the very beginning of her artistic practice, which was also the beginning of her collaboration with Kersnikova, Špela Petrič was surprised by the absence of a standard work method. According to her, the method in science is one that is learned and becomes a part of the established work procedures, while in the artistic process, the method is always reinvented and challenged every time. On one hand, it offers a lot of freedom, while being completely destabilizing on the other. Thus, even an artist with a PhD in science is surprised by the lack of rules, and previous knowledge does not help with the fact that the artistic work method is based on personal experience. This requires years of practice, encompassing a range of knowledge and the creation of brand-new skills located on the spectrum of collaboration, research, communication with all kinds of professional languages, administration and long-term visions on which the artist's survival depends. Špela Petrič has observed that her artistic practice is primarily conditioned by the precariousness of self-employment and the requirement to adapt her practice to the constantly changing working conditions.

K-9_topology, Maja Smrekar, 2017. Photo by Miha Fras.



K-9_topology: ARTE_mis, Maja Smrekar, 2017. Photo by Miha Fras.



K-9_topology: ARTE_mis, Maja Smrekar, 2017. Photo by Maja Smrekar.



Špela Petrič: PL'AI and Reading Lips

PL'AI dwells on the recent transformation in computer science that has shifted from calculations towards adaptive practices of learning from data. The focus on plants as living agents exposed to the machinic gaze harkens to the use of automation in industrial farming, yet subverts the epistemic framework of science and engineering by making the constructions strive for plant pleasure, representation and play. PL'AI explores the possibilities of play between cucumber plants and the naïve AI robot moving at their pace. (Honorary Mention, Prix Ars Electronica 2021)

At the Institute for Inconspicuous Languages: Reading Lips we are - with the help of natural and artificial intelligence - able to peer into the psyche of the plant by carefully reading its lips – that is, the thousands of microscopic, “tiny mouths” (stomatias) speckled underneath each of its leaves, and which the inch plant uses to breathe.

*Besides the distinctions between human and non-human, I focus strongly on who writes the algorithms and for whose needs and desires. In PL'AI, I found myself in a position of power, of the one who dictates the algorithms. However, since I identify as a vegetarian - just as I identify a plant as a vegetarian - I try to avoid any assumptions as regards what a plant is, what it wants and how it plays when writing the algorithm. I avoid characterization and try to leave the game as open as possible. This is a key difference, because I have been reluctant to operate with the term “human” for a long time, even though I find it hard to avoid, especially since economic, political, cultural and interest differences are considered in the same breath as the term *ἄνθρωπος*. The idea that artificial intelligence would learn from a plant, without human intervention, represents a considerable utopia, as there is no matrix that would dictate the procedures nor a matrix that would determine progress. This is suddenly left to other entities, and as a result, the evaluations of the work and progress of both artistic and scientific research are blurred. I would say that I avoid the possibility of defining the resulting artificial intelligence as meaningful and functional within the framework of science, while the same feature in art awakens the imagination and opens the possibility for a different conception of plants and the relationship between a machine and a plant.*

ŠPELA PETRIČ



1., 2. Institute for Inconspicuous Languages: Reading Lips, Špela Petrič, 2018. Photo by Miha Fras.
3. PL'AI, Špela Petrič, 2020. Photo by Hana Marr.

In the process of the PL'AI project, it was especially important to leave the sequence of interactions to two non-human entities, artificial intelligence and a plant. The latter established a reciprocal game. A game of bodies has arisen, which is technically not only a game between devices and plants, but between all involved bodies that build, maintain, and observe. Conceptually, the artist strove for conditions in which artificial intelligence writers would proceed from as few assumptions, narrow goals and instructions for the operation of the programme as possible.

Leaving the process open to unpredictable possibilities and shifts leads the investigative artist to another parameter that significantly affects the production. With a predetermined timeline, time is a prestigious quantity that not every process can afford.

Time is one of the obvious and important obstacles. At the end of the project with Keranikova, we didn't have a lot of cultivation time to grow better or more, although the project from the first email with the proposal to the final performance was a very long one - about one and a half years. The actual production time was quite short, so I think it would have been great to have more time there, but then maybe there wouldn't be time for repeating the process if this didn't work. Some processes just take so long, and there is nothing you can do to speed it up. Even if you stay up all night, cells need their own time - so this is the moment to submit to, to the agency of our work, cell processes in biotech labs. You are not in total control. You are dealing with living things. When you are in the production process, you often encounter uncertainty or even failure. We all have this experience of thinking that the concept is easier or more promising than reality. The time factor is something not everyone can afford.

- THERESA SCHUBERT

Due to the nature of the work, it takes quite a lot of time for me to develop a project, usually about three to four years. I am also one of those artists who does work, so I don't ask scientists to develop the protocols for me. I don't send materials over to finish or ask them to accompany me to the space. It took me two to three years just to figure out how to reprogramme my skin cells to stem cells and then to differentiate the stem cells. After that, there was a step to differentiate neural stem cells to leave the neural network. To extract data, and then to introduce them to the robotic body of music. It's research I did myself in the lab. Once I had my protocols established and prototypes working, only then could I present them.

- GUY BEN-ARY

As an artist who collaborates with institutions at home and abroad, I have noticed that artistic platforms that operate in the fields of biology, biotechnology, etc. often have production problems, as such post-media practices generally require a substantial financial infrastructure, which should allow a certain amount of time for researching and developing the

method, as well as the acquisition of appropriate knowledge. Even if only small funds are spent on the formal presentation, the technological process itself is usually a financial and temporal challenge. Our projects are extremely demanding, we invest a lot of energy in coordination and communication, and despite this, poor working conditions are often established, which is further hampered by the dispersion of knowledge. Keranikova designed a very important production system in this field. During the years of cooperation with this institution, I witnessed their ever-increasing recognition of the needs of the artist and their strategic approach to establishing a platform within which the scope of work in the form of the scattered search for tools and knowledge has been increasingly reduced. They have established a space for modern investigative art that provides artists with an infrastructural background in the broadest possible sense. The establishment of Keranikova, including its accompanying work modules, represents an extremely important paradigm shift, both for the local and the international world of art.

- MAJA SMREKAR

Furthermore, Maja Smrekar reflects on the otherwise arbitrary notion of creative freedom within the context of her own artistic practice. She is aware that specific rules of the game are inherent to both individual artistic media and any post-media system that has managed to overcome the legality of the medium. Until the establishment of Biotehna, progress was based on sponsorships and borrowing tools from acquaintances and sympathetic experts. However, the local art funding system still dictates established, mainly temporal-formal processes with very few possibilities for deviations, within which the entire timeline of the production must be known in advance, and may only last a little over a year, while the presentation of the work has to be formal, which is problematic when we consider that the artistic process may have an entry point A, but point B is always completely elusive.

Materialization beyond the object - embodiment beyond the body

The living presence at the heart of the body of work not only produces a new form of reality, but also transforms artistic objects into tools. Deviations from the imperative of the totality of the object and the completeness that this dictates are inscribed within investigative art. The process seeks holes and derivations whenever possible. Even if an object is presented in an individual phase of the project, the procedure, or performativity, is more important. What does the artistic process based on the moment of existence materialize into?

All too often the living is defined as the material of the artist's investigation. This awkward anthropocentric conception treats everything as human material. The moment it begins to be actively instrumentalized as the object of a project, it is doomed, as such a relationship is ethically questionable. During our many years of operation at Keršnikova, we went through a very fascinating transition from focusing on objects to focusing on processes. During the preparations for exhibitions or performances, we realized that these processes are exceptionally important for the understanding of a work of art, so we attempted to remove the mystical veil from them. These highly poetic processes are not always successful. It is also good to show failures - the possibility that is written into the structure of the performance.

- JURIJ KR PAN

Most of my collaborations are conditioned by the expectations of the final form, which is an object, an installation or at least a certain methodology. Besides the object, another, even more important part often fails to show itself clearly: all my works are performances. If the works are established on a living foundation, it must be continuously maintained. Investigative art is better placed as performative practice, because it focuses on the process. Sometimes this is clearly shown, sometimes it is hidden - depending on the understanding of the exhibition institution. As the professional public often attempts to label artists formally and as regards the contents of their works - for example, I am a "bio-artist who creates (installations) with plants" - deviations from the expected take some effort and time to be recognized and understood. In my current projects, I increasingly focus on the development of investigative art methods and hybrid acquisition of knowledge, with which I wish to obtain a better understanding of the context in relation to which the subsequent work is placed. Although we are tied to yearly production cycles, not merely the facilities, but also the development and research process must be financed. Thus, I adapt the forms of presentation to economic, temporal and production capabilities.

- ŠPELA PETRIČ

My work is presented mainly at media art festivals and has the strongest affiliation with so-called bioart, or biotech art. Just because projects often incorporate electronics, sensors, technical media, vision technology - it's a close field. Of course, I wish to access a broader public, so more people can access

my work, to make me more generally visible in art. We are slowly getting out of the tiny niche we were in years ago. But still, galleries and art fairs are unusual for me, I don't see many crossovers with that sphere. As for Kapelica, I feel that it is creating a scene in Ljubljana in which the visitors are very advanced, literate and experienced and able to draw parallels within the field. The opportunity to critically discuss my work was very welcome.

- THERESA SCHUBERT

The transience or the unrepeatability of the performative form of artistic expression is somewhat traumatic. Although the excellent archive of the Kapelica Gallery allows for high-quality presentations of works in the form of video and photographic documentation, it is currently not publicly available. Presenting previously performed performances is always a great curatorial challenge. Conventional historicizing with objects used in the performance can very quickly slip into the fetishization of the object, and the use of video loses the virtue of performance because it uses the theatrical element of the fourth wall. However, the most important is the temporary community that is established during the performative act as in this type of presence the fourth wall does not exist, and everybody present holds a certain kind of responsibility. At the moment the spectator shares the space with the rest of the living systems, he is co-alive and co-guilty, even in the potential subsequent questioning in which the general public might call the event unethical. We are often not aware of this as viewers.

As an investigative artist takes the life form from its original context, he must establish new, artificial contexts that will guarantee its existence. Laboratories, objects and installations present a necessary infrastructure, and it seems that the artist needs to place a living form into artificial contexts. The aforementioned performativity would mean a mere presence, which would not have sufficiently obvious effects for the human perception of time. This presence has an unsolved shortcoming: it is not theatrical enough to be able to communicate itself to the spectator, who would consequently miss the entry point that enables the understanding and arouses interest. Artists therefore use different ways of presenting their insights: from performativity to sculpture, from experimental to more conventional art forms. In order to enter the viewer's perception, they establish diverse correlations of presence, thereby creating a spectrum of possible embodiments.

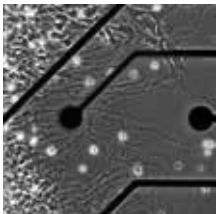
I like black boxes. I think they are a good stage for presenting projects. During the preparation for the exhibition version of mEat me, I made a longer two channel video about the performance and the process. I will present physical pieces of meat from the lab, a small flask of some of the remaining cells from the biopsy, and my frozen cells which I will exhibit frozen on dry ice. I wanted to show them growing, but having an

incubator at the exhibition is unfortunately too expensive. I aim to always accompany the objects with a video explanation; being too conceptual without being precise does not really fulfil my aim.

- THERESA SCHUBERT

I deliberately decided to move away from what people refer to as the bioart aesthetics. I don't aim to install labs in galleries and show petri dishes, pumps and incubators within the performance space. This is just not the way I do things. I moved away early enough, to what I believe to be brushed up, fine-tuned art objects. They have their existence within the gallery with or without the biological material. This decision causes me a lot of trouble, as it means a lot of extra work. Because it's not just about bringing material and equipment from the lab to the performance space. My current collaborator, Nathan Thompson and I make our own biological equipment from scratch: we make our own incubators, sterile hoods, automatic feeding systems and we automate the tissue culture processes. We redesign existing systems so that once they are embedded in our art objects, they are seamless. You don't see it as a lab, but it is a lab.

1. Neurons from cellF.
2. cellF, Guy Ben-Ary with Širom, 2018. Photo by Miha Fras.
3. cellF, Guy Ben-Ary with Alexei Borisov, 2018. Photo by Miha Fras.



Guy Ben-Ary: cellF

cellF is a neural synthesizer, the first autonomous wet-analogue electronic instrument. The "brain" of the project consists of a biological neural network that grows in a Petri dish and controls an array of analogue modular synthesizers in real time. For over a decade Guy Ben-Ary has been working with the art group SymbioticA, which operated in a unique art-research laboratory at the University of Western Australia, where he cultivated his skin cells in vitro, transformed them into stem cells and differentiated them into a neural culture. For the last part of the protocol, he used the BioTehna Lab. The neural culture was placed onto a multi-electrode array (MEA) that can record the electric signals produced by the neurons and use the recording to create a sound portrait. In the two sound events the dialogue with cellF was improvised by the Slovene band Širom and the Moscow sound artist Alexei Borisov (Honorary Mention, Prix Ars Electronica 2017).



For instance, cellRF is a fully functioning tissue culture lab, with its own incubator that keeps neurons at thirty-seven degrees Celsius, provides five percent CO2 and a high percentage of humidity. Overall, all projects are fully functioning labs installed within the work. This is unique about our practice, Nathan's and mine. The biological material is embedded within the living art object itself. Because of the difficulty of maintaining them alive, a lot of restrictions and limitations need to be considered while developing those instruments.

- GUY BEN-ARY

The gallery space of Kapelica is moving away from the laboratory aesthetics as it actively ponders the role of the object, which is conditioned by its ephemerality and, as a result, is practically impossible to store for a long time. However, the surplus value of all the artists is reflected in the activity, rather than in the results. It is clear that we lack a theoretical discourse in this new art system, as it is still in its infancy stage. In addition, a temporal distance is needed to obtain a clear insight into the most appropriate forms of production, which is why it seems important to accurately canonize and historicize the processes.

I set up projects as solving problems, but I am aware that beyond the problems, the projects inevitably enter the field of aesthetics. The Biobot project has an especially undefined, ever-changing body. In this case, it is a matter of considering what the body is, what defines it and what are its politics. Over a period of several years, the project has experienced numerous iterations, representing different options of movement. These iterations are consequently highly anamorphic, and the ultimate purpose of their development is for the body to eventually acquire the ability for direct tactile, sensory perception. To walk without wheels and without external aids. Biobot 1.2. is a much higher developed generation and consequently also more aesthetic, in the sense that it is more materially defined, and numerous decisions have been reached through it.

In addition to stating the ideas that serve as a philosophical basis, I consider the technical description of the events and the process, a reference to what we pay attention to, to be important for my exhibited work. I often include a technical sketch, although it is not verbatim. I believe this procedural level is worth explaining. Namely, those who recognize and are interested in the technical scheme usually approach the work, followed by a smaller number of people who dare to approach the technical loop and its solving.

- ZORAN SRDIĆ JANEŽIČ

Communicating the scientific side of a work of art is an exceptionally important dilemma, which, of course, does not have an unequivocal answer even within my practice. In the beginning, I focused more on ensuring that the methodology was not only relevant, but also evaluated somewhere, which turned out to be of secondary importance. A detailed graph might not mean much to the spectator who has not been scientifically indoctrinated. Over time, I realized that it makes sense if verifiable, science-based layers are present in hybrid art, but they should not be the only ones or in the foreground, as it alienates the work from the audience. In the most recent period, I have striven to improve my communicate with the audience, so I decided to offer more entry points into the artwork, and if they are interested, there are numerous other and more complex layers available, including scientific ones.

- ŠPELA PETRIČ

The laboratory, a cross-section of a sterile environment and a community

At Kersnikova, the consideration of the aforementioned dilemmas was recognized as relevant in the early period of the development of the art field. With this aim in mind, they slowly and steadily established three workspaces, which together with the Kapelica Gallery function as a single unified body, a production platform. The Kapelica Gallery, as the presentation body of this organism, functions differently from the white cubes found in modern art institutions. Firstly, simply because it is a black cube and secondly, more importantly: the gallery is also a group of producers who are ready to accept new elements into the organism. Three dedicated laboratories employ qualified professionals who are not only artisans, but come from diverse engineering fields. The laboratories within the institution are specific spaces, organized on the understanding and ability to solve the needs of a wide range of works of art. They are also one of the few laboratories that are open to colleagues and the general public: even though external elements, strangers to the laboratory process, visitors can enter and document the processes themselves. In this way, the work is demystified, the visitor is engaged, and the most important element of the organism remains the process.

Within the framework of Kersnikova's production platform, I think it is necessary to point out that Biotehna is not just a work space as such, for it establishes a specific, regular and repeatable space that enables the existence of a certain field of art. The development of artistic production is a series of impulses and reactions to the current political system. During

the establishment of the new political system, while our country was becoming independent, the art field, for example, acquired many new audio-visual technologies. This infrastructure began to be strategically invested in because it was believed that this was a modern field that needed to develop and progress. 30 years have passed since, and nothing much has changed. In the field of contemporary art that works with cell cultures, there is still no gallery outside of Kersnikova's production platform that would have a suitable space for such work to be shown. The main advantage of the Biotehna laboratory is that it is mobile and can be moved to another gallery space. This is exceptionally valuable.

- ZORAN SRDIČ JANEŽIČ

The most positive and incredible quality of the Kersnikova premises is that it is a hub where people who can significantly aid the development of a work of art hang out. We developed PLAI between August and December 2020. The closure of the cultural sector meant that many of us used both the gallery and laboratories as production spaces. The logistics were occasionally difficult as we were simply physically in each other's way, but at the same time, the fact that we had a place to meet was a great advantage. This was our hub for quite a few days and nights while we were working on numerous extremely different projects. This was a very constructive and at the same time pleasant experience. I believe that what happened at that moment is what Kersnikova aims for at all times: a lively, active intersection and a place where people come to work was created.

- ŠPELA PETRIČ

In the short period of steady growth that followed the establishment of the production facilities, enormous changes have taken place. While the entire art space was closed due to the pandemic, Kersnikova's production platform had to move to new, temporary spaces and thoroughly adapt them to the needs of the artistic and research process. Moving to unsuitable, administrative buildings is a common local phenomenon, and since they were not suitable for laboratory activities due to their construction method and the installed equipment, the ad hoc establishment of a functional sterile environment represented a great challenge. Especially when one needs an environment in which it is not only possible to grow bacteria, but also to keep cell cultures and human tissues alive. They were forced to stay on the move, as the current space is also only temporary, and therefore at least one more move will be necessary before reaching the final destination. Kersnikova is

handling these moves successfully. The last iteration of the Biobot project, on which Zoran Srdič Janežič is currently working, has recently reached a turning point at which neurons can live in a sterile environment without antibiotics that would prolong their existence.

In the context of science, the laboratory is always specialized and, as such, at its most efficient level. However, in the context of an art institution that strives to deal with a diverse range of topics, practices within one space are very different. This is encouraging for the discourse and intermediality that characterizes the field of investigative art in Slovenia. BioTehna had to adapt to the criteria of - in the context of this text - at least six different goals. Despite the utopian tone of the idea of a universal laboratory, Kersnikova has relatively successfully managed to achieve the ambition of possessing a wide range of techniques and methodologies. Not only as regards the equipment, but also when coordinating spaces and knowledge. In certain projects, a highly sterile specialized environment is not even necessary, and the collaborative efforts that result from the experience and network of connections of the production platform really come in handy. These represent the inventive ad hoc support structures for the project and establish constructive collaborations between exclusive external spaces of science and technology and more civil ones that allow mixing, establishing a discourse and documentation of the process.

