



luddites  
luddites  
luddites,  
all five of you



kloone4000





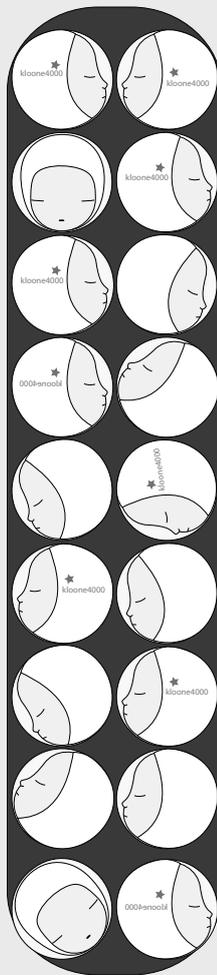
[www.kloone.anjeroosjen.com](http://www.kloone.anjeroosjen.com)  
research project of collaborating artists and scientists on cloning

# kloone4000

open studio - laboratory - art exhibition - lectures - discussions

kloone4000 exhibition

Silvia B.  
Loréne Bourguignon  
Wim Hardeman  
Lisa Holden (UK)  
Shunji Hori (JP)  
Joanneke Meester  
Netty van Osch  
Chrystl Rijkeboer  
Anje Roosjen  
kloone4000 research  
Olga Ast (RU/USA)  
Silvia B.  
Erika Biddle (USA)  
Loréne Bourguignon  
Roé Cerpac (IL)  
Annemarie Estor  
Lisa Holden (UK)  
Shunji Hori (JP)  
Jennifer Kanary  
Caitlin Masley (USA)  
Joanneke Meester  
Netty van Osch  
Rune Peitersen (DK)  
Chrystl Rijkeboer  
Naan Rijks  
Anje Roosjen  
Mieke Smits  
Taco Stolk  
Koen Vanmechelen (BE)  
Hanneke van Velzen  
Bas van Vlijmen  
Karl Van Welden (BE)  
Adam Zaretsky (USA)



kloone4000 lectures/debates

Arie Altena  
Toos Arends  
Danielle Arets  
Roel Arkesteijn  
Bertus Beaumont  
(BE) Johan Braeckman  
Bas Defize  
José van Dijck  
Bart Gremmen  
Paul Groot  
Frank Grosveld  
Bas Haring  
Rob van Hattum  
Jan Hoeijmakers  
Wiel Hoekstra  
Marli Huijer  
Dirk Jan Jager  
Ruud Kaulingfreks  
Jan C. Molenaar  
Miriam van Rijsingen  
Daan Roovers  
Paul Slettenhaar  
Marjan Slob  
Martijntje Smits  
Taco Stolk  
Tsjalling Swierstra  
Aad Tibben  
Tjeerd Tijmstra  
Raoul Teulings  
(BE) Koen Vanmechelen  
Cor van der Weele  
(USA) Adam Zaretsky  
Robert Zwijnenberg





kloone4000  
a research project,  
lecture program,  
discussions,  
films,  
DNA workshops,  
laboratory tours  
and  
an exhibition

# kloone4000

## introduction

*Cloning is a topic that appeals to the imagination, raises ethical questions and forces us to think about the future. This project is emphasising the special relation between art, science (mainly the terrain of genomics: the large-scale research on heredity and genes, including cloning) and technology.*

*Artists who work with themes related to genomics contribute to the public debate and analyses of scientific knowledge in an uncommon way. Art has the ability to criticise genomics experiments and their results, visualise them and make genomics accessible for a broad public, without stereotyping. In many cases it is also about visualising a reality that is inconceivable with the naked eye (DNA, nano-particles), for which there is a great need from within science. Artists and scientists are closer related in their daily practice than assumed: both are working with research, hypotheses, a search for truth and both are familiar with the 'eureka' moment. When artists are interested in the results, methods and applications of genetic research, and scientists in the possibilities of imagination, then there is a basis for cooperation, reflection and cross fertilisation.*

*Scientists are bound by theory and the public is often guided by emotions when thinking about the future of cloning, while an artwork is more independent, doesn't have to be 'true' and is not judged in these terms. This provides an appealing freedom to explore future scenarios.*



Silvia B. - Les bêtes noires

# kloone4000

## director's report

*Ad astra per aspera,  
on bio art, new media and collaboration*

### Bio art and new media

For an appropriate definition of the expression bio art, I search on the internet for *bio art* and *sci art*. This results in more than eighty thousand webpages, but hardly any provides a satisfying description. Art and science are uniting under these colours, an alliance which enables remarkable projects to be realised. In the broadest sense it covers artists who use life sciences (biology) in their work as a new medium and/or as a subject. This merging of form and content makes the definition too broad - it concerns almost all art related to life. The definition gains meaning again if it is limited to the use of biotechnology as a medium in art.

Biotechnology (and derived from that, genomics) as new media in art - this is something most people still feel uncomfortable with. The fear of artists playing with living materials, without proper training, illustrates just how far scientific practices are from daily life. At least, this is the experience, because the artists can be driven to do these experiments to demystify science, make it accessible and therefore stimulate discussion about biotechnology outside scientific and governmental circles. But this is not the (almost political-activist) agenda of all bio artists. There are also artists who are looking forward in the tradition of the *avant garde*, actively searching for the newest media and experimenting with it, regardless of the reactions of the audience.

Bio artists (the *avant garde* shows resemblance to scientific researchers) are pioneers in unknown territory, working with material and topics that are not common and are unknown to the public. The significance of this claiming of a new territory, acquiring new media and technology by artists should not be underestimated. On the one hand it is an expansion of the technical possibilities to produce art and add something to the existing canon. On the other hand it is a way in which the technology itself is explored, ruminated, tickled, criticised and made accessible. After time a technology has been introduced widely and is no longer new media, but accepted as an equal partner of painting and sculpture. So working with living materials will probably eventually become a partner too.

This is why I want to position bio art specifically as new media in this introduction to the kloone4000 project. The entanglement of the relative terms media art and new media is an obstacle, but also very relevant to this story. According to media theory almost everything is media: extensions of the senses as a vehicle to communicate with others in the public domain. Old media are 'one-to-one' (letters, telephone, e-mail) and 'one-to-many' (books, radio, television, webcasting). New media distinguishes itself as 'many-to-many', so far still a new area in which interaction and customised content are keywords (*P2P* networks like *Gnutella*, *wikis*, *weblogs* and personalised websites). This arrangement of new/old is not about analogue/digital, the way it is used in common speech. In the arts the use of new media as a term is also not defined according to analogue/digital, but was introduced at the time of the first video art projects. Video made it possible to combine image, sound, movement and time (multi media). After almost forty years,

video as new media has been outrun by newer media (like digital media) and become common media (together with painting, photography etc.). These days video is often noted as media art, also including other post-video contemporary media, but actually media art is an empty term, because all art is media art. In a way we can already speak of a postdigital era, because digital media are commonly used in daily life and in the arts. The digital camera, Photoshop and internet are no longer reserved for a select group of early adopters.

It definitely has its charm to lead the way as an artist, to trace new technologies before others work with it, just like the experts working on these new technologies. The prospect of a discovery, unknown possibilities and improvement or valuable addition to the already existing knowledge is very motivating. Currently, Biotechnology is a domain in which a lot of development is still anticipated and where new technologies are created - not least because there is a lot of money available for research, sponsored by the government and industry.