Documenting the process is 100% the focus in this project. This is where having a lab that is also a gallery proves to be helpful. It would have been very difficult, for example, to document the blood donations in a commercial or university lab. But in a gallery context, where art is made and documented all the time, the expectations are there already. It is expected that you will want to film and document, and perform workshops in this laboratory. There is a mutual understanding.

- CHARLOTTE JARVIS

In the In Posse project, in which Charlotte was developing artificially created seminal fluid as a possible future female sperm in collaboration with the Biotehna laboratory during the spring of 2019, access to the laboratory was crucial. She had already previously donated her cells at the scientific institute for the research into the development of sperm cells, but she lacked the knowledge of how to create seminal plasma, i.e. the liquid part. This crawling and oozing part, the cum, was extremely important to her, as she wanted to capture the moment of ejaculation within the gallery context. At Kersnikova, the work was ambitiously set within the limits, with relatively low resources and finally - beyond expectations. Jarvis aimed for an approach that, unlike comparable scientific experiments, would avoid the use of blood plasma from animal cells, most commonly cows. She suggested using her

own blood and the production team was open to her suggestion. The plasma extraction went so smoothly that another very welcome potential was revealed in the process. The project was joined by women, non-binary and trans people. A community has been established around the sperm cell.

Charlotte Jarvis: In Posse: Female Sperm

Throughout history, semen has been revered as a magical substance – a totem of literal and symbolic potency. The project In Posse aims to rewrite this cultural narrative, to use art and science to collaboratively disrupt the patriarchy by creating semen from “female” cells. In collaboration with the scientist Susane Chuva de Sousa Lopes from the Leiden University, In Posse attempts to grow spermatozoa (sperm cells) from Charlotte’s body. A female form of seminal plasma (the fluid part of semen) has been developed in the BioTehna Lab using material donated by multiple women, trans and non-binary people, and finally used in a series of re-enactments of the ancient Greek woman-only fertility festival of Thesmophoria.



1. Recipe for female seminal plasma. In Posse, Charlotte Jarvis, 2018. Photo by Nada Žgank.



2. Seminal plasma. In Posse, Charlotte Jarvis, 2018. Photo by Miha Godec.

3. The celebration after the festival Thesmophoria. In Posse, Charlotte Jarvis, 2018. Photo by Nada Žgank.

Kapelica was immediately enthusiastic. They helped me prepare the lab to take multiple donations, and organized a group of donors. And so, it became a group project, a collaborative project in the tradition of collective feminist art creation. It was this support and access to the lab that shaped the project. People from Kapelica were amazing - usually galleries and institutions tell you to go smaller, less risky, safer, less controversial. At Kapelica they do the opposite. They ask: How



can you make it more exciting, more edgy, bigger? How can you push this question? Usually, they try to find a reason it cannot be done, but in Kapelica they go for: we will find a way around it.

- CHARLOTTE JARVIS

The presentation of the projects is technically most demanding when the artist exhibits an active, living form. The possibility of sending a functional living art system to a foreign institution and presenting it live there and preserving it for potential re-presentations are rare exceptions that require superior handling and preparation by the host institution.

Our project cellRF requires a pre-preparation of at least two weeks before the show, as we need this time to start growing our neural networks. We start to differentiate neural stem cells to neural networks in the city in which we are performing. I have just returned from Munich, where I exhibited and where I had

to travel back and forth every day. As is the case, universities are on the edges of town, specialized labs are in big facilities and not in the centre where cultural institutions are. I had to travel three to four hours every day between the space and labs to work on tissue. Kersnikova made my life much easier. The fact that the lab was next to the gallery, within the complex, made our process much, much easier. The second thing that made it easier is the fact that in universities, there are so many bureaucratic hoops and loops to go through, whether you are a visitor or want to work there. In Kapelica we headed straight for the sprint-line.

I began the project at Kersnikova a month before the show. I shipped the frozen neural stem cells in liquid nitrogen and it was very important that somebody receives and successfully stores them. Kristijan Tkalec from Biotehna verified that the work complied to all biosafety regulations in Slovenia. This was very helpful and something that takes a lot of time in other countries was quite easy on this occasion. I usually send a list of requirements of things I could not ship. They successfully purchased and stored everything in the lab for me. When I arrived to Ljubljana, I did three hours of lab work daily in order to establish the neural networks, then I successfully transferred them to the next room to present and install them in this object that we call cellF: a cybernetic musician and full functioning automatic lab.

- GUY BEN-ARY

Kersnikova always tries to fulfil the artist needs and wishes and takes care of the bureaucratic and technical aspects, so you can focus on the process. They show strong support for the artist in the production process, with their or external connections or equipment. In the best ways they can, they look around for solutions and results and no idea is too crazy to realize. I like their courage and attitude towards edgy projects, I value it. I have worked in other labs and saw the uniqueness of Kersnikova in combining the experimental and production facilities as well as the gallery in one house. One can feel that the production happens in the same house and is just moved next door for the exhibition and that is something special, it enables different kinds of pieces. One has more decision power, or spontaneity that are possible only there.

- THERESA SCHUBERT

According to the people we talked to, Kersnikova is a model of artistic production that many could follow. In addition to the usual gallery activities,

Kapelica also takes a tactical approach to creating the conditions for understanding the creative field with biotechnologies. A conversation with the gallery's production team confirmed that the team is fully aware of the changing ways of perception that a modern art institution must adapt to. Since there seems to be little initiative among the users to understand the often complex modern technologies, a catalyst is needed. Kersnikova found a way to establish this aspect through the organization of their educational programs. The Kapelica Gallery has become a place not only for contemplation, but also an open workplace.

Establishing an artistic ecosystem for the next chapter

There is no commercial market for the work we perform. This is very empowering, it's a good thing. I don't need to try and sell my work, for this leaves me with a lot of energy as I do not need to deal with that system. It's liberating not to be a part of this game. Somebody could theoretically buy my living art work and have it at home, but I don't think that would be a good idea for anybody.

- GUY BEN ARY

In the discussions on investigative art, one can often hear that the art sphere still belongs to a niche, that it is on the fringes, that the public has not accepted it to a satisfactory extent. Some institutions advocate in-depth engagement with the design of communication and marketing in the existing system. Others, including Kersnikova, are aware that this is not a system in which they actually belong, and therefore invest a large part of their production energy into establishing a new one.

Being aware of the need to raise competences within a digitized society has become the spirit of the times. Within the educational konS programme, the Kersnikova production platform effectively filled the gap in the local education system. With the aim of creating a critical approach to new technologies and educating an informed public, they established a system of informal learning. In doing so, they see it important to develop different types of education on various levels of complexity and for various age ranges, i.e. to appeal to different audiences in a more or less complex manner. In addition to the critical distance to new technological implementations, participants will also have the opportunity to contemplate the artistic considerations of the future.

Although the konS platform is a system in the making, various spheres of social activities have already recognized its value. In addition, it offers participating artists the possibility of pedagogical work within their own field. At Kersnikova Institute, they are aware that the currently established comple-

menting of artistic activities with activities on the free-market forces artists to develop projects virtually in their spare time. This manner of working is disruptive and prevents the establishment of a stable artistic ecosystem.

Through the many years of experience brought by the constant active engagement in the field, the platform is able to recognize the potentials where cross-reality promises socially necessary and interesting progress. Among the goals they mention are the establishment of regular communication with the economy and the creation of a new field of artistic employability. Artists who are able to sense both, technological potentials as well as their dilemmas, will enable the development of safer, more trustworthy, more ethical, accessible and circular technology.

All of the above is primarily about imagining art thinking (as first articulated by the organization Ars Electronica) as a meaningful element in economic innovations, without forcing this thought to become anything else than artistic. This is a new approach, which does not mean adding new tasks to already multitasking artists or forcing them to move from the artistic to any other field of activity. The production platform assumes the task of a connecting link between the various fields of activity that promise an interesting and exciting future.

Kersnikova has joined other organizations that dedicate a large part of their production efforts to the creation of these junctions, thereby striving to establish the necessary systems of continuous funding for the artist as an innovator. "Knowing that artists are neither designers nor engineers. And that they don't have to be."

Communicating the liminal and ephemeral

No particular knowledge is necessary to immerse into the art projects that we show within our gallery contexts. We appeal to emotions that are not intellectual but physical. This is not about understanding or misunderstanding.

- JURIJ KR PAN

In order to establish the diversity of the field, sensitivity and precision in articulating the insights of an individual art project are very important. When the listed projects are compared with the concept of modern bioart, concepts become generic. In order for the living to not become merely symbolic and consequently objectified, hierarchies and differences must remain clear. In the absence of basic information, the viewer can equate different entities with something biological, which is what bioart deals with. Since the essence of investigative art lies in the investigation, it is interesting to think about how

to represent and communicate the development of scientific methodology without the work remaining closed within an overly didactic intention. In this way, the articulations of works of art strive for elusive balances.

I am always thinking about how to communicate the emotional landscape of a piece to an audience, while actually communicating what I'm doing. Solutions to the problems I am researching can be really didactic. I often end up having to explain how stem cells work, how DNA works and there is a real challenge not to turn it into a science lesson, but to also communicate emotions, the more liminal, ephemeral aspects of what I want to achieve. The societal changes I'd like to bring up, and the feelings of the participants. I try to think of how I'm going to present the documentation, which is the narrative material of a project. Secondly, I think of the emotional impact: that is the creative, ephemeral side of it. I usually have an idea at the beginning, but then try to allow other ideas to kick in during the process. With In Posse, it became an essay. Sometimes it's presented simply, sometimes in a complex scenography. I try to let the project dictate. Usually, it's hard in the beginning when I exhibit for the first time, because I need to decide upon everything, all the decisions of the story, so that it is going to be visually interesting, a little immersive and so on. Once the project continues, I have plenty of documentation, films, texts, objects. It becomes more of an editing matter, and I enjoy that a lot. The part when I have all this material and I sculpt it, so that people can get an insight. I enjoy setting up installations which contain lots of different media. This shows the journey and how complex these projects can become.

- CHARLOTTE JARVIS

During the Reading Lips and PLAI projects, I realized how poorly we - as a society - are acquainted with the everyday use of artificial intelligence, for example in the economic sector. In most cases the AI topic triggers a questioning of the definitions and limits of intelligence or creativity, or we perceive it as an entity 'due to which we will lose our employment, as a kind of Terminator that will threaten us in one way or another'. Meanwhile, everyday practices with better-named machine learning paint a different, but no less urgent, picture for understanding the transformation of society under the influence of advanced digital technologies. Over the last few years this area has been demystified with the aid of art and related theoretical discourses.

- ŠPELA PETRIČ

Špela Petrič advocated the use of playfulness and humour when setting up the PLAI project. She is aware that complex topics that overwhelm the public require a friendlier invitation to their content. The criticism of artificial intelligence systems reflects a great deal of inherent anxiety, thus she finds it important to strike a balance between naïve affirmativeness and dismissive anxiety. In PLAI, the artist, who has recently been working mainly on developing methodologies, has focused on the development of the methodology of laughter, which she believes is not a commodification of artistic expression, but rather an entry into uncertainty through laughter, which as a reaction to an excess of meaning opens the exits from the oppressive status quo. She uses the game between the plant and artificial intelligence to establish an intimate state on which private rationality and interest are built.

I approach the communication of my artworks with the idea that if the visitors want to know more, they always have the option to follow an individual artist or explore the online archive of his/her work. One of the clearest qualities of the Internet age is that we, as individual users, have the option to obsessively explore archives in a wide variety of forms. To a large extent, my work lives online, it is arranged in a network of online archives and publications, and in this sense the presence of the object is merely the starting point. In my opinion the dilemma of didacticism seems to be a question of how to be informative and not hermetic at the same time, which I always find a challenge.

- MAJA SMREKAR

I personally believe that art in the broader sense is often comparable to solving a mathematical problem, where it depends on the individual how much he will delve into it. Thus, the visitors are all mathematicians, but on different levels of abstraction. Is the abstraction level of my project clear to everyone? I don't deal with this issue, for I focus on the visitor. In this project, I think it is important to present the field of ideas, which represents the philosophical basis, as well as record the procedural part, and between these two articulations there can be a gap that offers the visitor the possibility to enter through one channel or the other.

- ZORAN SRDIĆ JANEŽIČ

Should it work? The question of accuracy

I recently read a publication in which the artist involved in calculating the carbon footprint of modern internet networks mentioned that she does not feel total commitment to the accuracy of her calculations, since she is not an en-

gineer. She explained that her intent is primarily to use engineering methods to present the concept in ways that would be tangible enough for the public to feel it. The latter raises the question as to where is the limit of so-called accuracy and how to treat the project using the scientific method so that it achieves its goal.

The level of scientific research must be a conscious decision that coincides with the concept of presenting the work. There is no rule here, but if we decide, to place the accuracy of scientific content in the work as one of the artistic media, this must be conceptually and technically able to withstand its ground, otherwise the lack of credibility of the work will become obvious. In the cases in which I am committed to formal scientific findings, this is mainly because I want to change the function of established scientific protocols, and address the problem in which the market abuses the instrumentalization of science as a paradigm for establishing identity, gender, class, nationality and even species. This is a palliation of life, which interprets certain results to which ideologies are freely appropriated as "correct". Within this starting point, I implemented certain scientific protocols in order to subvert their use through my own body. In this case, accuracy was absolutely essential, for it had to be sufficiently convincing to establish a critique of the use of science in relation to the conservative capitalist system, in which all systems within which we operate and live are ultimately embedded.

- MAJA SMREKAR

In order to articulate the answer, I would like to mention a project from the time I was still studying, when I created a hybrid, a stuffed mouse with a latex human ear. Today, we have already far surpassed the cult image of the mouse-human hybrid, because we have understood its unethical dimension when such a hybrid crosses into the field of patents and capital. However, conceptually, this mouse, whose deaf ear could utopically listen to a lonely old man, is nevertheless something I find interesting. The artistic field as the field of the impossible. Basically, my interests are very physical, and within these complex mechanisms, the movement I create is strongly performative. For the framework I make to actually be implemented, I would have to pass tests in medical studies. This search for a solution is no longer in my domain because it no longer contains anything artistic. Despite the fact that the desire and interest are the same, this is a point of departure into other spheres. But in my work, the muscle still has to work, contract

and stretch, this is essential. We can hear the opinions that intermedial artists create objects that look like a robot vacuum cleaner, but does not work as well. This is naive, because no artist would make a vacuum cleaner like Wileda or iRobot already did. The background is different, however, it should also work. The extent to which an artist deals with the details of the performance depends on the practice, a lot is legitimate. We can also write about neurons or render them. I personally work with them.

- ZORAN SRDIĆ JANEŽIČ



Zoran Srdić Janežič: Biobot

In the long-term investigative art project Biobot, the artist, together with a team of experts, experiments and develops neural tissue, processes input signals from it, which are used to navigate the robot. The aim of the project is to grow a simple hybrid organelle from the artist's own fat cells, reprogrammed into neurons, grown on a multi-electrode array (MEA), which, like a brain-on-a-chip, will be able to control the robot's movements in space. The AI software uses the output signals from the neurons to articulate the Biobot's locomotion, and matches them against the possible movements of the legs of arthropods. From these comparisons, the AI deduces the appropriate number of joints and limbs and suggests the most optimal skeletal constitution for a certain movement. The algorithmic search for the shape of the bot according to the stimulated biological activity appears to be an uncontrolled evolutionary process that opens the possibility of a hybrid bio-cybernetic life with its own intelligence and movement. (Honorary Mention, Prix Ars Electronica 2023)

I am happy that, in addition to the high percentage that affirmatively appropriates artificial intelligence and digital technologies, the other percentage addresses this topic more critically. However, I strive for a relational perception of artificial intelligence, not in the ontology of the Enlightenment, but post-humanist and ecofeminist. I am currently focusing on automation issues of care in agriculture and the health sector. After using algorithms within the art projects presented in the gallery, which, like a laboratory, is a completely isolated, controlled and privileged space, I think the next logical step is to transfer some of the premises from the gallery into a real space, where completely other things are taken for granted. I think it is important to understand how one can implement radical artistic positions outside of the gallery.

- ŠPELA PETRIČ



1. Experimental situation with an incubator, designed for the Biobot project at Centquatre, Paris, 2020.
2. Biobot in the mobile laboratory at Bozar, Brussels, 2021.
3. Biobot: AI ARthropod, Zoran Srdić Janežič, 2022. Photo by Mojca Gorjan.

My main focus is on authenticity - the idea and the outcome must be something I feel authentic with. In the sphere of art and science we can see some differentiation between artists in design. There is all this speculative design and nice visualizations. I believe they are valuable contributions to the field and for the popularisation of the topics, but as an artist I want to go to the next level and try to realize, materialize and touch in the lab. This obviously comes with certain specific limitations. If it was only about a symbolic representation

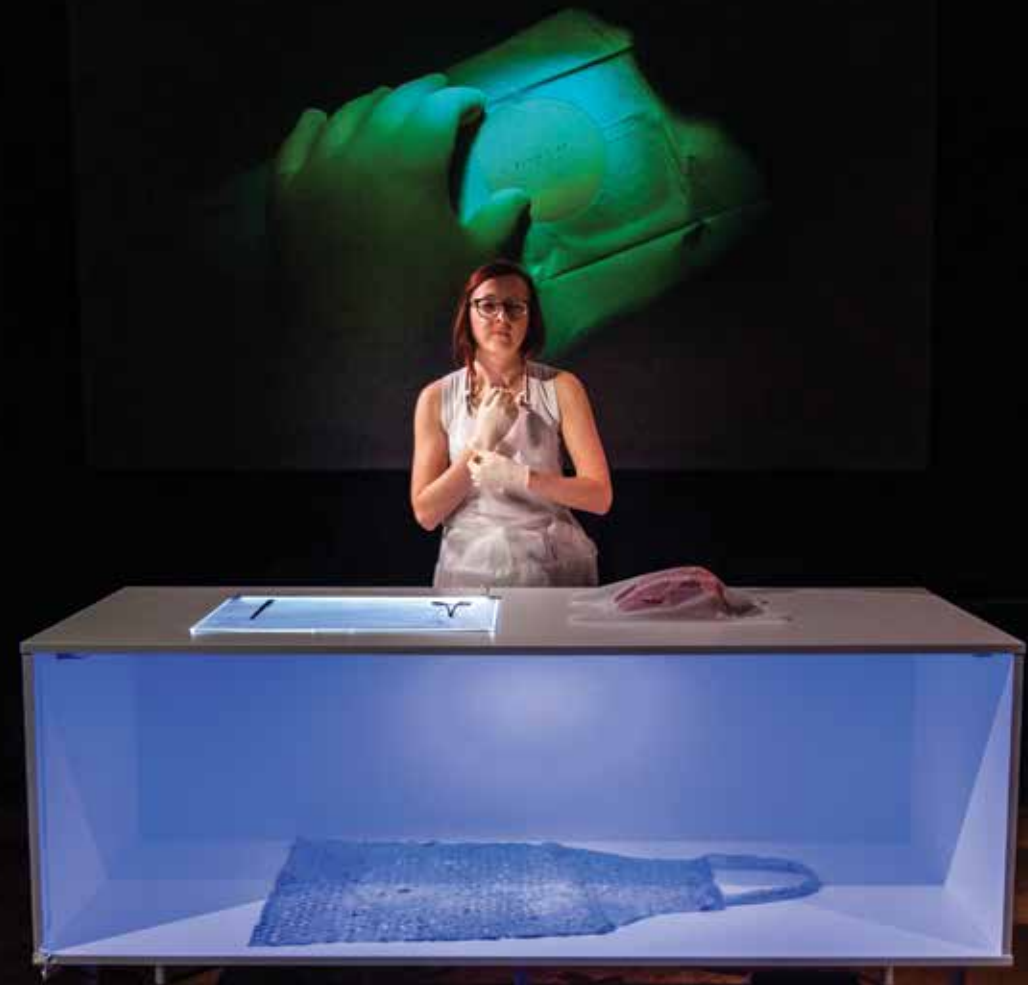
in design visualization, I could go crazy. If I want to do it for real, I need to obtain better scientific knowledge, do more research, have more collaborations, and find ways of doing this in reality. You quickly come to doing these error experiences, but understanding the medium is also important. Some things seem programmable and controllable in biotech, and the protocol might already be in existence. But sometimes it just doesn't work out - sometimes it's this unpredictability in life that I find so interesting and welcomed in my work, there is an openness towards the developments of nature in a good and bad sense, however it might go. There comes the question of belief - it must be there. If somebody states that they crossed a human cell with a donkey, there is no message, or nothing to evaluate the truth from just that statement.