Genomics research is being done in consortia of industries, universities and scientific institutes, a merging of previously separated worlds. On the one hand there is the fundamental research of universities, aimed at producing knowledge presented in scientific articles. On the other hand is applied research in a more commercial context, focused on patents. The income derived from the latter finances further research. Conflicting interests can arise with this kind of merger: sensitive information might be exploited by others and therefore can't be published, and financial backers can determine the course of research.

This makes biotechnology an interesting terrain, not only because of the technological innovations it produces, but also because of the political agenda and the economic interests that seem to explore the boundaries of the objectivity of scientific knowledge. The ethical questions that surround biotechnology – and bio art itself - are also opportunities for critical reflection by artists. It is obvious that artists can also have an activist agenda, they are not always purely artistically driven. The ethical dimension is remarkable, this kind of breathing down your neck is almost unknown in contemporary art and appears to give the arts a renewed social relevance. For instance, think of the overwhelming controversial reactions that the GFP bunny Alba, by Eduardo Kac, has evoked. This exceeds the discussion about the artistic quality of the artwork and gives it a completely new dimension. As well as cloning being very appealing to the imagination (at least the potential technical possibilities) there are several plausible reasons why art is moving towards biotechnology.

Bio art concerns artists who work with new technologies and sometimes even living materials. This can be visible in the final artwork or remain invisible because the new medium is merely used in the process of making art. It also concerns artists who, working with traditional media, are critical or curious about the social consequences of biotechnology. At first the attention focused on the possibilities of the genome: DNA, genetic manipulation and transhumanism are very interesting topics. Now that we are starting to realise that the genetic code is not omnipotent, the interest in other related areas like nanotechnology, artificial intelligence, cyborgs, robotics etc. is starting to show. On the one hand this is about a public interest, for

instance measured in the number of exhibitions and publications, on the other hand it is about the interest/opportunities of artists to work with this topic, as a medium or in content.

The forms chosen by artists to work with these topics are diverse, a painting about cells, working with living tissues, establishment of organisations to access knowledge, performances and publications.

*Chrystl Rijkeboer - kloone4000 installation*



An interesting example is The Biotech Hobbyist collective, a multidisciplinary group of artists, scientists, engineers, activists and cultural theorists who work with biotechnology in a creative and critical way. Biotechnology is gaining importance, and yet the methods, techniques and practices of biotech remain closed off from the general public. This Hobbyist group wants to break this up and fuel curiosity by educating people about biotechnology. They develop hobby kits and online manuals for practising biotechnology and stimulate critical and creative thinking. They explain how to isolate DNA, clone plants and tissue culture techniques.

### **kloone4000**

Kloone4000 was created out of a curiosity for cloning and genomics. I had been working on a series of paintings and photomontages in which the same girl was repeated over and over again. This approach to cloning was entirely visual – my preference was for endless repetition - and felt a bit lean after a while. The field of genomics is very dynamic, with opportunities to work with new, living materials for example, and stem cell research and genetic manipulation are highly specialised topics that I also wanted to learn more about.

In workshops run by the Arts Catalyst <sup>(1)</sup>, artists are introduced to working with living materials in a laboratory. This made me aware of the potential that I was ignoring by merely working as a painter. On the other hand I also see it as social engagement; I should know more about genomics if my work is about cloning. By making this kloone4000 research project public, I wanted to involve other artists, share knowledge and stimulate collaboration.

For the exhibition I selected artists based on their works, in which I saw a sensibility for manipulating physical appearance and identity, working with a combination of traditional and modern media. There were no 'real' bio art works because there were no interesting Dutch artists working with these new media to be found and the budget did not stretch to inviting foreign artists. A call for artists also failed to find any other bio artists. So I decided to do the project with artists who showed an interest in the field of genomics, as being potential bio artists. This is a good thing, because the project is about creating opportunities, connecting people and encouraging collaborations, to stimulate future bio art projects in Holland.

The structure including meetings and discussions was essential to accomplish this, for I believe personal contacts are needed to start collaborations. There have been lectures, panel discussions, debates with the audience, evening discussions with artists and young scientists, workshops and laboratory tours. The responsibility of organising these events, selecting and inviting experts and thus designing the discourse in a silent, invisible way, made me reflect on my own position as director. Organising this project, creating this structure of meetings has developed into a very personal, intimate statement, a new part of my work which used to consist solely of paintings.

This development came at the right moment, because I felt the limitations of painting in dealing with the topic of biotechnology. I wanted to explore more, talk to specialists, study and try working with living materials. As director I had close contact with all participants, sharing information, making connections between them, and even had an audience for it.



*Netty van Osch - culturing clones  
(kloone4000 installation)  
(courtesy Ron Mandos gallery)*

The conversations with participants such as the American bio artist Adam Zaretsky on working with living materials, the tours in the laboratories, the evening discussions with biologists where we made friends, will make future projects easier to organise. Kloone4000 functioned as a pretext to get appointments, the media attention had had an

effect and more and more people were eager to participate. Because of the personal contacts my belief grew stronger that it is necessary to organise events in which people can meet, instead of confining it to an opening party at an exhibition. The structure in which people can meet peers in person appeared to be one of the best results of kloone4000. Hosting is important, offering entrance, food and drinks for free, sharing all information online and encouraging participants to make kloone4000 their own. This is a very contemporary thing, connected to concepts of intermediality, 'many-to-many', letting go of the idea of art as a tangible object and in a way even to open source. This is nothing new in the art world, but in dealing with a wider audience it is good to show these developments. Most people still think of art as a painting or sculpture. Personally I don't see how I can make a painting in collaboration with a scientist in his laboratory, and this is also not my ambition.

During the kloone4000 project some of the participating scientists told me they had had no experience of collaborating with artists, but were interested in doing so. I realised they were not aware of having collaborated, kloone4000 is a collaboration project in itself already. They thought of it as an organisation which brings people together and that afterwards we would start making something like art. This derives from the idea of art as a tangible object, while you should look at it as a process, which is far more interesting and more suitable for collaboration. In this guise it doesn't matter who made which part, its authorship is collective. This might even be a very welcome change in scientific fields, where almost everything has to result in publications and the rules and standard



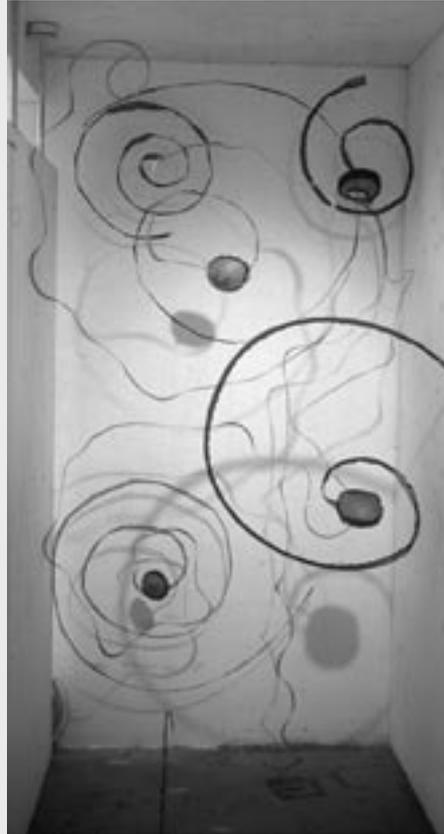
Caitlin Masley (USA) - mural of cloned architecture  
(Kloone4000 installation)

procedures for producing knowledge are in fact very rigid because of objectivity. There might be other ways to generate knowledge, based on creativity and impulse, process instead of outcome. A bit more Fluxus, maybe.

Bio art in Holland does not have a very distinct profile yet. There are artists that work with living materials, like Shunji Hori. For his K12 bacteria monitoring project he worked with scientists. This project however is isolated in relation to his other works, which makes it exaggerated to call him a bioartist. He would like to continue this project, but the technical realisation and collaboration with scientists make it a complex undertaking. Artists that relate to biotechnology and genomics in the content of their work (and not in the medium itself) are amongst others Margi Geerlinks, Mieke Smits and Taco Stolk. When the relation is content based, the art works are very divergent (manipulated photography, imaginary companies and media hypes) which makes bio art a very broad and vague term.

Nevertheless, I want to stimulate bio art projects with kloone4000, precisely because it is such complex terrain. In 2005 The Arts & Genomics Centre was established at the University of Amsterdam. This organisation is able to gather information, connect people and stimulate interactions between art and science. Collaborations are ultimately about a personal match, which takes time and has to be nurtured. An *artist in laboratory* project, initiated by the Arts & Genomics Centre, could take away obstacles that prevent artists and scientists from working together. The expectations of the art produced in this new field should be put into perspective, it takes time and experimentation

Jennifer Kanary - Cloned thought, I'm a bad girl, I'm a bad girl, I'm a bad girl...  
(kloone4000 installation)



to realise interesting projects. Kloone4000 shows there is a common ground for artists and scientists, an interest in collaboration. There appears to be a generation of researchers with multi-disciplinary training, who have access to different kinds of information in a digital era and do not hesitate to make new contacts without being part of a specialised network.

Finally I would like to plead for good exhibitions in this context, with international artists (like Oron Catts, Ionat Zurr, Natalie Jeremijenko, Adam Zaretsky, Eduardo Kac, Joe Davis) to show a wide audience the outcome of bio art and to introduce artists to this new media. Currently there are many discussions and forums on this topic, but I also noticed during kloone4000 that it is very tempting to remain at the level of resolutions and hopeful statements on art-science collaborations, but besides talking we have to start working, show interesting results and fuel future projects. *Artist in laboratory* and *scientist in atelier* programs are part of this.

The need to examine, criticise and acquire new technologies is obvious. Art has to be encouraged to take on a special role in this process, because - like science - it is fundamental to our culture. The *avant garde* will naturally claim new territories. Searching for relevance and a contribution to society is something art and science share, so they have a lot to talk about.

Anje Roosjen, February 2006

(1) The Arts Catalyst is a British science art agency, promoting the dialogue between art and science and its perception by the public, facilitating collaborative art/science projects, expanding new territories for artistic practice and setting up multidisciplinary research laboratories. [www.artscatalyst.org](http://www.artscatalyst.org)

skydouble

Hi there, I'm Her  
I was born on  
0<sup>th</sup> December, 1995.

Hi! I'm Devashra  
and I was born  
on

name is Sanvid  
I was born on  
5<sup>th</sup> November '95

Hi! I'm Jaidevi  
& I was born  
on 6<sup>th</sup> September '95.

Hey you! I'm  
Shantanu & I was  
born on 5<sup>th</sup> May '95.

Hi! I'm Chintal.  
My birthday is on  
26<sup>th</sup> April '95.

Hellooo... I'm Raghu  
My birthday's on  
25<sup>th</sup> August, '95.

Halo! My name is  
Komal and I  
was born on

Hi! I'm Salma.  
I was born on  
2<sup>nd</sup> February, '95.

Hi! I'm Prit  
I was born on

name is  
Aishwarya &  
I was born on  
26 May '95

Hi there! My name's  
Ansh and I was  
born on 10<sup>th</sup> August '95

Hi! I'm Yesha  
I was born on  
27<sup>th</sup> October '95.

Hello! Manan is my  
name and my b'day's  
on 20<sup>th</sup> November, '95.

A black and white photograph capturing the lower legs and feet of a group of schoolgirls. They are standing on a paved surface, possibly a schoolyard. The girls are wearing various styles of skirts, including a plaid one on the left and several dark, solid-colored ones. They are all wearing white socks and dark, lace-up shoes, which appear to be a type of school shoe or boot. The focus is on the uniformity of their footwear and the variety of their skirts. The text 'earthwalker' is overlaid in the upper right corner.

earthwalker

# kloone4000

## context



Silvia B. - Angel

*Why does science need the exploration of future scenarios? Is this not the terrain of ethicists and philosophers, thus already taken care of within science?*

Developments within science like globalisation, expanding economic interest in the natural sciences and technology and the enormous complexity and scale of research has necessitated a discussion on bio-ethics. This has caused the gap between (natural) scientists and philosophers of science/ethicists to grow. New research programs are being created on the frontiers of science, technology, culture, ethics and philosophy.

The need for ethics on matters like cloning, artificial intelligence and nanotechnology is urgent. Both for science: individual scientists have to morally support their work, even though they are only a cog in the machine and for society: the introduction of new technologies requires new ethics.

The development of new ethics is related to speculation about the future. Images have an important role in this, just like metaphors in language. The impact of science fiction underlines this point. Public debate about cloning is usually combined with warnings about *Brave New World* or *Boys from Brazil* (books you don't even have to have read in order to know they predict little good). Given this impact it is likely that scientists and artists might need each other in visualising the future.

*How is aesthetics related to ethics? Can artists contribute to an ethical debate?*

An aesthetical judgement can not be proven empirically. Aesthetic judgements are neither true nor false. They are normative statements about what is desirable and not about what is factual. Aesthetic statements are value judgements, like moral statements. It is important that these judgements are not misused in each others' place. It is possible to use an artwork to make an ethical statement under the guise of an aesthetic statement. Artists are given a relative level of freedom by society, which allows them to make artistic statements that might seem crazy and against all the rules but make us step off the beaten track. With their (visual) images they have a powerful tool to influence the opinion and emotions of the *lay* public, often more effectively communicating than the numerical results of scientific research.