-THERESA SCHUBERT

Theresa Schubert: mEat me

In her project, Theresa Schubert views the human body as a food production unit, as an ever-renewing food source. By using new in vitro meat production techniques, we could use our own body to feed ourselves, we could literally eat ourselves and stay alive at the same time. In her art project mEat me Schubert and a team of bioengineers multiplied cells from her thigh muscle in a serum made from her own blood and then seeded them onto an edible gellan gum matrix in the form of meat patty. In the performance the artistic gesture reaches into a hybrid space of alchemy, futuristic industry and posthumanism, and proposes a cannibalistic solution as a response to the fake "clean meat" ethics. (Honorary Mention, STARTS Prize 2021. Award of Distinction, Japan Media Arts Festival 2022)

For me, it needs to work - there are a lot of artists who bring biological material, they kind of cover it with a black box, and they ask people to believe that it works. When I bring living material to the gallery, it is working, and not just for the sake of poetry. A large part of my work is about the liveliness of biological material. We put the materiality of the work in the centre of the gallery. That's why we brought it to the gallery in the first place. If it's not working, you don't have to present it in this medium, you can do it another way - one can write theories about it. Describing ideas and what could be would be more accurate. I believe that an important part of the work happens when the audience faces the alienness of the created entities.



1., 3. mEat me, Theresa Schubert, performance, 2019.
Photo by Tina Lagler.
2. mEat me, Theresa Schubert, performance, 2019.
Photo by Hana Marn.

In the *Bricolage* project, we built the cell systems to a size where you can actually see them. We did this to eliminate all the questioning, and the entire idea of mediation. No projection screen, no piece of technology between the audience and the piece we want to mediate. We want the viewers to experience it in a direct way, so one can understand and start contemplating the idea. This phenomenological experience that the viewers are going through, the dissonance when presented alien entities perform. People asking questions, about what forms or fragments of life they have never seen before, are present in front of them. They are surprised by the liveliness and alien animacy that is projected from them. The focus of my work is bringing the materiality, the biological material to the gallery. With *cellF* we could just play the music, but the fact that neurons are in the space and that people can actually see the incubators and tissue cultures that are hosting them, makes the work interesting. Everything we are doing is augmenting and amplifying the neuro-performance that is happening in this one millimetre square area inside the petri dish. Should it work? Should we bring things that we claim that we do? Or should we be subversive? Some artists do that, there is nothing wrong with this, I just don't want to do it this way. Some people do it because they don't have the resources - it takes a lot of time and really hard work.

The other side of this comes when people ask me about the potential of growing neural systems, and the potential of reorganizing them in a meaningful way - maybe learn, but that is a strong word, it would be better to say to show emergent behaviour. This is the potential of neural networks. When we are questioned, if they learn and asked to show some data, we don't do that. We are artists and not there to cure cancer, we don't write scientific papers and analyse the work post festum. We don't need to do this in the gallery, we could use a normal lab, where there would be no phones, no sounds that would interfere with electronic currency. The experiments we perform are cultural, not scientific.

- GUY BEN-ARY

When working on *In Possé*, I was lucky to have worked with scientists who had a lot of funding for this project and we could therefore be 100% scientifically precise. I love this - I believe in the potential outcomes of the project and the potential this research has. My job is slightly different to the work of scientists, for me it is not important to know every measurement and scientific paper. I am artistically liberated from that and I focus on presenting the concept, the feeling. The vision of the

future, optimism, pessimism, the landscape of the project, what it might do, present, what it means for people emotionally, there is a kind of truth in this and artists have a great way of presenting it. It would be a shame to hide this behind the awesome precision of a large scientific work. I feel fortunate to have it both in this project. However, in some projects it is important to reach a decision, a choice about what is leading the project. What one has to do in order to make the project meaningful. Sometimes I need the science and its precision to work. If you don't have the reality of science, then there is no meaning. Sometimes it can be a bit more conceptual and symbolic. It can be a potential, where the idea is the most important. So, finding what is crucial in a specific project is the most important.

- CHARLOTTE JARVIS

The future of searching for the crucial

A clear vision shared by the participants in the field of investigative art is to develop socially relevant, lucid and penetrating projects on the intersection of biotechnologies and art, using programming language and other related skills. As characteristic of every point in history, here and now opinions are being formed about what is relevant and what approaches will deal with forms of life in the future. Kersnikova's production platform is an important member of the developing art ecosystem, as it is an institution that is highly demanding of itself and other people within its circle, thus establishing a critical discourse within the local framework, and finding constructive answers within the global framework. The people we have spoken to emphasize that cooperation with the Kersnikova Institute is not easy. It presents the participants with a great challenge to go beyond themselves and the walls of the laboratories on Likozarjeva Street in Ljubljana, and in doing so establishes a structure that might help answer the question: what will be important for life in a highly technological future?

¹ Zavod Kersnikova: Arc-hive. Life as an Object. Case studies. Ljubljana, 2022

² MAJA SMREKAR, GJINO ŠUTIČ: 'reProductive narratives', <https://kersnikova.org/en/archive/event/maja-smrekar-gjino-sutic-reproduktivne-narative-laboratorijsko-delo-in-raziskava>

³ Accessible at: www.spelapetric.org/plai

⁴ Žukauskaitė, Audrone: Hybrids, Chimeras,

Aberrant Nuptials: New Modes of Cohabitation in Bioart. Nordic Theatre Studies, 2019

⁵ Hauser, Jens. Paradoxes and obstacles in maintaining and staging biomedial art. Life as an Object, Zavod Kersnikova. Ljubljana, 2022

⁶ Jurij Krpan, 2022

⁷ Accessible at: www.youtube.com/@kersnikovaorg1012

kersnikovaorg1012



Three Laboratories and Their Art Practices

DEVELOPING CREATURES PROJECTS IN BIOTEHNA, VIVARIUM AND RAMPA

Developing CreaTures Projects

Between 2020 and 2022 we developed three creative CreaTures projects within Kersnikova. Even though the authors, their teams, participants and producers combined their knowledge and know-how, as well as the equipment and premises of all three laboratories, these projects have shown themselves as model examples also for our planned use of each individual laboratory. On the material level, the reProductive narratives research human cells and hormones in human urine, thus BioTehna was the best space for it. The project ml-isolla|tilo|nis|mus is an excellent example of integrating technology and human waste materials into an isolated plant sphere and thus its natural habitat was Vivarium. Alongside the work with mycelia in Vivarium, the workshops that emerged within the scope of MyCoBiont, reached mainly into the mechatronic part of Rampa, where the authors combined fungus and technology, creating radio transmitters and incubators as well as performed other hands-on work processes. In the continuation we will present the three laboratories within Kersnikova and the three projects that emerged within them.

BioTehna – Laboratory for the Artistic Research of Living Systems

The oldest laboratory on Kersnikova was established for working with living systems within artworks, and started developing with greater intensity from 2012 onwards. Lately, BioTehna has specialised for working with cells and tissue cultures, and with its equipment and expert biotechnological help it provides support to artists in their experiments with various organic materials, for instance with bodily fluids, and all the way to the most demanding projects which deal with genetic engineering.

Within art installations, the artificial life developed in BioTehna, is often supplemented with ambitious technological and robotic solutions, which demand the use of machine learning and artificial intelligence developed especially for it. These are genuine hybrid works that try to reach beyond the established on the cross-section of art and science. We never consider the bio-technological innovations in art as a purpose in themselves, for they always explicitly question the relations of power in society, and we direct them into revealing the biopolitics of the body through which it is possible to envisage a fairer society. The most demanding and resonating projects produced within Kersnikova were developed in BioTehna.



Maja Smrekar, Gjino Šutić: reProductive narratives

The reProductive Narratives project used an artistic metaphor to describe the social phenomenologies related to the recognition and appreciation of the female body as a production facility for new life. Using the facilities in the Universal Research Institute (Zagreb) and BioTehna Lab (Ljubljana), the author Maja Smrekar experimented with her menstrual blood as a material for artistic expression. In collaboration with the scientist and artist Gjino Šutić, the aim of the project was to open a space for reflecting and speculating on the existing and imagined reproductive possibilities.

The spread of contemporary populist ideologies linked to national and ethnic boundaries has increasingly focused on the issues of birth rate, through which the female body is cast as the property of the state through legal and ideological means. Through their hands-on biohacking research and practice-based process, the authors aimed to encourage strategic alliances employing hormones and menstrual blood within non-invasive biotechnologies. Within their laboratory work, Smrekar and Šutić experimented with isolating stem cells from Maja's menstrual discharge and cultivating them within growth media containing hormones extracted from her urine which at the end showed egg-like properties (specific protein structure), raising the imaginative scenarios regarding new speculative possibilities of reproduction.

1., 3., 4. Laboratory work and research. reProductive Narratives, Maja Smrekar, Gjino Šutić, 2021. Photos by Hana Marn and Kapelica Gallery Archive.
2. BioTehna, 2022. Photo by Mojca Gorjan.



From their laboratory work authors developed the public workshop Fertilize me, which focused on the human gonadotropin hormone, extracted from urine and already widely used within the IVF procedures for injecting in order to induce fertility. The workshop introduced the idea of freely exchanging hormones by developing low-cost citizen scientific tools that offer a speculative artistic alternative to the IVF process, aiming to empower women.



Fertilize me workshop. Maja Smrekar, Gjino Šutić, 2021. City of Women Festival. Photos by Nada Žgank.

Vivarium – Laboratory for Plants, Animals and Robots

Artistic projects involving living organisms and biomaterials require the establishment of a spatial and technical infrastructure that enables the conditions for growing, maintaining, observing and researching plants and animals, from simple to complex organisms. In artistic projects that required the cultivation of cells of plant and animal origin, mutual contamination occurred despite safety measures, so we established an additional space - the Vivarium.

So far, the projects in Vivarium included the research of plants and their interaction with technology (e.g. the StellaVerde) and the testing of new biomaterials from bacteria, slimes, fungi and other microorganisms, from which the authors created substitutes for leather, building materials, filtration systems, etc.

Vivarium hosts projects that need time, for instance plants need time to grow, and the artists who work with them need time to research and test the new sensory systems and the most favourable conditions for interweaving the plant with the algorithmic and robotic part of the art installation. The Vivarium is also an inspiring place for the creative team to hang out, in which soil, bacteria and fungi do not cause problems, but instead trigger reflection on new ways of coexistence.

Vivarium, 2022. Photo by Mojca Gorjan.



taro knopp & Kersnikova: ml-iso|la|ti|o|nis|mus

The researcher and artist taro knopp focuses on mycelia as an omnipresent organism, a communicator between various plants and organisms. In his projects mycelia is viewed as a tactical socio-political comparison, used to critically rethink the alternative models of economic production and co-existence.

At Kersnikova he led the co-creative process tied to his long-term project ml-iso|la|ti|o|nis|mus. Together with the mentors from Kersnikova, he constructed an installation consisting of transparent acrylic globes equipped with various technological sensors, radio transmitters and receivers. These closed, self-sustaining eco-systems combined different locally extracted organic materials and electronic devices that can sense changes in the living mycelia and create a sound environment with radio waves. Three globes resulting from the workshop were exhibited in the Kersnikova gallery space Modul as symbolic techno-organic machines. In the interaction with one globe, a sound performance with an electronic sensing instrument was developed and used for a performance at the exhibition opening. Another globe was co-created at the CreaTures Festival in Seville. The mycelium globes have become a part of the permanent exhibition at the Kersnikova institute, enabling continuous observation and research.



ml-iso|la|ti|o|nis|mus,
taro knopp &
Kersnikova, 2021.
Photos by Tina
Lagler and Hana
Marn.

Rampa – Laboratory for Mechatronics

Rampa is a connecting platform for artists at the beginning of their creative journey, who have started to develop their artistic projects, as well as a research platform for the preparation of educational programme. In this open incubator, researchers and communities connect art with mechanical engineering, electrical engineering, automation processes and information technologies in an innovative and creative way. Rampa offers a specifically equipped space in which authors collaborate with experts and engineers and co-create their projects, which are presented in their final form in the gallery spaces of Kersnikova Institute.

Workshops for different scales of projects and various public take place at Rampa. As supporting activities, they enable familiarization with materials and processes in works of art, take care of informal education of artists, development of community knowledge and activities, and transdisciplinary integration. The participants get to know the basics of technologies and materials, as well as the different approaches to solving similar problems, which gives them a better understanding of emerging investigative art. More complex works are created within the community, which can develop into artistic, socially engaged or lead to interesting products.

Rampa, 2022. Photo by Mojca Gorjan.



MyCoBiont workshops

The MyCoBiont project involved a series of workshops in which the participants learned about the life cycle of fungi and engaged in co-creative experimentation with various practical and speculative uses of fungi as a climate friendly biomaterial. The project's aim was to provoke a reflective discussion about the more-than-human entanglements surrounding the life of fungi and catalyse a shift in the human perception of non-human organisms that surround us: from materials or resources to be used for human benefits, towards organisms with which we co-exist.

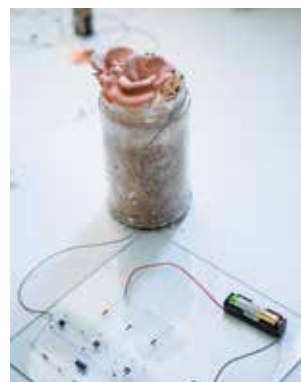
The MyCoBiont series started with a seven-part workshop led by the Gobjak initiative, in which the creatives learned the basics of fungi's nutrition and reproduction. They built a cultivation chamber, which provided suitable conditions for mycelium growth, and created their own mycelial bricks. With research and artistic interventions, it was possible to delve deeper into the diverse capacities of fungi – organisms that may represent a revolution in the field of new climate-friendly materials.

In his Radio Mycelium workshop Martin Howse focused on the hands-on exploration of a new networked imaginary: investigating the single organism of the fungal mycelium in relation to local, global and universal electromagnetic signals. The participants learnt about the properties and abilities of mycelia for processing and modifying signals. They built radio transmitters and receivers and interfaced them with examples of various fungi, imagining interspecies relations between humans, mycelia and their environments.

At the Becoming-with Fungi workshop led by Mary Maggic, participants experimented with the detoxifying properties of fungi in order to imagine new cross-species toxic entanglements. They created a xenoestrogen cocktail and fed it to Oyster mushrooms, stained with Remazol blue, a synthetic fabric dye. For the following two weeks, they observed the mushroom growth over time to see how these respond to the toxic residues of human industrial capitalism.



MyCoBiont workshops with fungi, 2021.
Photos by Hana Marr.





Creative's view

A Visionary for Every Laboratory

INTERVIEW WITH ORON CATTI

 JANA PUTRLE SRDIĆ

Besides creating several ground-breaking artworks in the field of art with living systems, Oron Catti is also a co-establisher of SymbioticA: a referential artistic research lab at the University of Western Australia. Most artists working with life sciences have visited or known and wished to attend their well known residencies. He also helped to set up the Biofilia biological art lab at Aalto University in Helsinki, and he has worked with numerous other bio-medical labs.

Initially, Catti was into speculative design of organic materials, which led him to tissue engineering. He is not as interested in humans as he is in nature and biology, but always in relation to speculation and art. The titles of his collaborative projects, mostly developed with his co-worker and partner Ionat Zurr, reveal their focus on the Other: Fish and chips, Pig Wings, and Crossing Kingdoms, as well as the profound, pulling interest in the biological world, often on a cellular level and the curiosity about life in Semi-living Steak, and Mechanisms of Life. Their works such as Biomess, and Victimless Leather also show empathy with all living beings. Catti recognizes art as the freeing expression in his originally determinative working surrounding: a scientific laboratory.

In our conversation we focused primarily on the emergence of wet labs for artistic purposes from the 1990s onwards, the three decades of developing art with living systems through his work in this field, the necessity to use and mess with the knowledge of biology that scientific communities often claimed for themselves, but which has had, especially in the form of biotechnologies, a deep impact on our society and (un)ethical behaviour.

When did you first encounter the need to use a laboratory in your artistic work? What kind of help did you need? You were working with tissue culture, why were you interested in this at the time?

I studied product design in the early 90s, and I was really interested in the potential link between biotechnology and design. I realised that biology moved away from being just an analytical science and became more of an engineering discipline. We learned how biological systems work and then we wanted to manipulate and engineer them. As a product designer I speculated that in the near future we would start to engineer and design living biological products. My interest arose from an ecological point of view, for I thought we could possibly change the way we think about manufacturing things towards growing them. If we would work with living biological systems, this could be more compatible with the natural environment and it would change our relationship with the artificial environment.

I speculated a future in which designers would design living biological products. In my original thesis, I was looking at many different biological technologies, such as, microbial, genetic and tissue engineering. The idea

was to cover the artificial environment with living biological surfaces and see if this would change our relationship to the artificial world.

At the same time the image of the mouse that had a human ear growing from its back hit the media and for me this represented a way to sculpt the living biological material. I became interested in the questions that those ideas were raising rather than the solutions, I was interested in the new ways in which we were manipulating life. The romantic idea of somehow working with living biological materials as an ecological solution or a newfound relationship with nature can easily be flipped and can become extremely problematic.

In the mid-90s I didn't know any artist working directly with biotechnologies, but Stelarc came to Perth and I interviewed him and I also wrote about Orlan although I was actually rejecting the idea of human exceptionalism, for I wasn't interested in the discourse revolving around the human body, but in a living biological body as a generic thing. Stelarc told me about a scientist at the University of Western Australia, who just started with tissue engineering and she welcomed the idea of artists engaging with scientists. Tissue engineering is already an interdisciplinary field, from growing cells to the scaffolds and bioreactors, so bringing in a designer didn't look strange.

From the very beginning, I wanted to do everything myself, I didn't want to come up with a project and then tell the scientists to do it for me. The whole idea was to engage in the most phenomenological, experiential way with the manipulation of life, to try and understand the entire process. Growing tissue culture is very much like a craft, you don't need to know the science behind it to be a good at it. It's like gardening, it's not rocket science.