Anje Roosjen - Triplet





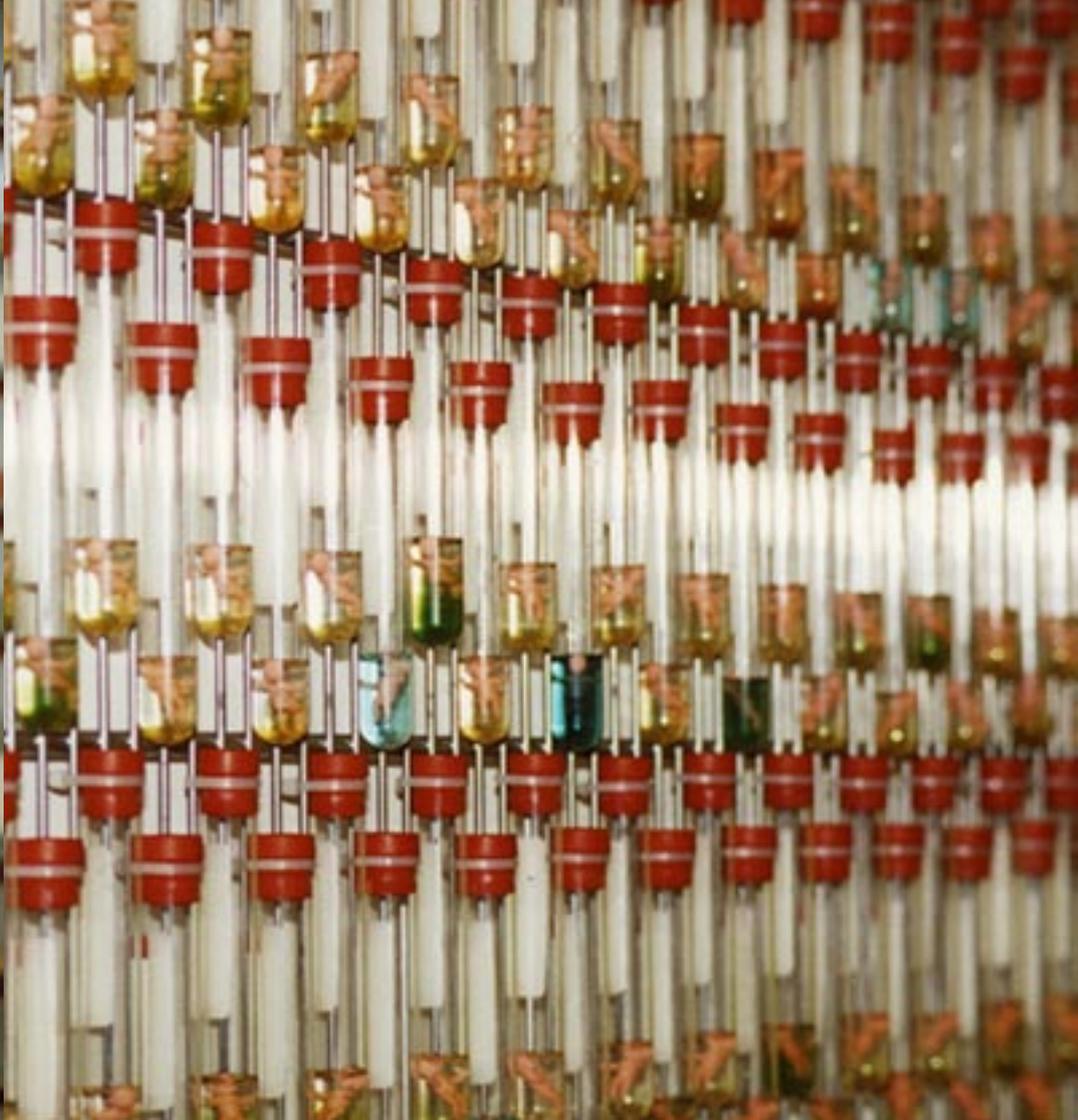
exhibition at retort project space











*Erika Biddle (USA) - from none, take one, add one, make none*

**Grimanesa Amoros (USA)**  
installations  
[www.grimanesaamoros.com](http://www.grimanesaamoros.com)

**Olga Ast (USA)**  
video  
[www.partast.com](http://www.partast.com)

**Steven Barich (USA)**  
video  
[www.srbarich.com](http://www.srbarich.com)

**Silvia B. (NL)**  
sculptures/installations/drawings  
[www.silvia-b.com](http://www.silvia-b.com)

**Erika Biddle (USA)**  
installations

**Loréne Bourguignon (NL)**  
paintings/drawings  
[www.phoebus.nl](http://www.phoebus.nl)

**Roé Cerpac (IS/NL)**  
encounters

**Wim Hardeman (NL)**  
manipulated photography/tintography  
[www.wimhardeman.nl](http://www.wimhardeman.nl)

**Lisa Holden (UK)**  
manipulated photography  
[www.lisa-holden.com](http://www.lisa-holden.com)

**Shunji Hori (JP/NL)**  
photography/video/installations

**Jennifer Kanary (CA/NL)**  
installations  
[www.roomforthoughts.com](http://www.roomforthoughts.com)

**Ximena Labra (ES)**  
installations  
[www.ximenalabra.com](http://www.ximenalabra.com)

**Agnes Maes (BE)**  
paintings and drawings  
[www.agnesmaes.be](http://www.agnesmaes.be)

**Caitlin Masley (USA)**  
photography/drawings/murals/installations  
[www.caitlinmasley.com](http://www.caitlinmasley.com)

**Rachel Mayeri (USA)**  
video

**Joanneke Meester (NL)**  
installations  
[www.joannekemeester.nl](http://www.joannekemeester.nl)

**Nela Ochoa (VE)**  
prints  
[www.nelaochoa.com](http://www.nelaochoa.com)

**Netty van Osch (NL)**  
ceramic installations  
[www.ronmandos.nl](http://www.ronmandos.nl)

**Rune Peitersen (DK/NL)**  
video/photography/installations  
[www.runepetersen.nl](http://www.runepetersen.nl)

**Chrystl Rijkeboer (NL)**  
installations with human hair  
[www.rijkeboer.com](http://www.rijkeboer.com)

**Naan Rijks (NL)**  
paintings/prints

**Anje Roosjen (NL)**  
paintings/installations/video  
[www.anjeroosjen.com](http://www.anjeroosjen.com)

**Mieke Smits (NL)**  
video/installations with grease

**Taco Stolk (NL)**  
installations/media art  
[www.wlfr.nl](http://www.wlfr.nl)

**Debra Swack (USA)**  
photography/installations

**Koen Vanmechelen (BE)**  
installations/Cosmopolitan chicken project  
[www.koen-vanmechelen.be](http://www.koen-vanmechelen.be)

**Hanneke van Velzen (NL)**  
photography

**Bas van Vlijmen (NL)**  
installations/paintings/photography  
[www.basvanvlijmen.com](http://www.basvanvlijmen.com)

**Karl Van Welden (BE)**  
installations

**Louwrien Wijers (NL)**  
conceptual art/organization

**Adam Zaretsky (USA)**  
installations/performances/biokunst  
[www.emutagen.com](http://www.emutagen.com)

kloone4000  
participating artists



Shunji Hori - bacteria monitoring project



## kloone4000 DNA workshop Adam Zaretsky

On October 4th 2005 Adam Zaretsky held a DNA hybrid Isolation workshop in the kloone4000 projectspace. Artists, journalists, arthistorians and other interested people signed up. The participants were asked to bring natural products for the hybrid mixture. Among the ingredients were courgette, chicken harts, narcissus bulb, oyster, green peas, strawberries, sweet chestnut, roast beef, chocolate raisins, hair and yellow roses. This mixture was blended with soap, salt, water and pineapple juice. Finally, after slowly adding alcohol, the DNA rose to the surface in the test tubes. A very strange, improbable and hybrid DNA.

*Professor Adam Zaretsky is a bio artist, working as a research affiliate in Arnold Demain's Laboratory for Industrial Microbiology and Fermentation in the Massachusetts Institute of Technology's (MIT) Department of Biology. He received a Master of Fine Arts in 1999 from the School of the Art Institute of Chicago, where he studied and researched with transgenic artist Eduardo Kac. Since then, he has worked with such pioneers of bio art as Joe Davis, Oron Catts and Ionat Zurr. Zaretsky also taught an art and biology studio class in fall 2001 as a visiting artist at San Francisco State University. Besides the bio-art installations on which he is working, Zaretsky has created a large body of digital artworks, collage and photography.*



DNA (deoxyribonucleic acid) is found in all living cells. These cells can be of plant, animal, fungus, bacterial protozoa and even viral particles. Many varieties of samples can be taken from various food, pets, pests, human bodies, laboratories and free or not so free living portions of the outdoors. Some recently alive 'materials' that you think might not have DNA are worth testing through extraction. Different cellular or multicellular organisms can be encouraged to grow by giving them food and an otherwise sterile and comfortable place to live. The definition of food and comfort is dependant on which living being it is that you want to sample. Sometimes 'volunteer' organisms can be attracted to an experimental food laden 'homes.'



# kloone4000 DNA workshop Adam Zaretsky

*photography: Bas van Vlijmen*



## kloone4000 DNA workshops primary school

Kloone4000 organized DNA workshops for primary schoolchildren in cooperation with Alex Verkade of De Praktijk. De Praktijk is a creative office for concepts, advice and development of scientific education and communication.

During the workshops the concept of DNA was explained. The children mixed all kinds of vegetables, fruits and fish in a blender, added salt, water, soap and alcohol to isolate the hybrid DNA from the *soup*.



October 10, 2005 primary school De Notenkraker group 8  
 October 13, 2005 primary school De Notenkraker group 7



## kloone4000 laboratory tours



*video stills by Sam Nemeth*

September 28, 2005 - kloone4000 tour in the Hubble Laboratory, institute for developmental biology in Utrecht. Biologist Bas Defize explained the stemcell research, and other research programs like of the development of the brain of zebra fish. He gave a tour in the laboratories.

[www.niob.knaw.nl](http://www.niob.knaw.nl)

October 11, 2005 - kloone4000 tour in the Erasmus Medical Center Rotterdam, department of Genetics. Geneticist Jan Hoeijmakers explained the biomedical cancer research and other research programs on aging diseases. Koos Jaspers guided the artists through the laboratories, demonstrating all kinds of equipment.

[www.eur.nl/fgg/ch1/genetics.html](http://www.eur.nl/fgg/ch1/genetics.html)

# kloone4000

## lectures

*During kloone4000 the following persons gave lectures:*

*Roel Arkesteijn (curator GEM, museum for contemporary art, The Hague)*

*Erika Biddle (artist and art critic, New York)*

*prof. dr. Johan Braeckman (professor of philosophy, university of Gent, Belgium)*

*dr. Bas Defize (biologist, Hubrecht laboratory, Utrecht)*

*prof. dr. José van Dijck (professor of media and culture, university of Amsterdam)*

*dr. Bas Haring (philosopher, computer scientist and writer, university of Utrecht)*

*prof. dr. Marli Huijter (philosopher and medical doctor, university of Groningen)*

*prof. dr. Jan Hoeijmakers (professor of molecular genetics, Erasmus Medical Centre Rotterdam)*

*dr. Miriam van Rijnsing (art historian, founder of the Arts & Genomics Centre, university of Amsterdam)*

*dr. ir. Martijntje Smits (philosopher of technology, university of Eindhoven)*

*Taco Stolk (artist and teacher at Royal Academy of Art, The Hague)*

*dr. Tsjalling Swierstra (technology ethicist, university of Twente)*

*dr. Tjeerd Tijmstra (medical sociologist, university of Groningen)*

*Koen Vanmechelen (artist, Belgium)*

*dr. Cor van der Weele (biologist, philosopher, university of Wageningen)*

*Louwrien Wijers (artist)*



*Netty van Osch - "Hear 'O'Hear"  
(courtesy Ron Mandos gallery)*

# kloone4000

## lectures (as MP3 available at the website)

### summary lecture Bas Defize

(biologist)

*On stem cell research and therapeutic cloning.*

Cell division, cell differentiation and morphogenesis are the processes that enable the creation of a complex organism. All vertebrates share a common phylogenic stage, during which the head, tail, and vertebra are clearly recognizable and the heart develops. During this stage all vertebrates look very similar.

Embryonic stem cells are the precursors of all possible types of tissue. The stem cells can be isolated from an embryo in the blastocyst stage. The first human stem cells were obtained from an IVF clinic. From thirty six left over embryos it was possible to isolate five stem cell lines. These were tested on mice, introducing the cells under their skin where they developed into a teratoma, from which all human tissues were retrieved. This proved that the implemented cells were indeed stem cells.

For medical applications it is interesting to let stem cells develop into differentiated cells that can be returned to the body. To prevent rejection, stem cells should ideally be of the same tissue type as the patient. This can be done with therapeutic cloning. In this process the nucleus is taken out of an activated egg cell. This empty egg cell can reprogram a different, even adult nucleus into an embryonic nucleus. This new embryo can be used to obtain stem cells. When the entire embryo is returned into a uterus this could become a human clone in theory. With animals this is being done, not with humans. The reprogramming of an adult cell nucleus is a complex process. You can't expect an exact copy from cloning; the cloning of cats showed differences in character and even in fur colour. This is caused by random reactions of the genes to changes in the environment, making them less predictable. Transgenic animals are animals that have been improved with additional genetic features. This is a time-consuming process, if you finally have one good transgenic animal you will see the advantages of multiplying it by cloning. Cloning is about making a copy, genetic manipulation is in fact

more radical: it adds new features and deletes unwanted features. Reproductive human cloning does not serve any purpose and burdens the clone with an inhuman role of being the same as his predecessor. If we genetically manipulate organisms, which could be desirable for several medical applications, we should keep the transgenic organisms isolated from the natural population.



Koen Vanmechelen, *Cosmopolitan chicken project* (foto: Alex Deyaert)

### summary lecture Bas Haring

(philosopher/computer scientist)

*On humans becoming a product of thoughts and design.*

In the 1930s Alan Turing wanted to copy himself and bring back to life in another time. He came to the conclusion that the best clone would be a copy of his memories and thoughts: this is his essence. It makes him the founder of computer science: he distinguished the memory as a collection of data from something that manipulates the memory (the processor). This is the foundation of the computer.

In common speech however, cloning means making a biological copy of a body and not the mind. If you see your body as an instrument, a clone might come in handy for spare parts, but in that case the clone should not be able to think (who is who's clone?). A cloned human is just not handy enough. Genetic manipulation, changing our genetic material in order to become different is already happening. At present mankind is still a product of nature; in the future we will be the product of our thoughts, we will be designed. What is nature? The Chinese character

for nature literally means *the things that are like they are*. These are things that are not affected by mankind. Nature creates whimsical, odd and inefficient products. The products of thoughts are less whimsical and inefficient, we often think of them as better than nature because they are faster, stronger etc. It is remarkable that they are also unambiguous. Obviously our thoughts are all the same and more boring than we realise. It is very hard to have a new, original thought. Remko Scha (professor of computer science and artist) recognises that man has a very limited creative mind and he uses computers to create new art, works no human mind could have come up with (but also hideous). So when man becomes a product of thoughts, he will become more boring too, as though we all come from the same factory. Will nature then disappear? Nature will shift, it is an illusion that we will control the making of man entirely. The new nature will reside in this uncontrollable portion.

### summary lecture Taco Stolk

(artist)

*On genetic art misconceived as visual art.*

Taco Stolk performs research on the foundations of art and creativity. For example by exploring media that are not commonly used in artistic communication. With the fictitious course 'Genetic Design' he seeks possibilities for artists to relate to scientific developments. The Genetic Design project is not merely about creating living works of art; other aspects are equally important, like ethical issues and the relations between form and knowledge.

Concept art and media art are almost always misconceived as *visual art*, though their creative properties are different. In genetic art the 'visual' aspect of a 'living artwork' is only part of the design. An animal, for instance, makes sounds, shows behaviour and relates to its habitat. Apart from that, societal issues are manipulated by genetic artworks. Similar conceptions are found in other forms of art using contemporary knowledge systems. Classifying these types of art as *visual art* is historically understandable, but leads to confusion and reveals a romantic and conservative viewpoint. The new types of art cannot be classified using sensorial criteria. The conceptual shapes from which they stem determine their appearance – whatever their sensorial outcome may be.