You learn about the conditions and start becoming more intuitive in the way you manipulate the tissue. I didn't know about anyone who was working as an artist in this context, so I had to figure out things for myself and my partner Ionat joined me. She studied photography and the idea was to document and produce representational mostly two-dimensional work rather than being able to show the actual objects in a gallery context.

We started working in a lab in 1997 and had our first big show of large-scale digital prints in 1998 at the Perth Institute of Contemporary Art. At the time we were doing in vitro work where we were using glass as the substrate to grow the tissue over it. I had a background in product design, and as I was used to working in 3D I always wanted to be a sculptor. We designed 3D objects, then worked with the glassblower to make those objects out of scientific glass and then grow the tissue over them. It was close to my original thesis on covering artificial, human-made objects with a layer of living biological material.

Then we started working with growing muscle cells and maturing them and then we

moved on to neurons, expanding our interests and moving away from glass to more sophisticated materials and different types of polymers. I was invited to give a talk in MIT's media lab and the scientist who invented the field of tissue engineering at Harvard medical school invited me to be a research fellow in his lab. So, in 2000 we ended up going for a year to the most advanced tissue engineering lab which was an amazing experience during which we learned a lot. It enabled us to be much more ambitious.

Were you assigned people you could work with, for instance scientific collaborators, and were you working on a specific project with which you really wanted to develop something? Or were you going around and they were showing you everything?

We were the first artists in residence in the research part of the medical school at Harvard and in order to be able to get a visa they appointed us as research fellows. All other research fellows were people with at least one PhD and a lot of experience, but we were considered their equals and just had to work on our own projects.

By the second day we were already sitting under the hood and starting to work with the different materials that we had access to, different types of polymers and after a week I made a list of potential projects that we could create. It was amazing to realize the potential of what can be done with highly advanced technology.

And we were always equal, and I introduced computer aided 3D printing and manufactur-

ing to the lab as a part of the exchange, but it wasn't like the previous power dynamics.

That was the idea I brought back to the University of Western Australia. Even though we were able to obtain funding we constantly had to ask for favours and have to do favours in return. When we set up SymbioticA we were trying to equalize this power imbalance and get artists who are interested in working in the lab to be treated like legitimate researchers. This was why I was careful when I started hosting workshops for artists using DIY technology, because artists are not DIY biologists, but professionals in their own field and we shouldn't be treated as inferior to scientists. The starting idea with SymbioticA was to enable artists to work with living biological materials by ourselves, we learnt the technique, asked a scientist to mentor, maybe teach us the techniques, but we don't commission them to do the work on our behalf and this was a very strong ethical perspective.

If you are working with living biological materials, you have a responsibility towards them and you don't want to let someone else take the blame.

For many artists in our field, when things go wrong, they don't want to take responsibility and would blame the scientists.

You have already answered a lot of the questions I was interested in. Besides Stelarc and Orlan, did you later recognize any pattern? Was it becoming a trend to work with living organisms or tissues?

When I started in 97, I didn't know anyone else who was doing anything similar. I went to Boston for the first time in 99, where I met Joe Davis and suddenly realized there are other artists working in labs in this ex-

perimental way. In 2000 I was invited to a five days long event in Banff in Canada and I think this was one of the most important moments in the history of the field of artists working with biology. There I met Joe Davis, Eduardo Kac, Steve Kurtz from the Critical Art Ensemble, Marta De Menezes, Adam Zaretsky and a few others. It was really the first time that we realized that there is a community or at least a group of artists from all over the world that have a shared interest in working with living biological materials and with biotechnology as an art form. So, that was the beginning of a trend. When Heath Bunting brought us all together, we realised that some participants already knew each other.

A lot of people in arts have big egos, thus it was interesting to see how people were trying to claim their territory, while having very different approaches. I don't call myself a bio artist, I don't really like this term. I didn't sign the bio art manifesto that Eduardo wrote, because I find it quite problematic. But I was in a very fortunate position, for I was able to set up my own lab that was not to be used just by us. I managed to negotiate access to those scarce resources that artists usually don't have and share them, because as we started to exhibit our work, more artists would come and ask us about something similar they wanted to do. When we had the opportunity to start SymbioticA as a part of the university, we also set up as a residency space to open it up to as many artists as possible.

It was all about expanding and we were really interested in different approaches and not trying to be prescriptive in regards to ideologies. When selecting residents we

considered how they are going to make use of our resources and how willing they are to engage in the network themselves. Okay, that's a pretty good place for you. We started to run workshops and Ars Electronica was extremely important, especially in those early days. The show with Eduardo Kac in 99, Joe Davis, Marta De Menezes and us in 2000, and then us doing Fish & Chips in 2001. Suddenly there was a venue to show this kind of work.

Shortly after that Kapelica started to show living biological artworks and galleries and museums opened up to this kind of art. We were able to show the Pigs Wings project in one of the most traditional art galleries in Australia and keep those wings alive for the first two weeks. Hand in hand with the growing interest of artists there is also the growing potential of being able to exhibit those works beyond merely the representational technique.

One thing became apparent from the very beginning: we were not a movement in a sense of sharing an ideology or even a similar relationship to the material. Some artists came from media or performance art, or from a very traditional art background. Already with a small number of

artists working with biology there was a wide range of motivational agendas. The only thing that they had in common was working with living biological material.

When the Paradise Now exhibition was shown in New York in 2000, many of the artists were using very traditional representational techniques to comment on biotechnology and then later called themselves bio artists. It was a strange branding that did not really fit the phenomenon of artists working in it.

I also know you were a guest at the Royal College of Art in London. Have you noticed an interest to build an infrastructure similar to SymbioticA there or anywhere else?

The Royal College of Art is a different story. I was a visiting professor at the Speculative Design Department, where I was invited to work with students between 2009 and 2012 and then I was a professor at large in Contestable Design from 2015 to 2017. We worked closely with Imperial College and had a good relationship with the scientists there, so we did not have to set up our own lab. However, the difference between SymbioticA and other initiatives was that we

Extra Ear – ¼ Scale, The Tissue Culture & Art (Oron Catts & Ionat Zurr) in collaboration with Stelarc, 2003. Medium: Biodegradable polymer and human chondrocytes cells. Venue: Kapelica Gallery. Photo by The Tissue Culture & Art.



were based in a science department. The dynamics are very different to those within the bio labs in art and design schools. There is the SVA Bio Art Lab at the School of Visual Arts in New York which went from fish tanks to a truly impressive fully blown bio lab. There were a few initiatives in the States, some sort of DIY labs and I've been to quite a few universities where they got a bio lab in the design school which was basically a sink, but later became more advanced.

In 2012 we came to Aalto University in Helsinki, where we helped set up Biofilia. This was a really interesting project because no one wanted it except for someone in the Finnish government, so they had a big budget to set it up. Now it is really nice to see and it is in regular use. It was the opposite of SymbioticA, since we built it slowly with not a lot of funding, therefore we didn't have to promise a lot. We helped to build Biofilia and it became a kind of a dream lab, but again it was a part of the school for art and design, so there was no opportunity to meet the scientists in the corridor and have a chat, you had to make an official appointment and visit the lab.

At SymbioticA no one in the science department interfered with what we were doing, so we had amazing autonomy that would be impossible in an art and design school, because the people around it don't understand this type of work. We had a license to engage in hardcore artistic research in our own wet lab and we had access to scientific knowledge and were able to work in numerous other labs at the university. That's something

that would be almost impossible to replicate if we ran our lab in an art and design in an art university.

The closest thing can be found in upstate New York, a place run by Paul Vanouse who spent a lot of time with us and a professor in the school of art at the Buffalo university, but he did manage to negotiate a lab space they call Coalesce Center For Biological Art. It is a kind of a hybrid, but based in a biological science department and they have a residency research program, where they perform a lot of interesting work.

Do they have art production and are they working with artists?

The residency program is for artists and as opposed to SymbioticA, where we had to charge residents, because of the way we were set up, and we had to find funding for the program, this one offers money to their residents.

What about Bioart Society, did you help them too?

Yes, the same person from the Finnish government came to visit Australia and after she saw what we were doing, she decided that Finland needs something similar. Initially she negotiated this with the research centre of the University of Helsinki in Lapland, where the Bioart Society is still running a number of their residencies and then she set up the Bioart Society. But there was no one in Finland who was doing this kind of work, so it was a strange mixture of nature artists and artists who were into ecology. However, they gradually got more involved and Erich Berger was appointed to run it, so it was transformed into an amazing organization. They never had their own lab so they had to rely on others in the north of Finland and other places.

When we came to set up Biophilia the whole idea was to open it up, to allow the Bioart Society to work there, and they found other ways to support artists. The work that comes out of there shows that they are not strictly biotech, but they engage with art around biology. They deal more in nature than manipulated living biological material as an art form, but I think they are doing amazing work.

Yes, when I was in Finland two months ago, I realized their strong inclination towards ecology, they are so surrounded by nature that this comes naturally to them. So, it is obviously always a person with a vision, someone who establishes a new trend, such as Eric Burger in the Bioart Society or Paul Vanouse in...

...the Coalesce Center for Biological Arts? You will also need someone who is determined enough and can drive it because it is not easy and now there are so many of them. There are quite a few initiatives I have been following, sometimes in the role of an advisor, which would get a lot of money and make crazy promises, but then would get defunded after a couple of years because they failed to deliver. Bio-design is extremely popular in the Netherlands, but their approach is often problematic. At the Bio Art & Design Award they have a crazy model, for they want artists to talk to scientists about the proposal in advance, see how the artwork is going to look even before they start working on it, and then they have six months to produce the work.

At the SymbioticA residency program we asked the residents not to commit to any exhibitions by the end because it is a research, rather than production, residency. Some of the most problematic residencies we had were when the artists were committed to having an exhibition and then they spent all of their time being stressed and thinking of the outcome even before they understood what they are doing. And biology doesn't work like this. It took me three years to come up with what works for me. But I know that the work had significance, or conceptual grounding, because I spent the first three years just trying to figure out what I'm doing. This is why I have problems with the Dutch model.

There were people who didn't really spend any time in the lab, but asked the scientists to do the lab work. Sometimes the scientists wouldn't be able to fabricate something and the artist had no lab experience so he didn't know whether the scientist was telling the truth, but if he was interested in the conceptual impact of the work, this doesn't really matter. There are artists who claim art as a license to make things look like something else; they would put a silicone model and claim to grow it. As if you wouldn't be able to tell the difference, but if you understand biology, you know it is a biological impossibility.

I'm not blaming the artists, but I think we all have to be very critical and sceptical about what the artists claim. For us, it is very important to do what we claim to be doing.

With time we can come across what we call the aesthetics of disappointment. It seems that these technologies are not as powerful as they are being made to look.

At Kersnikova we have a very similar approach because, as

you said, we want to create things that we claim to be true; to keep living organisms and not artificial materials that look like something alive. We don't want to be fascinated by biology and the amazing nature, or by technology and the laboratory environment. When curating and producing with artists we aim to keep liveliness and growing and make an artwork of this living thing, combining it with technology.

I consider exaggerating or showing things as if they are something they are not a valid form of artistic expression. I have an issue with how gullible people are, how many of them are not willing to engage in a critical analysis of what they are actually experiencing. But that's a different story and I think artists play a really important role in reminding people that we shouldn't believe everything we see.

This structure you had at SymbioticA of working with scientists, having an equal lab and then meeting them hallway, being able to talk to them and developing the project in a more friendly environment – is this still your ideal model? If you would envision the perfect future lab for artists, would you want a scientist to be employed in the art lab?

This is a really interesting question and I believe it's extremely relevant, considering that I don't think I'll ever be able to replicate this model. Over the past years scientists also started showing an interest in joining the residency. They felt that SymbioticA is a place where they can engage in open-ended curiosity-based research. Scientists feel that they are very constrained by what they can

do in their own profession, because they are driven towards utilitarian outcomes.

If I would have an unlimited budget, I would like to set up an institution that would be a gallery within a research centre, all-in-one, which might be similar to what you are trying to do. A gallery space, which I refer to as the field laboratory, is a place where you basically research the interaction between the audience and works rather than the place of the final work. Then I would invite both artists and scientists to come and join the residencies in symbiosis.

Some of the scientists that we worked with decided they want to become artists after they followed a few artistic projects, but it ended up in disaster. Many artists who worked on one or two projects suddenly thought they could cure cancer. Maintaining the integrity of the disciplines is important if we wish to generate interesting outcomes. So, the imagined institute would have to be very smart in regards the development of these relationships, and how people join in. And you need to be able to pay the artists or scientists who come to the residencies, and have staff, technicians, people who maintain the labs. This would be an interesting model.

When biology became engineering many of the processes of manipulating living systems became simplified, protocols are performed by machines.

You don't really have to be fully immersed in a biological science department in order to

have the ability to do things that you couldn't do even in a more sophisticated lab merely five years ago .

Yes. We now have three different labs near the gallery and we employ a biotechnologist. But we also bring in other scientists, because one always needs some specific knowledge for different art projects. That's why we have good relationships with four or five institutes where we can either visit or have a scientist come to our lab and work here. For us it is clear that we can work together, but for them coming into a lab like ours and working here was something new.

That's nice. And hopefully there will be more similar initiatives. But we also had residents that never really engaged with scientists, because we have so much knowledge already at SymbioticA. Some artists were teaching other artists scientific techniques and didn't need the scientists.

True. When we have foreign artists working with biological material, we know that they have a specific knowledge. We always try to encourage them to hold workshops, so they can transfer their knowledge to others.

Most artists are very generous. Some artists would be very glad, if somebody was interested in their knowledge.

Artworks and live systems can be so different, but do you think it would be ideal to bring the lab into the gallery, or make a gallery out of the lab, or something in between? How does one set up an exhibition that would work best?

I have tried many different approaches. We set up our first lab in Ars Electronica in 2000, as a kind of a big tent, which was what we needed to grow The Worry Dolls. And I talk about it as an interesting case, where the technological frame took over the content because I can guarantee that at least 80% of the people who came to the show, never even noticed The Worry Dolls, because they were so taken by the scientific equipment. We were criticised for merely showing re-contextualized scientific equipment, although it had a purpose and it was the frame for biological artworks.

We are trying to be more specific regarding the lab design. I think I built about 20 labs in galleries all over the world. The Kapelica (Extra Ear ¼ Scale, 2003) one was really interesting because we designed it with the Wizard of Oz in mind, so it was behind a curtain.

But when it comes to a permanent space to show biological artwork, I've been working a lot with Michael John Gorman, setting up this big Biotope Museum in Munich and the idea was there would be a lab behind a glass wall, so people could see what's inside and then you can change and reopen, it can become a display case, or you can hide it completely.

If I would ever be able to set up something like that, it would be outwards facing, where you could show living biological material that has restrictions such as level two safety, but keep it visible. And it could still be easily transformed into a museum exhibit even though it would be protected within the lab. I like the modular idea and I've done many versions of it. In a 2011 show the lab was designed so that it looked like someone ripped it from a science building and dropped it into the gallery. The cables were coming out and it was a bit tilted, but we contextualized it in a symbolic way. This worked really well because it was a part of a very big show with some ten

Creative's view

Is the Artistic Idea of Designing Life a SmokeScreen in the Neoliberal Biotech Revolution?

Very few people realized the profundity of biotechnological advancement

INTERVIEW WITH THE CRITICAL ART ENSEMBLE

 JANA PUTRLE SRDIĆ

CAE is a group of tactical media practitioners, who reflect on the sometimes most neuralgic points of human society, using a wide range of cultural forms from publishing books to direct public interventions. Uninterested in the distribution mechanisms built for cultural venture capital, they make art to engage the public on social issues that affect everyone. In this sense, they are probably the most socially and politically engaged artists in our selection.

Since biotechnology is a minefield of ethical issues, foundational to global economy, and often brutal in its social and environmental politics, it is no coincidence that CAE would be drawn to it. From criticizing contemporary forms of eugenics in the late 90s (in a project *Flesh Machine* that was presented at Kapelica Gallery in 1997), through a line of works on human reproduction, transgenic crops, and biological weapons, CAE were among the first to try to apply the use of advanced biological materials and processes in art. Therefore, we decided to ask CAE member Steve Kurtz to talk about their view of using biolabs for art purposes, describe their story, and share some observations on the origins and history of art that engages life systems through the use of laboratory platforms.

Two things are immediately obvious: you react to societal problems and you act as a group, with no interest in the personal stories of individual artists. Can you comment on that?

Nothing is more uninteresting to us than expressionistic art. Who cares about personal stories?

This isn't to say that they can't produce some attractive eye candy, but this art form is ultimately solipsistic and unrelatable for most. We are sympathetic to minorities who have been prevented from developing their personal stories and images and therefore need to do that, but that's not something we are qualified to do, and it's much too restrictive, and by its nature, exclusive. But the social (cultural, political, economic) is truly something we all share and have a stake in. It is a sphere of concern for everyone, so that is the place we explore in the hopes of being able to communicate with people regardless of their background or history.

We are ultimately asking, what kind of world do we want to live in?

Could we thus say that social criticism and commentary is the most important part of your work?

Cultural criticism is extremely important, but that has to turn into action, or we have failed. Which means we fail a lot.

Was having a biolab at home and all the work you did in laboratories, only one layer of your work, the part that focuses on the (possible) troubles of biotechnology?

The lab is a means to an end. If we can't get our ideas and practices out of the lab, we have failed yet again.

The work we do is not for scientists, nor is it for the investment/collector class (who hate our work); it's for the public. In many ways CAE's meta-goal has been to understand how to create public art that undermines authoritarian tendencies in culture and promotes democratic ones as well as social and environmental justice. Museums, galleries, and labs each have their place. They are certainly platforms to be used, but we would find a practice where the artist never leaves any of these platforms questionable.

When did you first encounter the need to use a laboratory in your artistic work, and what kind of help did you need?

In 1996, when we started an exploration of contemporary eugenics. For that, we needed two labs. First, we wanted a cryogenics lab. We actually got one from a material science lab at Carnegie Mellon University. The professors there were just going to put it in the trash, so we rescued it. Second, we thought that DNA extraction and amplification would be useful for constructing the theatre/spectacle we needed to coax the public into this discussion, and for that we needed a modest molecular biolab, which turned out to be a little more difficult to acquire. The equipment at that time was not only expensive, but was also far from optimized, it was bulky and awkward to move around. Our critique of contemporary eugenics finally came together with the project and book *Flesh Machine* (1997–98). Public Net-base (arts centre in Vienna at the time) was the first to present it. Konrad Becker, the Net-base founder and director, acted as the producer for this first iteration, and somehow he found us a molecular biology lab (such as they were at the time) and a technician to run it.



Flesh Machine, lecture performance, Critical Art Ensemble, 1998. (Performed at Beursschouwburg, Brussels; Kiasma Museum of Contemporary Art, Helsinki; Museums Quartier, Vienna; Labor Gallery, Graz; and Kapellica Gallery, Ljubljana.) Photo credit: CAE.

What led you to establish your own lab at home?

That was with GenTerra (2001–3). We put together a cell biology lab. By that time, it was clear that we needed our own equipment and that we had to know how to use it. Moreover, the public nature of what we were doing demanded that we have a mobile lab. Then, in 2003, we got the equipment for molecular biology.