Contemporary education in the arts is still based on antiquated ideas. To develop significant education in this field, art education of all disciplines (visual arts, music, theatre, film, etcetera) should be united in a university department devoted to *artistic* production of knowledge, in addition to its close relatives in science and the humanities.

## summary lecture Tjeerd Tijmstra

(medical sociologist)

*On the dark side of predictive medical science.*

Predictive medical science has certain advantages, such as personalised medicine, but there is also a dark side. Genetic testing provides us with information on future diseases, including diseases for which no cure is available. Defects have repercussions for the family (what does it mean for you if your brother turns out to have a hereditary defect?). DNA diagnosis is expanding rapidly, in this culture of information more and more risks are being calculated and analysed in correlative research. We live in a society in which we are confronted with more risks than ever. Everybody who wants to have a baby can be tested for the gene for cystic fibrosis, preventing future pain and limiting health costs. Are we entitled to DNA diagnosis? Premature tracking down of diseases is based on the idea of 'the sooner the better'. Many choices for research are made based on anxiety and the fear of regret if left too late. Business is profiting from this situation (total body scans and genetic testing at the Body Shop). We should be aware of the social consequences of determining groups of people with a high risk of diseases.

## summary lecture Marli Huijser

(philosopher/medical doctor)

*On Damien Hirst's Love Lost 2000, multitudes of time and prenatal diagnosis.*

Damien Hirst gives a different perspective on biomedical applications with *Love Lost 2000*. This work can be read as a critique on biomedical science. Marli Huijser chose this work because it shows several notions of time. Our culture takes a linear time notion for granted (past – present – future). Biomedical sciences however introduce a future that exists in the present (intervening today is necessary to prevent diseases in the future). In *Love Lost* Hirst is pointing out the other side of visualising the foetus. It



Wim Hardeman - Vlad

pronounces a fear of a future in which everything is visible and what doesn't fulfil is eliminated prematurely (prenatal diagnosis). Because of the ultrasound we know the sex before the child is born. DNA is carrying information which is often expressed only after fifty years, but is considered present already. This is the tragedy of predictive medical science, which promises to save us from misery but brings all kinds of potential illnesses in the present. The watch refers to linear time, the coffee mug to cyclic time and the computer to real-time (ultrasound). Because of these different notions of time in *Love Lost*, we become aware of the concept of multitude of time. This concept of time is also becoming more and more accepted in molecular biology. The relationship between DNA and the organism is not only linear, but is also influenced by the environment and hence not completely predictable. Hirst opens

up a new perspective with this work, because it deals with more than just anxiety or dissatisfaction with biomedical science.

## summary lecture Cor van der Weele

(philosopher/biologist)

*On transhumanism and metaphors.*

Until 1859, when Darwin wrote the theory of evolution, nature was God's design, something holy and not to be played with. This new approach of evolution made way for intervening in nature. After 1953, the year of the discovery of the structure of DNA by Watson and Crick, the manipulation of nature entered a next stage.

Artists are now posing many of the same questions on science as philosophers and ethicists do. They point out casualness, pose new questions and look for blind spots. The use of metaphors is very common and accepted. Science has some difficulty acknowledging it's use of metaphors, it regards this as a threat to objective knowledge. However, genetics is packed with metaphors.

Transhumanism aims at improving humans with technology. The discussion on the use of mood improvers (Ritalin and Prozac) can be seen as a precursor. Gregory Stock (*Redesigning Humans*, 2002) is excited and hopeful because of the high speed of technological innovation. He uses the metaphor of the development of an individual life: mankind is leaving his childhood behind and is now entering his adolescent period in which he discovers the core of the human nature: crossing boundaries. Bill McKibben (*Enough, staying human in an engineered age*, 2003) thinks human nature is about accepting boundaries and acknowledging finiteness. He uses the same metaphor but shows a main character which is now fifty years old. Nicholas Agar (*Liberal Eugenics, in defence of human enhancement*, 2004) introduces ideas on upbringing as a model for thinking about genetically improving your child. If upbringing is as deterministic as hereditary material (nature-nurture), then we must have the option, in this liberal society, to improve the child genetically. The choices should be expanded instead of limited to give the child its own freedom of choice. The metaphor in this book is also upbringing. In ethical questions the search for the one and only right perspective is tempting. But the major influence that metaphors have on our thinking

shows that all perspectives are imperfect. The challenge is to learn how to use all these incomplete and metaphorical perspectives in a constructive way.

## summary lecture Johan Braeckman

(philosopher)

*On the fear of human cloning.*

Humanity has the right to improve itself because we are the product of an evolutionary process that is not concerned with us. We are not a final product - we are still full of errors and in certain aspects you might say it is a stupid design. We are dealing with a very powerful technology, one we are not quite ready for.

Cloning evokes all kinds of negative associations: clones of dictators, armies of slaves with no free will, the horror of the clone turning against his creator; eventually the *real* clones of the future will have to deal with this negative heritage.

The European Parliament has pronounced itself against human cloning because it is considered to be incompatible with the principle of equality, because it makes eugenic/racist selection possible, it violates the right to an individual genetic identity and is insulting to human dignity.

This is over-exaggerated. Because a clone is considered a copy, it carries the negative aura of imitation. But a clone is only genetically identical. A monozygotic twin is also genetically identical, but not the same in character, personality etc., nor are they inferior human beings. Human dignity has to do with making independent choices, giving direction to your own life, self-consciousness and experiencing pain and joy. Cloning is expanding these possibilities. Family planning is better than natural or coincidental conception: the children are wanted and arrive at the right time. You don't lose respect because of the way you were conceived, IVF children are or should not be treated differently either.

There are no standards in nature that tell us what to do and what not to do, our values are a human creation. And there is nothing stated about cloning in the Bible, so God's will in this matter is unclear.

Thesis: the only ethical reason not to create a human by cloning is medical insecurity. Cloning with adult cells is too risky, causing accelerated aging and other risks.

Thesis: a cloned child will not confront us with particular problems in child-rearing. Unrealistic expectations of a child are not good anyway, a genetically improved child can be pushed by its parents as well, as is often the case already; this is part of upbringing.

People want a cloned child because they want a genetic link with their child, but are not capable of making a child themselves because of infertility, genetic defects or hereditary risks.

## summary lecture Jan Hoeijmakers

(geneticist)

*On DNA damage and aging diseases.*

Our body consists of billions of cells. In each cell is a nucleus, in which the chromosomes are nested, containing all of our inherited traits (genes), stored in the DNA. The long DNA double helix is wrapped around protein balls.

The protein can be dissolved with soap, this isolates the DNA as a wire. Every microscopically little nucleus has 1,5 meter of DNA wire, founded by more than six billion building blocks, arranging the genes in a row. Each gene can be copied into RNA, this message is sent from the nucleus to the cytoplasm where it is translated for constructing protein. Every gene takes care of a different protein. The proteins are doing the actual work. Some proteins are enzymes, or hormones and others are in charge of duplicating the DNA before a cell divides. There are also proteins that repair DNA if it is damaged. The duplication of DNA during cell division is a very precise process but occasionally errors are made (1 in 10.000.000.000), what can lead to cancer for example. DNA is damaged by radiation (UV), chemical substances (exhaust fumes, smoke) and oxygen radicals (breathing). This causes the demolition of approximately fifty thousand building blocks in each cell every day. At the same time repair is done continuously, this is why you hardly notice the damage. There are rare congenital diseases where the defect is on the gene that is responsible for the repairs. This causes a wide range of defects like over sensitiveness of the skin for UV radiation in sunlight, skin cancer, growth failure, impaired development of the nervous system and short life expectancy. To study these rare diseases research is done with laboratory animals (mice). Research showed that the defects can be seen as a way of premature aging. The aging process of

mice can be compressed from two years to two weeks and the aging process can be isolated in a single organ, which is very handy for studying. Because we live longer we want to improve the quality of life at old age and slow down the aging process. DNA is the only molecule in every cell that can't be remade, it is indeed the blueprint of everything. If the DNA damage can't be fixed the cells will eventually die, this is the process of aging. We could reduce the metabolism (for example by eating less, but this is not comfortable) or reducing the cause of the damage, by adding substances in nutrition that catch the oxygen radicals before they can do damage.