GenTerra was a part of our examination of GMOs, along with Free Range Grain (2003–4), and they paired with the book *Molecular Invasion* (2002). The first problem we had to consider was how to get people to see they had a stake in this issue. When we brought up transgenics to people their eyes would glaze over, so we had to create a theatre that would bring them to the subject. The great Beatriz da Costa (RIP) joined our team for this project, and she built an amazing robotic roulette wheel designed to “release” bacteria. The wheel had several samples of wild bacteria that we would collect and grow, and one dish of “transgenic” bacteria. (We put transgenics in quotes, because it was transgenic only to a certain degree. We placed a fragment of human DNA in some gut *E. coli* bacteria, so it really had no impact on the organism, but its transgenic nature was true enough for our purposes.) The participants could press a button that set the wheel in motion, and a robotic arm would lift the lid of the Petri dish in the winning position. The ro-

bot was housed in the context of a fictional company (GenTerra) that made transgenic creatures. We performed this performance wearing our white lab coats, so people knew who was hosting the event, and so they knew we were authorities (yes, sometimes clichés can offer an advantage). We also had computers filled with fun graphics and other info about transgenics.

Normally, no one would want to engage in this literature, but when faced with the fact that transgenic bacteria could be released near them or by them, they became quite interested in what we had to say. Most people were afraid of the bacteria—first of all because it was transgenic and they didn’t understand what that was. And second, the antiseptic industry has left most people with the idea that bacteria in general can only be dangerous and should be destroyed at all costs.

By the time we were done, we could have a nuanced conversation about the issues involved, rather than appealing to the then-dominant narratives that either transgenics should be ended and all GMOs banned, or GMOs should be allowed to flourish without regulation and if problems occurred, they could be cleaned up later. We knew

we did well when people, especially children, would streak out some of the transgenic bacteria and take it home with them. What started in fear ended in knowledge.

Did you subsequently recognize a pattern in other works and artists around the world with a similar orientation?

It might sound odd now, because bioart is everywhere, but there were only a handful of us in the beginning. Only a few people in cultural institutions realized the profundity of what was about to take place with the maturing of molecular biology.

Back then, it was extremely difficult to show work in institutions, and especially in public spaces. There was so much hype about terrorism and anthrax attacks. We would have to meet with lawyers to discuss any “dangers” the public might face with our work. We had to have participants sign papers waiving their right to sue the host institution. It was madness, ending in the absurdity of Steve being arrested by the FBI for terrorism. We suppose this is the price of pioneering.

Why was he arrested?

While an emergency medical technician was at Steve’s home, he saw the home lab and turned Steve in to the FBI. The FBI thought there could be no reason why anyone would have a lab unless they were terrorists. So, they immediately came and arrested him (before they even had a warrant). They couldn’t get a terrorism charge to stick, but still indicted him for mail and wire fraud, alleging that he defrauded American Type Culture Collection of patented property. This was all, of course, nonsense, and the charges were eventually dismissed. On the downside, however, the process took four years and cost 250,000 USD.

Even now it seems that we need numerous permissions for working with cells, for example, and often also consents from everyone involved. This is especially true for some EU supported research projects such as Horizon. And we have several experiences with ethical committees. But who were the handful of you at the beginning, and did you all have a chance to meet, discuss your work, and consult each other? Or was the biological arts scene not so friendly?

The first generation consisted of Joe Davis, Eduardo Kac, SymbioticA, Shu Lea Chaeng,

and a few others. We all knew each other. We were friendly person to person, but we had wildly different ideas about what should be done and why we were doing it. We were closest to SymbioticA, but we had healthy disagreements even with them. We were tribes of one.

Can you tell me more about this? From what I've heard from Oron Catts (SymbioticA) he was, and still is, interested in the way future biotechnologies will be able to design life, but with a focus on the non-human-centred biological world, while Eduardo Kac wants to, in several of his projects, combine his own DNA (or encode a text message in DNA) with biological or artificial life. Your work seems to contain less fascination with the possible aesthetic outcomes of biotechnology, designing life or future possibilities; it focuses more on immediate ethical and concrete consequences of biotechnology and the power relations behind it. What were your disagreements?

The main disagreement is built into your question.

When CAE looked at how new biological knowledge and technologies were being applied it was shocking to us how much abuse and injustice there was. One concern was how it was aiding the ramp-up of new neoliberal colonial and endocolonial projects. Our other main concern was that, now, the bodily inscription of the imperatives

of authoritarian culture could happen from the inside out in a way that would perfectly complement the outside-in inscriptions of spectacle. To make matters worse, most of this was happening, particularly in developed countries, unbeknownst to the vast majority of the public.

So, CAE was of the belief that direct action had to be taken in order to solve these situations. We thought that aestheticizing these products and techniques would normalize what should not be normalized. We were afraid that this kind of art could act as a smokescreen that would keep the public separate from the unfortunate truth of how the neoliberal biotech revolution was proceeding in practice. In this way, the table was set for a serious disagreement with those primarily interested in aesthetics in a manner that, in our opinion, came at the expense of the public interest.

What did you all need most: knowledge, equipment, practice? Were you looking to collaborate with scientists, or did you want to be involved hands-on from the start?

What we needed most was equipment, and someone to teach us how to use it. We had good financial support, so it was easy to buy equipment. We were quite amazed at how much the technology had evolved in a mere five years. We got wetware and disposables from science supply shops for high schools. Occasionally we would have to go through a university lab for high-end reagents or specialized bacteria. We had good connections for that, so that wasn't so difficult. For training, we would often hire a biology graduate student. We did not use scientists as col-

laborators; only as advisors. They primarily helped us to make sure we didn't do anything dangerous or harmful to people or the environment, and to make sure we did not have any of the conceptual elements wrong.

What about the most valuable, large pieces of equipment that are needed for lab work? Like biosafety cabinets, incubators, qPCRs, etc.? Or did you rent the whole lab?

We bought everything. Now we have a bunch of old equipment in the shed. We never used a qPCR, just a PCR. Almost everything was available at the high school supply shop. For the PCR and high-quality pipettes, we had to send away to a national distributor. We weren't that concerned about safety, because we never used anything outside of Biosafety Level 1. You need a sink and some disinfectant and you're good to go (at least in the US).

Did you eventually get your first lab support, and did they let you into the laboratory to work? Were there other labs around the world where you were offered entry, collaboration, maybe learning?

Besides working at SymbioticA, we never worked in a professional laboratory. We were amateurs, and were happy to stay that way. Maybe it's time to emphasize that CAE was not doing science. We were using materials, equipment, techniques, and methods from the biological sciences to make art and theatre. The closest we may have ever come to doing science was with Molecular Invasion, when we attempted to develop a means to target the modified genes in crop GMOs. But even contestational biology was more theatrical than scientific.

Yes, I think all artists want to stay on the artistic side. I see

it sometimes as pulling live material and biotechnological protocols out of the hands of scientists. They were not used in art before, but this does not mean that artists cannot use them. What was the idea with targeting modified genes in crops?

It has always been fundamental to CAE's practice to find ways to use objects to do things or create outcomes that they weren't designed for.

The basic idea of targeting the modified gene in GMO crops was to take a trait of adaptability and transform it into a trait of susceptibility. We did this at a time when Monsanto was suing organic and natural farmers for patent infringement when pollen from neighbouring farms using RoundUp products blew into their fields.

We thought, let's see what we can blow into Monsanto's fields. We never went that far, but we did do a proof-of-concept project and exhibit at the Corcoran in Washington, DC (and a number of other locations worldwide). It got heavy press coverage that sent Monsanto into a fit. They sent a team of lawyers with cease-and-desist letters to the museum. They threatened to sue everyone. It was a circus. But it was all scare tactics. No one got sued, but we have often thought that this was when we got on the FBI's radar.

Was there a project, closely related to biotechnology in CAE's history that you find especially interesting and maybe an

example of good art practice in this field? Can you tell us more about it?

We have always had a soft spot for our millennial piece, *Cult of the New Eve* (1999–2000). We believe it was the most fun for us and for our audiences. We preformed some of the crazy promises and exaggerations of biological science, and the Human Genome Project (HGP) in particular, as theology while dressed in uniforms that were a combination of the UNAbomber and the Heaven’s Gate cult. In the preparation phase, we shattered the genome of the first volunteer (“Eve”) for the HGP, spliced it into yeast, and then brewed beer with it, which we used to bake communion wafers. (We collaborated with Paul Vanouse on this project. He led the production of the beer. He turned his studio into a brewery and arranged for the modified yeast.) We then went around giving communion and preaching the prophecies of the New Eve.

However, to be fair to scientists, many of the absurd things they say are to make their grant applications more appealing to government bureaucrats—just like every astrophysicist, astrobiologist, and astronomer now has to say that whatever it is they are doing is essential to building a space station on Mars, when really it has nothing to do with that.

That is my next question: what kind of experience do you have when working with scientists? What kind of communication and understanding were you able to have, and could you develop some long-term collaborations?

We should start by saying that science is brutal work. Scientists are extremely busy people who work all the time. That is their life, and that is what is required if they want

to succeed. We recently listened to an interview with a 2022 Nobel Prize winner in chemistry, and she said she worked a hundred hours a week, and had to come to grips with the fact that her work would be the entirety of her life (no relationships, no kids, no fun). Even worse, if you are low in the lab hierarchy, not only is the work brutal in its intensity, it is also crushingly boring. We really didn’t want anything to do with that culture. We were quite content in our corner of the art world where hedonism, madness, and modest discipline were valued qualities, and most importantly, we had a minimal work schedule.

When we were lucky enough to get to spend an extended amount of time with a scientist (usually a biologist of some specialization), the experience was absolutely fascinating. If you can get them to talk about areas of speculation in their field, they are a treasure trove of ideas. Say what you might about artists, but scientists have all kinds of wild thoughts percolating through their brains. If they trust you enough to let those thoughts out, we can guarantee you will have a memorable conversation.

I have met quite a few artists and scientists who don’t believe that fields as diverse as art and science can have much in common, even after working on art & science projects. They just seem too far apart. This friction between the different ways of thinking seems to show up in every project. What do you think about this? Does it make any sense to work with scientists, when one is critical about the consequences of biotechnological practices?

This is the old, old C. P. Snow (The Two Cultures) position—a long-standing belief, and

one that we are sympathetic to.

Artist and scientists can have great conversations and advise one another in very productive ways. But work together, no. A scientific project is completely different to an artistic one. Scientists generate knowledge; artists generate experiences for others. Where we intersect is in our common desire to generate understanding. We do go about this in very different ways, but this contrast is often what makes the conversation interesting.

Nicola Triscott, who started one of the first wildly successful art and science curatorial organizations, Arts Catalyst, in London, once said to us something along the lines of: “When I first started in art and science curation, I really wanted to get artists and scientists collaborating together in shared work spaces (as opposed to cultural spaces), but after a few years I discovered that this was a really bad idea.” So, while she was very supportive of promoting dialogues and the sharing of information between artists and scientists, she realized very quickly they couldn’t work together.

I believe that our Freaktion Bars, public talks about futuristic ideas between artists and scientists, in a relaxed environment, were some of the most interesting events to take place around our labs. There is also a certain mistrust, ranging from slight irony to complete misunderstanding, in the way scientists usually look at artists who work with live systems.

What would your ideal futuristic art lab look like?

Nothing special. As we noted, the lab is just a means to an end. It’s not a project in and of itself. We also have a tactical approach. The lab needs to function in service to that end. If it can provide that service, then it’s good enough for us. We don’t think beyond function in lab construction.

Yes, one can look at it this way. I guess I see it as even more important than the gallery at the moment, and when I think of the lab, I actually mean the program that had evolved around it, including residencies, workshops, discussions, presentations, the public, artists, and scientists.

I’m afraid we are going to disappoint you here. While we are not political anarchists, we are poetic anarchists. We do not have the temperament to start and maintain an institution. Now, we are glad that they are there, and we are happy to enact limited participation in them. This was an old disagreement we had in the late ’90s and early at the beginning of the millennium with SymbioticA. This has been settled now. They were right, and we were wrong. One of the reasons authoritarianism has gained so much traction in the West is due to the left ceding so much institutional ground to the right. (Even as we speak, there is a concerted effort to kick SymbioticA off the UWA campus.) Along with many others, CAE’s faith in the Guat-tarian notion of molecular revolution and de Certeau’s ideas around tacticality went a little too far. We had to rewind this back a little. The kind of future thinking you are calling for is profoundly important, but it might be a little late for CAE.



Creative's view

The Power of Art Lies in Hacking Technology and Science

INTERVIEW WITH SHU LEA CHEANG

✎ JANA PUTRLE SRDIĆ

If we take a look at artists who appropriate emerging media and the use of new technologies as a signifier of their time, not merely as a tool, but also as a social symptom, we cannot avoid mentioning Shu Lea Cheang's work. With her extensive use of cyberspace and film media, performances and installations with sensing, computing and live systems, the exploration of biotechnological future scenarios and her courage to tackle controversial topics such as cloning and ectogenesis, we can easily say that she is fully aware that the new ideas are undistinguishable from their means.

Above all, her work permeates the communal and collective spirit, the thoughtful sense of a bold social critique, and as a Taiwanese-American-European artist, she is also involved in anti-colonial activism, be it in a cyberpunk, queer oriented resistance or in the more community and geek oriented collective Mycelium Network Society which she co-established and together with its members created a large installation with a live mycelium system.

Shu Lea Cheang does not consider herself a bioartist, however, she was one of the first to recognize the appearance of artists dealing with live systems and has been in constant touch with this flow through her inclination towards hacking technology, field research and her interest in futuristic science fiction. As a critical observer of the relation between art and science, Cheang offers a valuable final reflection, not from the centre, but from the margin and sheds new light on the subject in this series of interviews.

As I was reading about your artistic career and following your film studies and your queer cinema in the 80s, it seemed to me that you were always in the front line of media development in art. Later you turned towards cyberspace, internet-based art, software interaction, art and technology. Through your projects you followed the social issues related to queer identity, racial stereotypes and institutional repression. Talking to you as someone who has been developing and using a variety of artistic media, I am deeply interested in your current view on working with live systems. Mainly, because there are so many problems with live organisms in art, from ethical issues to great difficulties in sustaining them for exhibitions. Do you see it as a point of no return or will these attempts fade away and be forgotten in time?

This is actually a very good question. Of course, so-called bioart doesn't just happen, but I can see that art with live organisms as an art practice has been on the rise over recent decades. By rise I mean that it is accepted, promoted, celebrated and brought to major media art festivals.

We are also talking about a new generation of artists who have a background in biological sciences and identify themselves as bioartists, working with biomedicine. Many of them use their body as a testing ground, extracting from or injecting mixed elements into their bodies. These body hacking practices challenge medical science's proprietary claim over our body/data.

I don't see it as a particular point of no return. These types of experiments still need medical science advice and need to be handled with great care. One can consider body hacking as an act of intervention. Works that present live systems are after all a simulation, adopting the body as a contested zone for field studies.

While talking to Steve Kurtz I realized that you were already present in the first group of bioartists who most likely gathered at the end of 90s. Was this a special step for you, an important change that moved you into the area of live art from cyberspace and film?

As a collective that engages in tactical media, the Critical Art Ensemble has always

investigated biotech, bio-engineering and pharmaceutical practices with political, social and economic perspectives that I can totally identify with. I remember meeting Steve Kurtz carrying his all-in-one bio-tactic suitcase, crossing borders, recounting his encounters with security checks.

CAE foregrounded the emergence of political bioart.

In the 90s, I was a part of the review panel on Paul Vanouse' DNA investigation projects at the Rockefeller Foundation. Back then, Paul failed to win the argument to grant his practices as art, but he had a grand comeback when his LABOR was awarded the Golden Nica in the Artificial Intelligence and Life Art category at the 2019 Prix Ars Electronica.

In my own work, I got into farming garlic with Garlic=Rich Air, which was presented in 2002 by Creative Time in New York City (which continued with its various editions as AglioMania (www.agliomania.com) until 2009). The brief from 2002 reads:

In a fictional "post-crash" scenario, organic garlic has been recently ordained as new social currency, serving as "credito" on a shared global network. In the first phase of this project, Cheang organized the harvesting of 10,000 garlic plants, cultivated by Tovey Halleck, an organic farmer in upstate New York. By joining the Garlic Credito Trueque Club, the project roams greater New York City with Wireless network nodes as Mobile Urban Farm Stands. Get Garlic. Go Wireless.

By 2009, during a Hangar medialab residency, I declared a new cycle of my work, Viral Love Bio-hack, and started my UKI project which resulted in a feature length film, UKI, (<http://u-k-i.co>), a Scifi Viral Alt-Reality cinema, to be released in 2023. This cycle of my

work is largely inspired by Paul B. Preciado's book *Testo Junkie: Sex, Drugs, and Biopolitics in the Pharmacopornographic Era* (2008). My approach to biotech and bio-engineering is more focused on bio-politics, thus it departs from the current bioart scene of DIY bioscience practices.

I feel there is a switch from the interventional bioart tactics in the works of the earlier bioartists to the current practices that produce more elaborate gallery installations with fabricated living systems.

This is actually very interesting, because you are an observer of art with live systems with some similar practices and you might be touching upon this field on some points, but you also reflect upon it from different artistic positions. I see similarities between Steve Kurtz's collective and your art because he exposes political power relations and resistance with his group work, performances and books, a kind of art that is interested in the social problematics. I see other artists, such as SymbioticA, more fascinated with the possibilities of life in a laboratory, with how to design life. Your projects such as UNBORN0X9 with an artificial womb and an ultrasound apparatus is less fascinated with designing life, for it questions the meaning of artificial reproduction and considers how this will be used or abused in the future.

UNBORN0X9 started when Ewen Chardonnet and I were invited to attend a residency at echOpen in Paris. EchOPEN is an NGO



1. UKI, a scifi viral alt-reality cinema, Shu Lea Cheang, 2023.
2. Baby Love, Shu Lea Cheang, 2005.
3. Cover image for UNBORN0x9, Future Baby Production collective

organization engaged in developing affordable medical ultrasound imaging with an echo-stethoscope and a mobile interface. EchOpen advocates open-source biotech and they invited us to hack their product. I conceived an installation/performance, in which I made ultrasound audible, rendering the ultrasound data (via a PD network scheme) into sharable data for sound artists to expand on into a collective sound performance while live coding the imaging of the ultrasound. As the project developed across various disciplines, we founded the collective FUTURE BABY PRODUCTION.

Ultrasound, a technology that originated in sonar detectors used in submarine warfare, was introduced in obstetric practice in the early 1960s. UNBORN0x9 emerged from hacking ultrasound to further the research into reproduction methodologies and bio-politics. During an ART4MED (art meets health and biomedical research) residency in 2021, I developed an online reading group web platform in order to further research ultrasound politics, ectogenesis and surrogacy. This year we will finally launch the online reading groups with Art Laboratory Berlin's series on permeable bodies. (<https://artlaboratory-berlin.org/events/permeable-bodies-opencall-ectogenesis/>)

Your art often evolves around power relations and since machine learning and life systems in art depend greatly on scientific research and expert

laboratory know-how, I would like to know how you see this collaboration between art and science in terms of power? Can we do something to equalize these power relations between science / scientific institutions and art?

At this point I feel a bit ambivalent about the collaboration or promoting the collaboration between art and science which has been a major focus in EU funding. There are un-reconciled power relations between the pursuit of art and science research at certain junctures. I have practiced artistic intervention derived from the science-fiction scenario.