Chrystl Rijkeboer - Perfect stranger

# kloone4000

## library

Lori Andrews, *The Clone Age* (New York: Holt and Co., 1999)

Suzanne Anker & Dorothy Nelkin, *The Molecular Gaze* (Cold Spring Harbor, New York: Cold Spring Harbor Laboratory Press, 2004)

Rosa Beddington, *Cloning* ([www.nimr.mrc.ac.uk/MillHillEssays/1997/cloning.htm](http://www.nimr.mrc.ac.uk/MillHillEssays/1997/cloning.htm))

Ian Berry, *Paradise Now: Picturing the Genetic Revolution* (2001)

Annick Bureau, "The Ethics and Aesthetics of Biological Art", *Art Press*, 276 (2002) Paris, France

Critical Art Ensemble, *Flesh Machine* (1998) ([www.critical-art.net/books/flesh/index.html](http://www.critical-art.net/books/flesh/index.html))

Ernestine Daubner, *Manipulating Genetic Identities: The creation of Chimeras, Cyborgs, and (Cyber-) Golems, Parachute 105* (2002) Montreal, Canada

José van Dijk, *Manufacturing Babies and Public Consent. Debating the New Reproductive Technologies*. New York: New York University Press (1995)

José van Dijk, *ImagEnation. Popular Images of Genetics*. New York: New York University Press (1998)

José van Dijk, *Het Transparante Lichaam. Medische Visualisering in Media en Cultuur* (Amsterdam University Press 2001)

Eric Drexler, *Engines of creation, the coming era of nanotechnology*, (1986) Oxford University Press

Vilem Flusser, *Curie's Children*, *Art Forum* vol. 26, No. 7 (1988) and vol. 27, No. 2 (1988).

Bryan Forbes, *Stepford Wives* (film) (1975)

Francis Fukuyama, *Posthuman Society* (2002)

Donna Haraway, *Cyborg Manifesto* (1985)

Jens Hauser (ed.) *L'Art Biotech* (Le Lieu Unique, Nantes, France 2003)

Natalie Jeremijenko & Eugene Thacker, *Creative Biotechnology: A User's Manual* ([www.locusplus.org.uk/biotech\\_hobbyist.html](http://www.locusplus.org.uk/biotech_hobbyist.html))

Bill Joy, *Why the future doesn't need us*, in *Wired April 2000* ([www.wired.com/wired/archive/8.04/joy.html](http://www.wired.com/wired/archive/8.04/joy.html))

Eduardo Kac, *GPF Bunny*, in *Leonardo*, vol. 36, no. 2 (2003)

Daniel J. Kevles, *In the Name of Eugenics* (New York, Knopf 1985)

Ira Levin, *Boys from Brazil* (1978)

Ellen Levy (ed.) *Contemporary Art and the Genetic Code*, special issue of *Art Journal* vol. 55, No. 1 (Spring 1996)

Andrew Niccol, *Gattaca* (film) (1997)

Jeremy Rifkin, *The Biotech Century* (New York: Tarcher/Putnam) (1998)

Hillel Schwartz, *Culture of Copy* (1996)

Lee M. Silver, *Remaking Eden* (New York: Avon) (1997)

Peter Sloterdijk, *Der Operable Mensch, anmerkungen zur ethischen Situation der GenTechnologie* (2000)

Peter Sloterdijk, *Regeln für den Menschenpark* (1999)

Steven Spielberg, *A.I. (Artificial Intelligence)* (film) (2001)

Andreï Tarkovski, *Solaris* (film) (1972)

Tran T. Kim-Trang & Karl Mihail, *Gene Genies Worldwide*, *Leonardo*, Vol. 36, No. 1 (2003)

H.G.Wells, *The Island of Dr. Moreau* (1896)

E.O. Wilson, *Biophilia* (Cambridge, MA; Harvard Univ. Press 1984)

Stephen Wilson, *Information Arts* (MIT Press: Cambridge, Mass. and London England 2002)

Micheal Winterbottom, *Code 46* (film) (2003)

Susanne Witzgall, *Kunst nach der Wissenschaft, Zeitgenössische Kunst im Diskurs mit den Naturwissenschaften*. Nürnberg (2003)

Adam Zaretsky, *Viva Vivo! Living Art is Dead*, *Leonardo*, Vol. 37, No. 1 (2004)

# kloone4000

## links

Virgil Wong: [www.virgilwong.com](http://www.virgilwong.com)

Andrew Carnie: [www.andrewcarnie.co.uk](http://www.andrewcarnie.co.uk)

Jan Willem Wartena: [www.artxs.org](http://www.artxs.org)

Eduardo Kac: [www.ekac.org](http://www.ekac.org)

Sabrina Raaf: [www.raaf.org](http://www.raaf.org)

Amy Youngs: [ccad.osu.edu/~ayoungs](http://ccad.osu.edu/~ayoungs)

Anne Esperet: [anne.esperet.free.fr](http://anne.esperet.free.fr)

Franco Angeloni: [www.supergenetic.net](http://www.supergenetic.net)

Marco A. Morales: [www.genaid.com](http://www.genaid.com)

Margi Geerlinks: [www.margigeerlinks.com](http://www.margigeerlinks.com)

Loretta Lux: [www.lorettalux.de](http://www.lorettalux.de)

Ina Senftleben: [www.ina-senftleben.com](http://www.ina-senftleben.com)

Anthony Goicolea: [www.anthonygoicolea.com](http://www.anthonygoicolea.com)

Daniel Lee: [www.daniellee.com](http://www.daniellee.com)

Suzanne Anker: [www.geneculture.org](http://www.geneculture.org)

Ramon Verberne: [www.ramonverberne.nl](http://www.ramonverberne.nl)

Karin Bos: [www.arttrack.nl/KarinBos](http://www.arttrack.nl/KarinBos)

Red Dress: [www.reddress.nl](http://www.reddress.nl)

Cloning Agency: [www.cloningagency.com](http://www.cloningagency.com)

Ela Bauer: [www.elabauer.com](http://www.elabauer.com)

Suguru Goto: [www.suguru.goto.free.fr](http://www.suguru.goto.free.fr)

Rachel Wilberforce: [www.rachelwilberforce.com](http://www.rachelwilberforce.com)

Sonja van Kerkhoff: [www.sonjavank.com](http://www.sonjavank.com)

Voebe de Gruyter: [www.voebedegruyter.be](http://www.voebedegruyter.be)

Orlan: [www.orlan.net](http://www.orlan.net)

Stephen Wilson: [userwww.sfsu.edu/~swilson](http://userwww.sfsu.edu/~swilson)

Genomic Art: [www.genomicart.org](http://www.genomicart.org)

Asci: [www.asci.org](http://www.asci.org)

Art future: [www.artfuture.com](http://www.artfuture.com)