For example, in 2001 I started the Locker Baby Project with three editions, Baby Play, Baby Love and Baby Work. This project was conceived in order to investigate the speculative production of a cloned baby. I used Tokyo subway lockers as the breeding grounds for off-grid clone babies and drafted a sci-fi scenario - The transnational DPT (DollyPoly Transgency) that breeds clone babies as an industry. The quest for rechargeable robot labour continues, intelligent pets open new markets and transgenic clones can be found among us. Versions are updated, bodies unwired, behaviours dictated, what remains to be programmed are "memory" and "emotions". The Locker Baby holds the key to unlock the networked inter-sphere of ME-motion (Memory+Emotion), a playfield of sonic imagery triggered solely by human interaction.



UNBORN0x9, Future Baby Production collective, MU, Eindhoven, 2022. Photo by Boudewijn Bollmann.

Artists don't want to be a part of research or be limited by research. What is your opinion of DIY labs? Do you have any experience with them? I don't have in mind merely wetlabs, but also maker labs. Do you have any preferences for DIY or institutional labs? The latter have more equipment and knowledge; have you worked with any of them and with which ones? What is your experience with labs and people in them?

Since I relocated to Europe, most of my work has been developed in DIY labs. From 2009 on I had been hosted by residencies at Hangar media lab (Barcelona), medialab Prado (Madrid), Plataforma Cero and Laboral (Gijón) where I was developing the UKI project, first as a live cinema performance and a biosensor game. I worked on UNBORN0x9

(<http://unborn0x9.labomedia.org>) while being hosted by Echopen (Paris), Labomedia (Orléans) and UrsuLab (Antre Peaux, Bourges) which focus on open source and creative commons applications. My participation in feral labs across Europe led me into this field and prompted me to start my own GEEK-CAMP (Andes, New York) in the summer 2020, and LAB KILL LAB (<http://lkl.clab.org.tw>), which I conceived and realized at Clab Taiwan amidst the pandemic quarantine in 2020. I activated 5 temporary thematic work stations – Phytopia, Wateria, Forking Piragene, Rice Academy rice bug revolt and Technoia which host nonconforming artists in a collective camp, working together in sessions that are closely associated with deep-rooted local networks of activists, cultural workers and bio-science labs. The Barcelona Biomedical Research Park which is considered to be the largest biolab in southern Europe, is possibly the most institutional lab I have worked with.



Opening performance at the eleventh Taipei Biennial by Mycelium Network Society, 2018. Photo by: Hanlu Zhang.

On my visits, I brought my UKI science fiction scenario for consultations with bio-scientists who work in specific lab experiments/development on bioinformatics, bioengineering, genomics, synthetic biology, microorganisms. The conversation would start by me posing the question: can you envision this scenario of occupied bodies in which red blood cells are re-conditioned to re-engineer human orgasm data for profit for GENOM Co, a biotech enterprise? This research led me to consider a transgenic future that would develop from the current bio-science development.

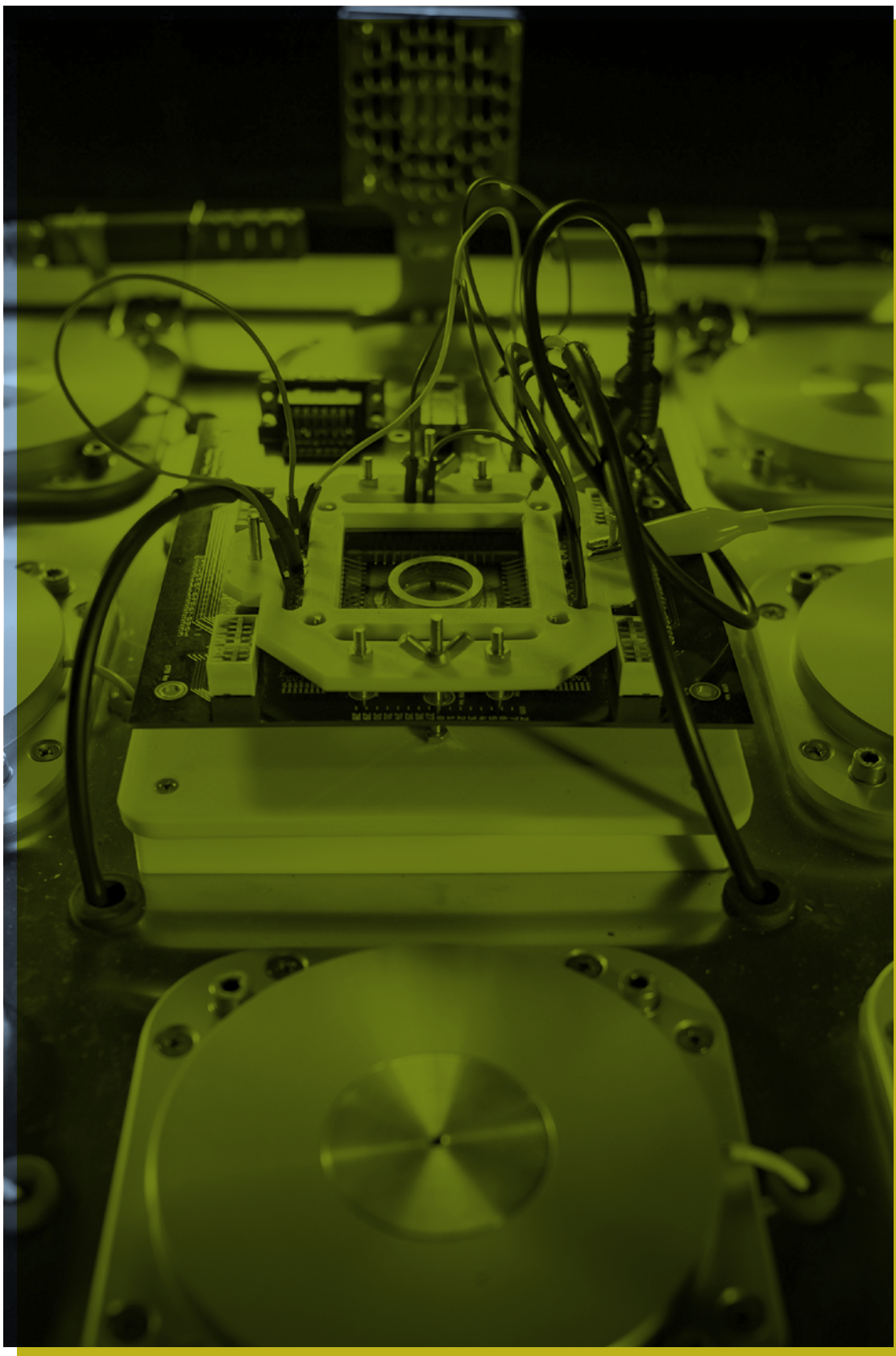
During the pandemic, I have worked on the

feature film script for UKI and wrote: as we submit ourselves to vaccine experimentation, we have departed from binary gender and deviated into a transgenic discourse. To live with the virus is to trans-mutate our bodies, teleporting our viral bodies into a brave new Eco-System.

And now you already mentioned several projects in which you engaged with life systems.

I should also mention the Mycelium Network Society (<http://mns.stwst.at>). Initiated in cooperation with Stadtwerkstart in Linz, MNS and cycleX (<http://cyclex.info>) in Andes, New York, MNS proposes an underground network imaginary world situated in a post-internet mud-land, powered by fungus, spores, culture, kitchen, radio, transmission, installations, workshops and performances. The Mycelium Network Society presented an installation and performance (with Martin Howse, Taro Knopp, Franz Xaver and global MNS nodes) at the Taipei Biennale 2018 which had a thematic approach to Post-Nature – A Museum as an Eco-system. For the Taipei Biennial, MNS developed a functioning

model of a mycelium network which demonstrates its innate capacity to relay information, working symbiotically with other roots and plants. Following the precise molecular structure of Patulin, a toxic substance produced by fungus, this installation is built from transparent acrylic “atoms” containing real growing *Ganoderma lucidum* mycelium and a series of custom-made sensors, transmitters and receivers. As a networker, I continue to enlist artists, labs, farms who work with mycelium as a medium for art, food and medicine.



Insider's View

BIOTEKNA: Developing our attitude towards living beings in art

 JANA PUTRLE SRDIĆ

Two scenes from my first year of working in the Kapelica Gallery already reveal the complexity of the human relation to life: the pig's hearts, which were attached to a perfusion system for blood circulation, beating outside the body for 48 hours in the gallery, and 14 chickens, which were fertilised in a chicken coop in the middle of the gallery, brooded in an incubator, and, as growing animals, left their first home, the exhibition space, when they were taken to the artist's farm in Belgium.¹ The so-called *miracle of life*, which we wondered about with the dramatic heartbeat of an organ outside the body and the blood that spilled (not for the first time) across the gallery floor, and which also accompanied the much calmer and longer process of egg hatching, that feeling of something *alive* in the gallery, which attracted all the residents of the building on Kersnikova at the time to visit it daily - later accompanied me through many other artistic projects.

In one way or another, I had contact with living creatures in most projects, and today I can no longer imagine that I would follow solely inanimate materials within artistic processes. Every time we prepare a protocol for growing cells in the laboratory or search for suitable organisms in the field, all of us probably have the feeling, at least for a moment, that this is just the beginning of our troubles. Sometimes we want installations with an on and off switch, but we would not consider it a proper challenge if we had something that does not grow, change, flourish or fade out, appropriate or reject technology.



artificial intelligence. Life and creation are positions par excellence, we use them when we try to highlight groups or secure states - especially those that are supposed to be exclusively ours.

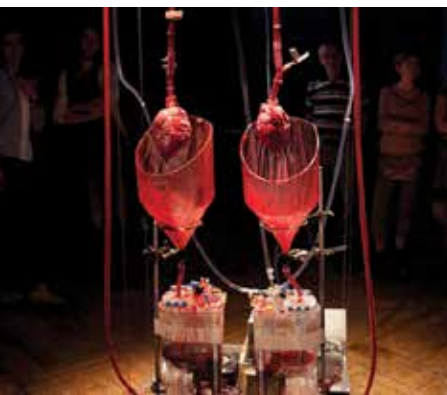
This is followed by the most obvious question: is art entitled to incorporate the living? Many artistic processes and works found in the history of art are unethical when viewed through today's post-anthropocentric view.

All living has become a state that is protected: it develops, tries to establish itself as a functioning (eco)system within the laboratory, as a second, perhaps artistic nature.

Thus, we realized that we cannot stick electrodes into cockroaches in order to determine their direction of movement, nor can we order animals to be slaughtered for a performance, we can only look for animals that died of natural causes. When growing tissue in the lab, it is important to know that the electrical signals given to the neurons are a stimulation and not something that will kill them. Dead plants are increasingly unjustified, and today, the few animals that live near our laboratories, most commonly die of old age.

Use is said to be changing into coexistence, which influences the questions that are tackled in art projects: can the human body live in symbiosis with plants in space, how do we influence rats with our circadian rhythm, what system will help slime mold find the shortest way out of the labyrinth, what does AI learn from interacting with a dog, what kind of vapour will a tree use in response to a nearby creature, and is man becoming obsolete in the inseparable coexistence of nature and technology? The new questions are those about relationships.

So how does one collaborate with the living in art inside BioTehna? The increasingly common way is to use one's own body. The strategy that body art employed from the very beginning also began to take effect in laboratory practices: Theresa Schubert obtained muscle cells for cultivating for nutritional purposes from her own body, while Charlotte Jarvis provided her skin cells for long-term research and transformation into male sex cells. Maja Smrekar also uses her body in her project K-9_topology. The public's reactions to her project made me aware of my own exclusive attitude towards other animal species, in this case dogs, despite the fact that I have lived with them for most of my life. The power of art projects lies in experiencing, not just understanding them.



1. Helen Pynor, Peta Clancy: The body is a big place, performance, 2013. Photo by Miha Fras.

2., 3., 4. Mechelese Styrian, 17th generation breed, grown in Kapelica Gallery. Cosmopolitan Chicken Project, Koen Vanmechelen, 2013. Photo by Miha Fras.

I have a series of questions about life in the laboratory and life in the gallery. From a philosophical, as well as a purely biological point of view, *life* is a problematic concept, as it is defined by organic, changing processes, which, however, are not entirely unambiguous, as the border between living and non-living is more of a grey area rather than a clear demarcation.

Life is also a concept charged with human ideas and emotional reactions to it. The disputes that arise when we attribute life to some entities and deny it to others remind me of the heated debates about the possible or impossible creativity of



The longest lasting project I am involved with is Biobot, in which signals emitted by neurons move the robot. Considering that the growing of neurons and displaying them requires demanding conditions, which exceed the standards of DIY laboratories, with complex biotechnological and sensory work that otherwise takes place only in scientific institutes, and the various remodulations of the robot that I have witnessed, it was difficult to empathize with Biobot's living system. In other words, or as artists like to say: it's not about mammals that look at us with their eyes and with which we, humans, can more easily establish a relationship, nor about plants that thrive or wither, nor about chicken voices in the gallery. Biobot means liveliness that is indirectly visible through a microscopic image, it means a sterile environment that is isolated from visitors at exhibitions, a complex idea that includes machine thinking which determines the shape of the robot. To me it also represents the longest preparations for laboratory work and a questionable result, but when the biological part is successful, the final movement of the bot is subject to several more loops and complications during further technological processing.

Despite the hard work, it is clear what each project means and why we undertake it. Some of the projects carried out in BioTehna have a strong socio-critical note in the chain of meanings: In Posse, with artificially created

1., 2. mEat me, performance, Theresa Schubert, 2020. Photo by Hana Marn.

3., 4. In Posse: making female semen, performance and workshop, Charlotte Jarvis, 2019. Photo by Miha Godec.

5., 6. Biobot, experimental situation, Zoran Srdić Janežič, S+T+ARTS exhibition at Centquatre, Paris, 2020. Measuring signals from neurons. Biobot, Zoran Srdić Janežič, BioTehna, 2021. Photo by Hana Marn.

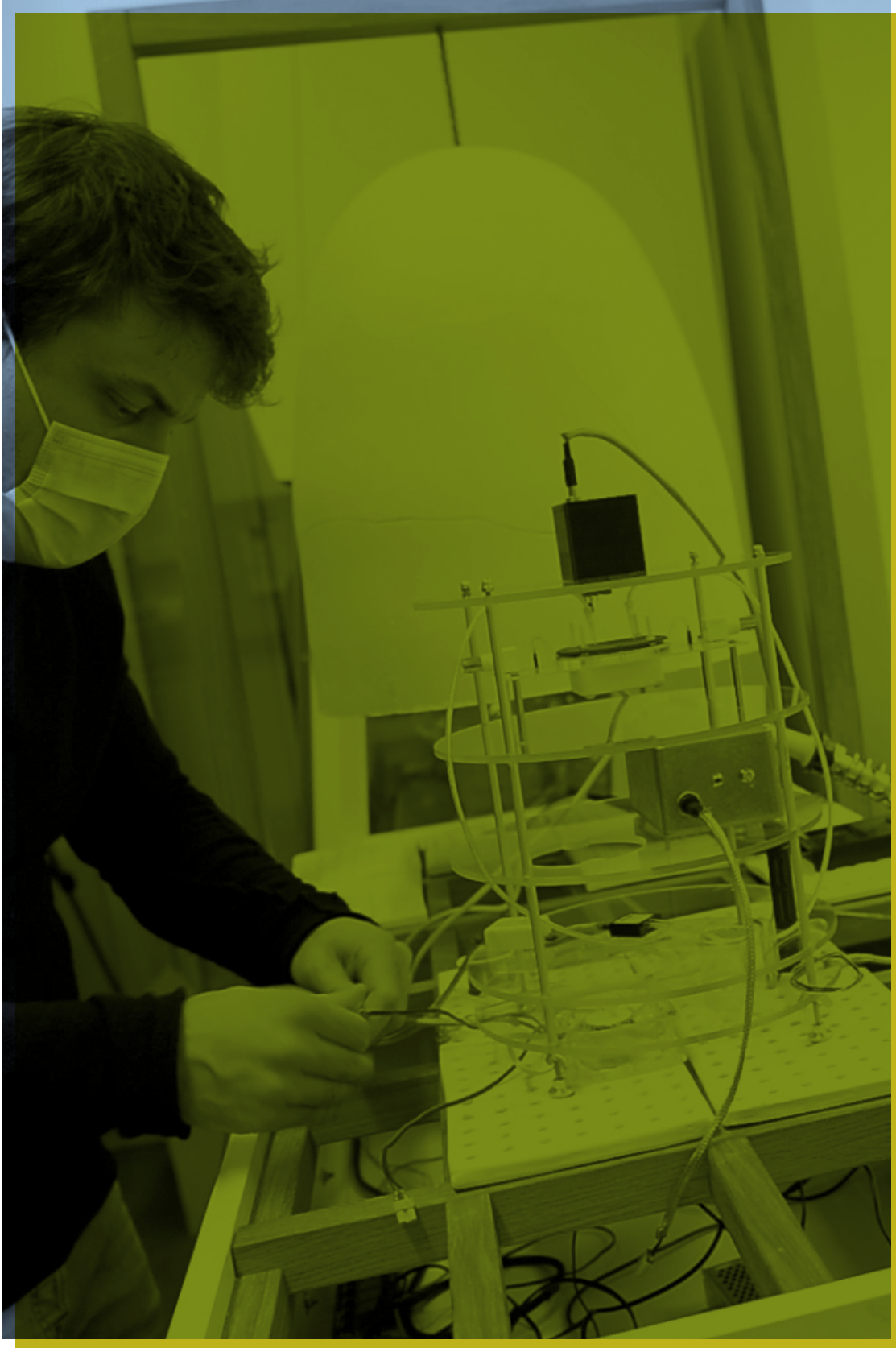
seminal fluid and the hacking of sperm, which would be developed from the artist's skin, carries with it all the weight not only of a patriarchal society, but also the line of strong and successful artists, who were predominantly male. Other projects such as Biobot or Infinite In-Between, harness something new, which we are dragging from the future: the more complex development of artificial intelligence, new biotechnological creatures, quantum biology. Technology, as we see it in the artworks we produce, is not a tool as such, but rather establishes new concepts, creates new, previously non-existing spaces of thinking and actions for the entire society. This is why we reach for scientific and technological discoveries that are still barely conceivable, but, as is becoming increasingly evident with each new decade, they significantly change our world. The art that deals with them is especially valuable in Kapelica, and BioTehna also exists because of such projects.

The laboratory is a space dedicated to living, changing systems, and even the first art projects I mentioned that were not carried out in the laboratory could at least partially take place in it today. Many of the more complex works of art we produce require blood cells or blood serum for growth, human hormones, an immortal HeLa cell line, or perhaps something specific as a recipe for a complex seminal fluid. BioTehna always lacks knowledge and equipment, artists often bring in their experts and collaborations with institutes, but Kernikova's ties with research centres are also multiplying.

I do not have a clear vision of the future of art with living systems, just as its processes are not smooth and linear in the present.

However, as developments in biotechnology will play a major role in our future, and as our relationship to other beings changes, living projects are becoming increasingly addictive. Life art is charged with presence, the presence of someone else, not merely us, humans.

¹ The following artworks are mentioned in this paper: Helen Pynor, Peta Clancy, *The Body is a Big Place*, Koen Vanmechelen, Mechlese Styrian, Theresa Schubert, *mEat me*, Charlotte Jarvis, *In Posse*, Maja Smrekar, *K-9_topology*, Zoran Srdić Janežič, *Biobot*, Mojca Založnik, Gregor Krpič, *Infinite In-Between*.



Insider's View

The Transformation Process from a Community Lab to a Wetlab

✎ KRISTIЈAN TKALEC

Prior to 2016, BioTehna was a classic open laboratory in which different DIY communities met and explored ideas that attracted them while working with living systems and open-source tools. The final biological part of the opus K-9_topology by Maja Smrekar brought great changes, as we, during the design of the project, estimated that we will need to upgrade our laboratory, while also deciding to introduce a stricter work system. We introduced a new use coordination with which we aimed to carry out the complex art project, while preserving the community and the openness of the laboratory. The real challenge lay in the equipment upgrade, and given the modest means, we decided to purchase a microscope, a used electrophoresis system and a refrigerator with a freezer. We borrowed the more expensive equipment - autoclave, laminarium, incubator - from Slovenian manufacturers.

The goal of the working group was to manipulate egg and somatic cells and prepare a hybrid cell that consists of the membrane of the egg and the content of the somatic cell. The research process was adapted to the artistic purposes. Gjino Šutić, the head of the UR Institute in Zagreb, who at that time had more experience in the field of tissue engineering and embryogenesis, took over the reading of scientific articles and the compilation of protocols.



Maja Smrekar and Gjino Šutić working in BioTehna. K-9_topology: ARTE_mis, Maja Smrekar, 2017. Photo by Hana Marn.

I found my first close collaboration with an artist challenging, as we both spoke our own language, Maja artistic and I scientific. When we finally found a common language, things literally took off. I started viewing the world from a different perspective, and started asking completely new questions: is scientific research only aimed at discovering and learning new findings, or can it also be a tool for communication, a critical view of social actions and technology? I began to look at the problem of reproduction from a new perspective, I began to understand artistic thinking. For the first time, I felt what ideal conditions for creative thinking mean, i.e. allowing ourselves to explore for the sake of exploration itself which will lead us in directions that we know do not lead to the scientific goal, but allow the goal to change, upgrade and adapt.

I made sure that we had all the necessary reagents in the laboratory before we started with our work in 2017. Maja and I prepared the media mixes that would ensure 2 months of smooth work. During this time, we first tested the protocol on pig oocytes, which helped us establish the challenges that awaited ahead. We realized we were missing certain specialized tools, such as micropipettes and a micromanipulator. We decided to create them ourselves: we made micropipettes from glass pipettes with the help of fire and attached them to an improvised micromanipulator, with which we manipulated and worked on oocytes.

We met daily, in the morning hours and worked until late afternoon, sometimes into the evening. It took some time to assimilate as we found ourselves in a renovated laboratory, with a new, unproven protocol, and as we were working together for the first time. The work was very demanding, but at the same time very rewarding, as all three of us were constantly learning. The transformation of the laboratory required new protocols, new rules of sterile work and restricted access to the laboratory. My previous experience working at the National Institute of Chemistry proved useful, as we had to be consistent in our desire to succeed. Despite all the new protocols, we created a part of the equipment ourselves, which was reflected in less accurate and reliable results.

When working with the DIY micromanipulator, we broke numerous glass pipettes and damaged a good number of test oocytes as a result of our imprecise operation. In the end, after a lot of repetition and five hours of carefully implemented laboratory work, we managed to reach the end of the protocol and produce a denucleated egg cell, into which we introduced the content of a dog's somatic cell.

Maja Smrekar's K-9_topology transformed BioTehna from a community into a biological laboratory in which demanding projects can be developed. Smrekar's affinity for developing complexity, not because of complexity itself, but because of the goal of the project, pushed BioTehna into a slight identity crisis, as it was no longer possible to switch back to the open laboratory format. The conditions that have been established in the laboratory require training for work. BioTehna has become known for performing demanding protocols under controlled conditions and many international artists have since approached us with their ideas, some of which were realised together.

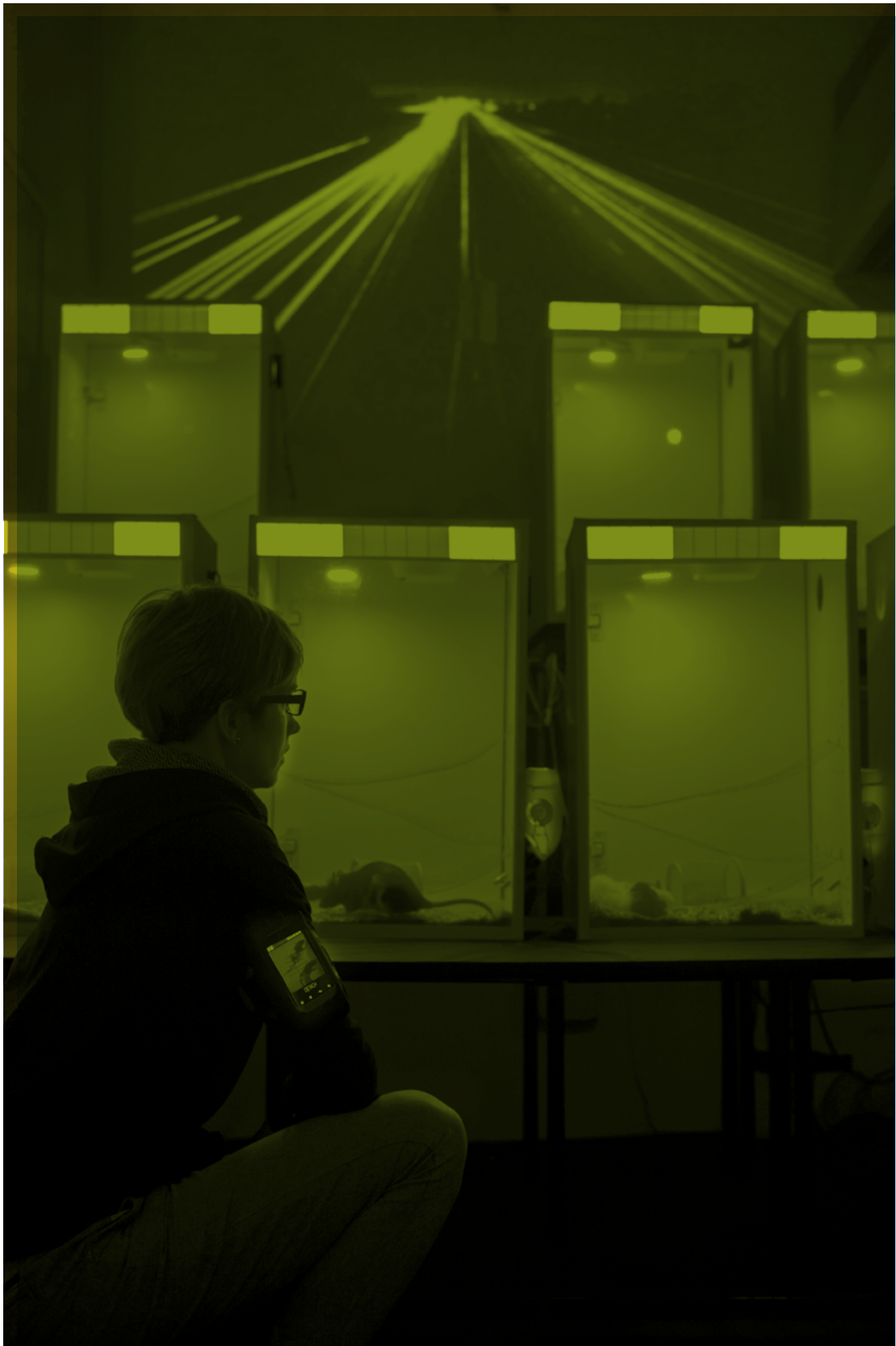


Gregor Krpič working in BioTehna. Birefringence, Mojca Založnik, Gregor Krpič, 2020. Photo by Hana Marn.

Open Source Clinostat. Xenological Entanglements. 001: Eromatase, Adriana Knouf. Photo by Hana Marn.

Adriana Knouf and Kristijan Tkalec working in BioTehna. Xenological Entanglements. 001b: Saccular Fount, Adriana Knouf, 2020. Photo by Hana Marn.





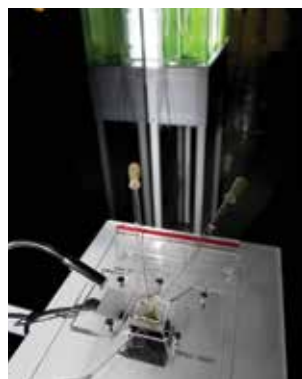
Insider's View

VIVARUM - a laboratory shaped by the emerging necessities of art projects

✍ SIMON GMAJNER

In 2012, when I joined the team of the Kersnikova Institute, we established the first version of the laboratory, relying on the ideas and experiences of the Hackteria community - an international network of scientists, engineers and enthusiasts who deal with open source (bio)art, do-it-yourself biology and laboratory infrastructure.

In the first two years of its existence, the laboratory started hosting the first artistic, research and educational projects: Špela Petrič and Robertina Šebjanič developed the Humalga project, which investigated the possibility of developing a genetic record of a human-algae hybrid as a survival strategy in response to the dark predictions for the future of the human species. Their installation needed daily care as algae needed to be cultivated and filtered. The following year, Špela Petrič turned the space into a miniature rat city for her Solar Displacement project, where she used rats as a bioindicator of human adaptation to a life that is no longer aligned with natural circadian rhythms. Already during its development stages, the project required daily care and dealing with rats. Once the exhibition ended, the maintenance of the rats became the producers' task, which I, as a producer, found psychologically exhausting over the next two years, as it required the periodic euthanasia of diseased rats and the removal of those that were destroyed by others.



1. Solar Displacement, Špela Petrič, 2013.

2. Circadian Drift, Špela Petrič, Maja Smrekar, 2012. Photo by Nada Žgank.

3., 4. Humalga, Špela Petrič, Robertina Šebjanič, 2012. Photo by Miha Fras.

The following year, Robertina Šebjanič established a saltwater aquarium for jellyfish, which she included in her Aurelia 1+Hz project. For this project, we installed tanks in the laboratory, in which we prepared seawater using special recipes and acclimatized the jellyfish in it, before we moved them into presentation containers for the duration of the exhibition. Considering the long-term preparations and care for them, it was quite difficult for me to look at the same organisms in the exhibition containers in the gallery, which often shredded jellyfish to pieces. The fact that jellyfish are supposed to be immortal did not improve my feelings.

Meanwhile, Špela Petrič was already preparing her next series of projects, Confronting Vegetal Otherness, which significantly marked her artistic creation in the years that followed and at the same time took place in parallel with the final design and independence of the Vivarium laboratory as a space for research into possible forms of coexistence of (human) animals, plants and technologies. Already in the first year of its existence, Vivarium hosted her project Strange Encounters, in which the artist juxtaposed and brought a bladder cancer cell and an algae cell into interaction, and thought about the establishment of the various biopolitics of the two different worlds. For this purpose, we emptied the Vivarium and turned it into a dedicated laboratory for research and presentation of the project, and used it as an exhibition space for the first time. Fortunately, there were no living creatures left in it, except Oskar, a tropical perch, which we caught in a pond during the activities in Maribor and removed it from the environment as an invasive species and moved it to Kersnikova for the next few years. During the project, Oskar found

a place in the office of the Kapelica Gallery, where he was the first animal we shared an office with after Koen van Mechelen's freshly hatched chickens.

In the last years of the previous decade, we already knew that this version of the Vivarium, together with the entire production platform of Kersnikova, would have to find a new home and prepare for the move at the end of 2020. However, before this happened, the last, perhaps the most faithful to the purpose of the space, art projects were created in the laboratory.

In 2018, Špela Petrič and a group of her colleagues developed the project Institute for Inconspicuous Languages: Reading Lips from a series of researches into dialogue situations between humans and plants, which she started in 2015 with the project Skotopoesis, in which she used the shadow of her own body to influence the growth of watercress.

Through the long-lasting performance, she established a reciprocal perception between plants and herself, which she, in the Reading Lips project, upgraded to a reciprocal perception between plants and a machine with a technological interface - an algorithm that, through the collection of data from plants, began to perceive itself as a plant.

1. Aurelia 1+Hz / Proto Viva Generator, Robertina Šebjanič, 2014. Photo by Miha Fras.
2., 3. Team work on PLAI, Špela Petrič, 2020. Photo by Hana Marn.



The last and most complex project in her Plant-Machine series, with which we said goodbye to the third version of the laboratory and the old premises on Kersnikova, was PLAI. This was an autonomous interaction between an algorithm and a plant: between a robot and the tendrils of cucumber seedlings, which the artist juxtaposed through technological interfaces, thus developing a game that took place at the speed of plant growth. The robot, consisting of a frame and fifty touch-sensitive cords and equipped with a rotating 3D laser scanner, tried to imagine the movement of the plant and reacted to it by raising and lowering coloured balls.

When a cucumber tendril wrapped itself around one of the balls, the string became a fixed support for climbing, and the robot gained an understanding of its own physicality through its interaction with the cucumbers.

The production process was as complex as the description of the project and lasted for more than a year. The process demanded the work of a large group of individuals with different skills such as programming, machine learning, AI, mechatronics, 3D printing, botany, architecture... The most intense development of the project took place during the months of the COVID pandemic. At that time, the Kapelica Gallery became a mechatronics laboratory and, together with Vivarium, represented a refuge where we could research and create together, i.e. simply work, as some segments of society were allowed to do, but the cultural and artistic field was often not.

The move to our new location that started in 2021 brought with it new infrastructural challenges and was physically and mentally demanding. It took

almost an entire year before we could work on new complex projects in Vivarium again. The artist Eduardo Reck Miranda developed his Biocomputer Responsorium with a group of mentors from Kersnikova at the end of 2021. In this installation, they used bio-processors made from a single-cell slime-mould organism, which exhibited a certain level of intelligence and could be used to implement a new type of artificial intelligence.

At the same time, we also started intensively studying the mycelium - the vegetative body of fungi, which started already with Saša Spačal's project Myconnect (2013), after which we joined the international Mycelium Network Society. This time, we managed to find a sufficient number of interested individuals for in-depth research, from the most basic knowledge of the organism and its potential in creating new materials, processing telecommunication signals, to detoxifying the environment.

The one-year intensive research of this organism at the MyCoBiont workshops culminated in the beginning of 2022 in the joint project of the mentors and the author taro knopp ml-iso|la|ti|o|nis|mus.

We connected the experience and knowledge gained in the workshops led by Martin Howse and Mary Magic to the ml-iso|la|ti|o|nis|mus project and established closed environments with natural and technological elements - small Vivariums. These are techno-organic hybrids, transparent globes in which the soil inhabited by mycelium and plants is also contaminated with materials common to our environment, and the microclimates are equipped with various sensors. These symbiotic and self-sufficient ecological systems have become distant satellites of knopp's project on Kersnikova and enable constant observation of the development of their living content in interaction with technology, as well as new insights into the impact of the human species on the environment and living conditions, which are becoming increasingly extreme and harsh. In its concept, the Vivarium laboratory is a similar ecosystem.



Radio mycellium, Martin Howse, workshop, 2021. Photo by Hana Marr.

Mycellium globe. MyCoBiont - ml-iso|la|ti|o|nis|mus, taro knopp & Kersnikova, 2022. Photo by Tina Lagler.



Insider's View

New Investigative Learning Models in RAMPA

 PETRA VANIČ

With the establishment of each new laboratory at Kersnikova, it became clear that the people in them ask questions to which they do not have answers. They test new solutions, share knowledge with each other and thereby gradually create a community of hackers, geeks, mentors, young artists who learn from other artists, scientists and engineers, who develop their projects parallelly and periodically in all three laboratories. We spend a lot of time developing this community, communicating with its members and establishing both educational work as well as focusing on the production of young artists who are developing their first projects in Rampa.

This supportive environment, as we call it, enables the development of a multitude of ideas, which are essentially related to the problems of modern society, from enthusiasm for the rapid development of technologies and problems that accompany them, to progress in science and critical consideration of the consequences. Using tools and materials in an individual laboratory is an important experience that requires time and learning.



Solar Houses, Summer Academy, 5HEK, 2014.
Photo by Hana Marr.

With the knowledge that the visitors of Rampa can acquire through workshops and their own projects, as well as with the artworks and processes in the adjacent gallery, the ever-present investigative learning takes place completely spontaneously, which in my eyes represents the essence of Kersnikova. In Rampa, this takes place in a relaxed way, with informal meetings between artists and experts, through which the community is constantly exposed to out of the box artistic thinking.

A key factor for the new generations is the understanding of science and the development of technologies such as machine learning, robotics, 3D and virtual design, renewable energy technologies and food production, biotechnology, etc. When dealing with these topics, Rampa's community is in touch with the most current issues, which it tries to solve critically through practical processes and innovations.



Next stop: Mars, 5HEK, 2017.
Photo by Hana Marr.



Renewable resources of energy, 5HEK, 2016.
Photo by Hana Marr.

The vision of a carbon-free world and green energy presents a great challenge, and as it has already been proven, for example, when building a rover for Mars, drones, rockets, or when working with biological systems and inventing food for the future - they are capable of creative solutions.

At Kersnikova, we are developing an investigative learning model based on the transfer of knowledge and skills within interdisciplinary workshops for youngsters. We are considering how artistic practices could be incorporated into research-based learning approaches, along with scientific protocols and new technologies, thus enabling inspiration of new ideas and solutions within the community.

In 2012, the first organized workshop for children took place in Rampa, and in the same year, we included youngsters into the KiiCs project - Knowledge Incubation in Innovation and Creation for Science. These were the first seeds of informal education, and its added value could be found in art (A = art), which at that time successfully entered the acronym STEM (STEAM).

By the end of 2013 we established the Friday Academy (5HEK), a series of workshops for children

and youngsters. We wanted to empower them with various knowledge on the phenomena found in the modern world. From the very beginning, we drew content from artistic creations and relied on the work in the three laboratories.

Numerous artists contributed to this project, for instance: Gilberto Esparza, Maja Smrekar, Taro Knopp, Zoran Srdić Janežič, Agnes Meyer Brandis, Christian Zwaniken, Saša Spačal, Stahl Stenslie, Andie Gracie, Angelo Vermeulen, Paul Vanouse, Adam Brown, Michael Sedbon and many others. We are currently carrying out over 150 activities for youngsters each year as well as a comprehensive programme of activities for adults. In the latter, we are especially proud of the artists who start their careers with education and project development in Rampa.

We have developed a special training programme for mentors, which is included in the field of investigative art and in which they get to know the different insights of artists in the laboratories, master the basics of programming, electrical engineering, wearable technology, laboratory work, 3D technology, microcontrollers, 2D drawing and the use of a laser cutter, etc. In addition, each group develops its own workshop.

Space Academy, 5HEK, 2022.
Photo by Mojca Gorjan.



Workshop in BioTehna, 5HEK, 2017.
Photo by Hana Marn.

Solarbots, 5HEK, 2014.
Photo by Hana Marn.



The mentors have an important task, as they provide the participants with the principles of DIY, DITO and peer2peer learning and teach them hands-on production and the use of open-source systems, all of which empowers the individual for critical and democratic thinking.

The artistic aspects that we highlight at Kersnikova give the individuals opportunities to develop ideas, at which those with an entrepreneurial mindset can gain an insight into something they would not normally imagine.

I am most enthusiastic and inspired when I see children who not only grow up through the programmes we develop at Kersnikova, but also co-create them. Later, some already in high school, others during their university studies, return to us and participate in the mentor programme and pass on their skills and knowledge to the younger generations. Some become active mentors with rich experience gained during their years of learning at Kersnikova, others collaborate with artists or even develop their own artistic projects. We are glad that they recognize us as a team and an environment to which they can return, develop their own ideas, form communities, socialize and actively contribute to society.



Insider's View

SlimeVenture

✎ EVA PONDRK

In 2020 I received new roommates - slime mould. It all started with Michael Sedbon's *Ctrl* installation in the Kapelica Gallery, which represented a game of life modelled on John Conway's work and in which slime mould played the leading role. 10 petri dishes with slime mould competed for the victory, and at the end of each slimetrode, the electrical potential of the slime mould was measured, and the computer converted the results into spatial coordinates used in the game. After ten rounds, the moves of the slimes were analysed and on the losing side, artificial intelligence improved their game in the next round by emitting a strong flashing light that the slime mould retreated from.

This was not my first encounter with slime mould. During Michael's workshop in BioTehna I learned from experience how to take care of slime mould, feed it with oats, reproduce it, prepare slimetrodes, make sclerotium or dry it so that it can be used at a later time. However, most of all, I was fascinated by the unusual life of slimes, which have completely different intelligence to us, humans, but we can find similarities between slimes and artificial intelligence, as both are capable of analysis and learning from past experiences. Slimes, which are capable of finding the shortest path to food, also have an external memory, which helps them remember where they have already looked. They are bio-memristors, i.e. they adjust their resistance to the electric current flowing through them, which makes them interesting for biocomputing. They are capable of phototaxis, chemotaxis and thermotaxis, making them experts at adapting to their environment.

Inspired by the experiments and learning, I developed a set of ten workshops for children Slimeologists, and moved the slime into my closet, which they explored in search of food and spread through it. During the period of Slimeologists, we could not meet due to the pandemic, so I had an almost industrial production of slimes, which we sent to the children through the post, so that they could follow the hands-on workshops that we conducted online. In our experiments, we designed labyrinths for them and created a slimetarium that recreated their natural environment. We made slimetrodes and measured their resistances, thus producing the SlimeSound, which is created by the slime mould as it changes its conductivity, which depends on their protoplasmic flow. Working with living organisms is not easy and these were creative outlets.

In 2021, I had the opportunity to collaborate with the artist Eduardo Reck Miranda, who creates music together with slime mould. We would meet remotely, I took care of the slime mould, Gregor Krpič of the electrical engineering and hardware, and the programmer Ana Smerdu of the software. Together, we developed a version of the musical installation with a piano, the Biocomputer Responsorium, in which the biocomputer responds to the composer's musical phrases. Eduardo is a composer at the University of Plymouth's Interdisciplinary Centre for Computer Music Research, and he was inspired for this project by responsive singing, in which the soloist and choir sing alternately. While the human performers follow the scores, the responses of the Biocomputer Responsorium are unpredictable, as the biocomputer reacts to musical phrases in a different way each time. The living bio-processors in this system are slimes that act as bio-memristors. Musical phrases are converted into voltage variations within the bio-processors (i.e. slime mould), which then change their resistance according to the voltage. The components then process the resistance and convert into musical responses.

1., 2. Friday Academy: Slimeologists, Eva Pondrk, 2020. Workshop series developed together with Gregor Krpič, Ana Smerdu, Lovrenc Košenina, Sanja Hrvačanin, Luka Žagar, Karmen Recer, Kristijan Tkalec, Klara Buh and Urša Adamič. Photo by Hana Marn.



I imagine that personal electronic devices will soon include living processors from self-regenerating and self-repairing organisms. The installation was exhibited in the Kapelica Gallery, where we encountered numerous problems with maintaining vibrancy, which needs specific conditions for development. From an artistic computer game with slime to the creation of a workshop and finally a musical installation with a biocomputer, it was an exchange of knowledge and testing for one of the most fulfilling development lines, in which the know-how and functions of our laboratories and gallery intertwined. Even though I have a special relationship with slimes, from disgust when they mould or escape from petri dishes to admiration when they sing in chorus and merge into one with electronic components, it is always nice to see when they once again weave the yellow slime web among the oatmeal scattered on agar.



3. Ctrl, Michael Sedbon, 2019. Installation in Vivarium. Photo by Miha Fras.

4. Biocomputer Responsorium, Eduardo Reck Miranda, 2021. Installation at Kapelica was developed together with Gregor Krpič, Eva Pondrk and Ana Smerdu. Photo by Katja Goljat.



Equipping laboratories

Equipping laboratories

✍ SIMON GMAJNER, JANA PUTRLE SRDIĆ

First steps

Research art, by its very name, indicates the length and importance of the process. The end result, which is - in our case - often an installation that includes a living system, is only available to the general public in its final phase. Creatives need laboratories dedicated to work (i.e. the process itself, rather than exhibition) for cultivating, dealing with what is alive, developing sensors for monitoring the living parts, engineering electronics and algorithms for communicating and co-existing with technology, developing biotechnological processes and taking care of organisms.

As no space is complete without interior design and the people who live in it, the laboratories on Kersnikova would be a means to themselves if it were not for the equipment and the community that uses it. Before setting up the laboratories, we considered the necessary and functional equipment that would support the research projects carried out in them. Since we are talking about the intersection of art, science and technology, we are also talking about equipment that we associate with laboratories in scientific research institutions.

The ability of cultural organizations to purchase such high-tech equipment is limited, and the funding mechanisms in the artistic field rarely allow for this. In the past, we got used to taking a more practical approach and often manufactured the equipment ourselves. Individuals and communities working in the field of DIY garage biology, such as Hackteria, GaudiLabs, Rüdiger Trojok and many others, were our inspiration as well as provided help and advice. Trojok is established in the broader community as one of the leading experts and consultants for setting up research laboratories with DIY equipment.

The DIY way

One of the first pieces of equipment that we made ourselves - following the example of Hackteria and the instructions provided by Marc Dusselier, its founder and a key element in the establishment of the BioTehna laboratory at the Kersnikova Institute - was the MICROSCOPE. Today we work with a more advanced version, but in the beginning, we used a cheaper one, made from old computer equipment, a web camera, some wooden parts, screws and elastic. The microscope served its purpose and over the years, like any DIY equipment, it has undergone a series of improvements and evolutions.

Making a microscope is still the starting point in our educational activities for the youngest, who we teach DIY approaches: we disassemble a certain technology, in this case a webcam, and appropriate its original function for another purpose, which helps us understand it better.

A slightly more demanding piece of equipment, which our artists and experts tackled, was the MIXER for liquids in laboratory experiments, which was later replaced with a certified magnetic stirrer with a built-in heater. However, in our first projects, the stirrer was assembled from written-off motors, springs, a speed control potentiometer, but lacked a revolution counter and similar upgrades. The machine would not have passed the first elimination stage of an industrial design competition unless the jury had an eye for a steampunk / industrial aesthetic, but it worked most of the time (under control).

Since most of the experiments carried out in our laboratories are biotechnological, the need for a PCR device - a thermocycler designed for DNA and RNA amplification - soon arose. We were helped by Urs Gaudenz, the founder of GaudiLabs, which designs and manufactures DIY laboratory equipment. At a multi-day workshop attended by both DIY enthusiasts and researchers from various institutions, we produced a working PCR device, which, as is typical for DIY devices, is less user-friendly and not quite as plug-and-play as the commercial version. We recently replaced it with an industrial version.

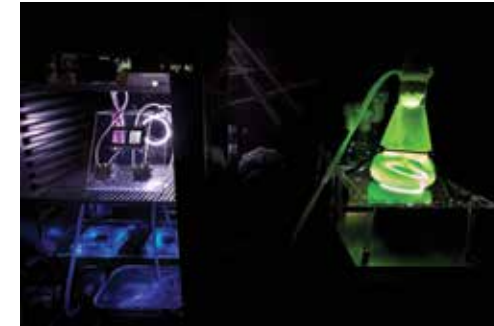
Working in a sterile environment

Handling biological samples requires working in a clean, sterile environment. Although we, in some cases, helped ourselves by surrounding the work surface by candles, which sterilized the air in the room, this method is not truly reliable, and at the same time it led the visitors to believe we were dealing with medieval rituals rather than scientific experiments.

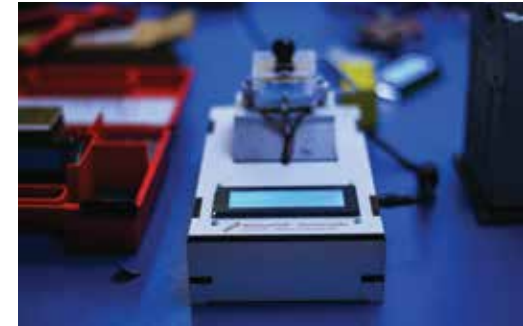
In order to make the BioTehna laboratory sterile, we isolated it, introduced ventilation and a UVC lamp to disinfect the air. Some artists created a clean



DIY microscope.
Photo by Miha Godec.



DIY Incubator and shaker. Strange Encounters, Špela Petrič, 2017. Photo by Miha Fras.



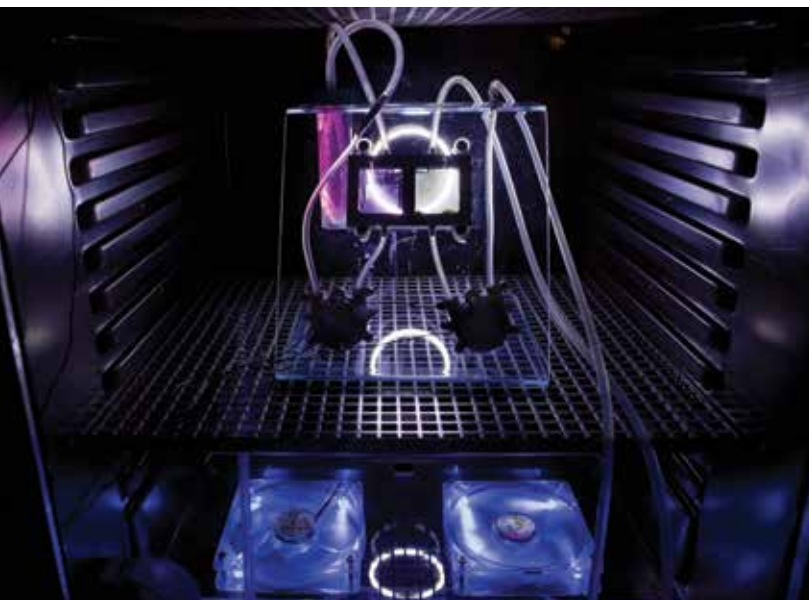
Open PCR, Urs Gaudenz.

work surface by making a chamber that filtered clean air into the work area with samples, and we also made various laminaria as part of our educational activities. For this we needed a fan, a HEPA filter, a sheet or plastic container and the knowledge of how to glue and weld different materials. Nothing an average person could not handle. With a donation from a company, combined with the funds from the Cohesion Mechanism, we eventually had the chance to obtain certified scientific equipment - LAMINARIA.

Despite the professional equipment, the most important factor when working in a sterile environment remains the individual's consistency in performing experiments. For some, it does not matter if they continue to work by candlelight.

The INCUBATOR is a piece of equipment used for the cultivation of cell and microbiological cultures that has undergone the most iterations at Kersnikova due to the various needs of the projects. The basic components are sensors, heat controllers and a fan that ensures even air circulation. An incubator can be any well-insulated and sealed container, which can be upgraded depending on the type of culture with a supply of gases, most often CO₂, a humidity regulator and light sources.

While the first simple incubators were built from used plastic crates for the needs of growing simple organisms, the atmosphere in the incubator in Špela Petrič's project Strange Encounters had to be precisely regulated. Its appearance, which became part of the functional scenography of the art project, was also important. Do-it-yourself communities usually swear by the functionality and accessibility of equipment and do not look at classic aesthetic standards, but we used a black wine cooler for the construction and



DIY Incubator. Strange Encounters, Špela Petrič, 2017. Photo by Miha Fras.

Clean air chamber. Photo by Miha Fras.

equipped it for proper temperature and CO2 maintenance. Plant and animal cell cultures were cultivated in it until the specialized laboratories Vivarium and BioTehna were finally separated. The incubator worked well for its basic purpose and is still used today in the Vivarium for the cultivation of mycelia, slimes and other organisms.

Industrial innovation and mobile lab

Different artistic projects had different requirements for maintaining and exhibiting living organisms, which led us to the realization that we needed equipment that would not only be used for scientific, but also for artistic research of living systems, that is, equipment that offers the precision and reliability of scientific-research equipment, but also enables a different use, which is specific to art projects.

The S+T+ARTS (Science, Technology and the Arts) mechanism, which was established in Europe with the aim of promoting artistic creativity in economic innovations, enabled us to design, develop and manufacture a unique incubator designed for laboratory work for Zoran Srđić Janežič's project Biobot. The incubator is a part of the exhibition's mobile laboratory and gives the viewer a direct insight into microscopic events. It consists of nine heating fields on which cultures can be grown in petri dishes that are visible under the glass surface, and that is also visible to the viewer through a microscope under the petri dish and the heating plate that transmits a microscopic image of the neurons to a screen on the outer wall of the incubator. The product, which was planned and manufactured together with the medical equipment

company Kambič, is both an innovation for the needs of an artistic project and a new acquisition of BioTehna, available to all artists who wish to work with cell cultures.

The mobile laboratory is a space with all the basic equipment that belongs in a wetlab and enables cultivation at the exhibition site, which was especially important in the case of neurons, since these special cells, due to their physiology, would not be able to withstand the transfer from the research institution to the exhibition site. The space of the mobile lab is also sterile and controlled, which in fact enables biotechnological work, but at the same time poses a unique challenge in presenting and communicating the artwork to the viewer.



Mobile lab. Biobot, Zoran Srđić Janežič, 2023.

Insider Incubator. Biobot, Zoran Srđić Janežič, 2020. Photo by Hana Marn.



Designing new spaces: Food lab

The various contents that we address in our art projects mean that we work with different materials and processes. In cooperation with Nova Gorica, the European Capital of Culture 2025, we started to think even more intensively about the future of food, where we are particularly interested in small-scale food production in urban buildings and environments, that is, micro-gardening, but we also follow the metaphysical interest of plant-machine inter-cognition and together with creatives we are developing automated robotic systems for growing plants.

In the food laboratory, food experts will meet with local growers, artists with chefs, and experiments with robotic cultivation, food production, fermentation, filtration, dehydration, and waste processing will be carried out. Accordingly, we will need growth chambers for algae, fungi and bacteria, from which we will produce biomaterials. With the help of a digester, we will actively aerate the beer and kombucha production processes. Refrigerated showcases will also function as exhibition spaces. Fermentation chambers and lyophilizers for drying fruits and vegetables will be among the first innovative devices we will develop for personal use.

As a project of Kersnikova in Nova Gorica, Food Lab is waiting for a series of interesting conceptual changes in design, and the results will also depend on the local community, from allotment gardeners, geeks, architects, to chefs, authors of workshops and artists with their installations. The numerous years of experience with our laboratories will be of great help to us.



StellaVerde at Ars Electronica Festival 2023. Photo by vog.photo.



Inspirational prototype of precision garden as a possible scenario for sustainable food production. StellaVerde, Gregor Krpič, Simon Gmajner, Dr. Jan Babič, Dr. Marko Jamšek, Gal Sajko (Jožef Stefan Institute), 2013. Photos by Simon Gmajner, Katja Goljat and Matjaž Rušt.

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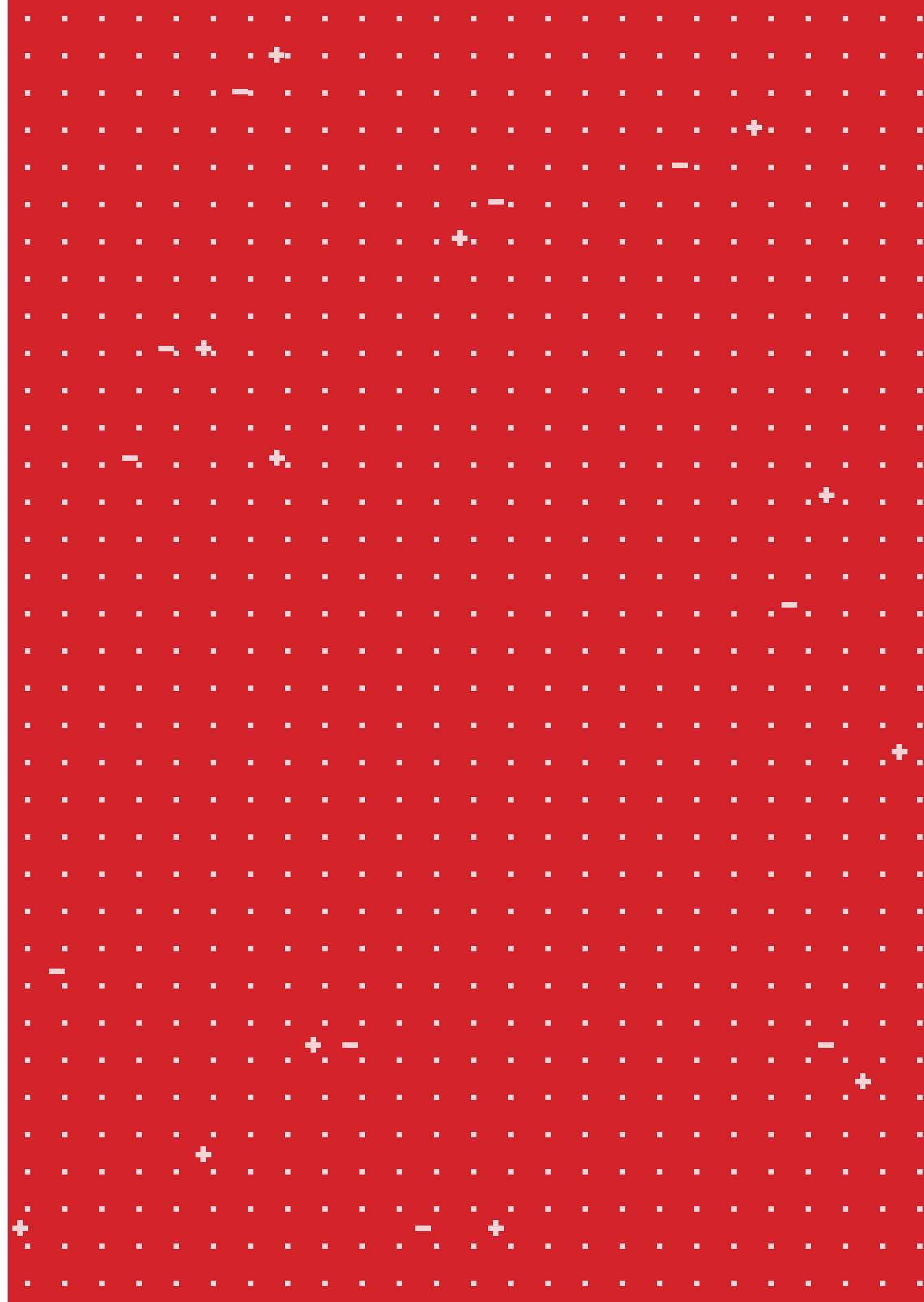
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