The Arts & Genomics Centre: [www.artsgenomics.org](http://www.artsgenomics.org)

Critical Art Ensemble: [www.critical-art.net](http://www.critical-art.net)

Experimental Interaction Unit: [www.eiu.org](http://www.eiu.org)

Arts Catalyst: [www.artscatalyst.org](http://www.artscatalyst.org)

Gene(s)is: [www.gene-sis.net](http://www.gene-sis.net)

Rhizome: [www.rhizome.org](http://www.rhizome.org)

ARS Electronica: [www.aec.at](http://www.aec.at)

Symbiotica: [www.symbiotica.uwa.edu.au](http://www.symbiotica.uwa.edu.au)

# kloone4000

## support

kloone4000 was supported by:

### Netherlands Genomics Initiative

NGI is a taskforce dedicated to strengthening genomics-based research and business in the Netherlands  
special thanks to Peter Folstar and Gijs van der Starre  
[www.genomics.nl](http://www.genomics.nl)

### Stadsdeel Amsterdam Oud Zuid

local city council Amsterdam, temporary art projects  
special thanks to Anita Frank, Lex Meijer and Stefan Vervaecke  
[www.oudzuid.amsterdam.nl](http://www.oudzuid.amsterdam.nl)

### Retort

special thanks to Lianne Sloots, Simon Oud and Ineke Heising  
[www.retortproject.nl](http://www.retortproject.nl)

### The Arts & Genomics Centre

special thanks to Helen Chandler, Robert Zwijnenberg and Miriam van Rijsingen  
[www.artsgenomics.org](http://www.artsgenomics.org)

### De Praktijk

De Praktijk is a creative office for concepts, advice and development of scientific education and communication  
special thanks to Alex Verkade  
[www.praktijk.nu](http://www.praktijk.nu)

### GeNeYouS

GeNeYouS, an initiative by young scientists, offers a platform for information exchange between scientists working in the fast evolving field of genomics  
special thanks to Terry Vrijenhoek  
[www.geneyous.nl](http://www.geneyous.nl)

### Waag Society

Waag Society is a knowledge institute operating on the cutting edge of culture and technology in relation to society, education, government and industry  
special thanks to Sam Nemeth, Floor van Spaendonck and Margreet Riphagen  
[www.waag.org](http://www.waag.org)

# kloone4000

## Retort project space



Retort is an organisation with a project space, 34 ateliers and a guest studio hosted by the Gerrit van der Veer Foundation. It is located in the stadsdeel Oud-Zuid in Amsterdam.

The project space offers artists room for collaborative projects, exchanging of ideas, discussing contemporary art and involving the public in the 'art process'. The project space serves as a workshop, platform, office and laboratory.

Retort aims to promote 'work in progress', in which multiple artists and art disciplines cooperate, stimulating interaction between the public, neighbours, the artwork and the artists. Experiments are welcomed. Artists are given the opportunity to use the project space to realize their proposal and conduct the research.

Projects in Retort often have a substantial relation to the neighbourhood and artists are encouraged to involve neighbours in the projects, actively seeking public.

Retort, Aalsmeerweg 103, 1059 AG Amsterdam  
[www.retortproject.nl](http://www.retortproject.nl)

# kloone4000

## The Arts & Genomics Centre



The Arts and Genomics Centre is part of a broad multidisciplinary research programme, jointly hosted by the Universities of Amsterdam, Leiden and Maastricht. The Centre's role is to stimulate, support and conduct artistic and scientific research into the interactions between and intersections of art and genomics.

One of the research programme's major assumptions is that artists who focus on genomics, or who incorporate its scientific results into their work, contribute to the public debate and to the dissemination of scientific knowledge in a completely different manner than is achieved by other means of debate and dissemination - and hence that the visual arts can lead to a broad cultural embedding of genomics. The centre thus organises meetings, discussions, collaborations and exchanges between artists, scientific researchers, art theorists and professionals from business and government organisations both nationally and internationally to encourage interactions between the arts and genomics research.

TAGC, postbox 94062, 1090 GB Amsterdam  
[www.artsgenomics.org](http://www.artsgenomics.org)

# kloone4000

expressions of gratitude

*Erika Biddle, Olga Ast, Silvia B., Jon Birdseye, Lorène Bourguignon, Roé Cerpac, Annemarie Estor, Lisa Holden, Shunji Hori, Martijntje Hallmann, Els van Odijk, Jennifer Canary, Caitlin Masley, Joanneke Meester, Netty van Osch, Jan Rothuizen, Rune Peitersen, Chrystl Rijkeboer, Naan Rijks, Mieke Smits, Wendela de Vries, Anoushka van Velzen, Taco Stolk, Koen Vanmechelen, Hanneke van Velzen, Bas van Vlijmen, Karl Van Welden, Pieter Reitsma, Tinca Polderman, Adam Zaretsky, Arie Altena, Toos Arends, Danielle Arets, Roel Arkesteijn, Bertus Beaumont, Johan Braeckman, Bas Defize, José van Dijk, Bart Gremmen, Ionatt Zurr, Paul Groot, Frank Grosveld, Bas Haring, Rob van Hattum, Jan Hoeijmakers, Wiel Hoekstra, Marli Huijjer, Dirk Jan Jager, Ruud Kaulingfreks, Jan C. Molenaar, Miriam van Rijsingen, Daan Roovers, Paul Slettenhaar, Marjan Slob, Anita Frank, Lex Meijer, Peter Folstar, Gijs van der Starre, Martijntje Smits, Tsjalling Swierstra, Aad Tibben, Tjeerd Tijmstra, Raoul Teulings, Cor van der Weele, Ine Gevers, Robert Zwijnenberg, Simon Oud, Ineke Heising, Lisanne Sloots, Louwrien Wijers, Floris Fojier, Remko Gouw, Alex Verkade, Terry Vrijenhoek, Roos de Jonge, Albert van der Schoot, Martin uit den Boogaard, Sam Nemeth, Floor van Spaendonck, Margreet Riphagen, Hinco Gierman, Kay Grosskop, Ingrid Leeuwangh, Jan van den Berg, Hannie van den Bergh, Martijn Gijsberti Hodenpijl, Filia den Hollander, Emiko Kato, Marianne Heselmans, Merlijn Schoonenboom, Ben van Raaij, Hans Abbing, Hans Achterhuis, Steve Kurtz, Domeniek Ruyters, Edith Doove, Els Reijnders, Tijs Goldschmidt, Frits de Waard, Freek van Duijn, Frénk van der Linden, Gary Schwartz, George van Houts, Gijs Stork, Gijs van Tuyl, Henk Oosterling, Henk Slager, Janneke Wesseling, Joke Hermsen, Christine Sluysmans, Koen Brams, Leo Delfgaauw, Lex ter Braak, Margi Geerlinks, Roos Gortzak, Arnon Grunberg, Huub Schellekens, Sjarel Ex, Theo Tegelaers, Thomas Peutz, Antoon van de Braembusche, Wim Pijbes, Wim T. Schippers, Eduardo Kac, Nina Folkersma, Ronald Plasterk, Richard de Boer, Inez de Beaufort, Frans Meulenberg, Helen Chandler, Brigitte Mulders, Macha Roesink, Antoinette Reuten, Frans Boomsma, Judith de Bruyn, Jacob Witzgenhausen, Ron Mandos, Mirjam de Winter, Robbert Dijkgraaf, Tinie Kerseboom, Oron Catts, Jasper den Hertog, Hielke Praagman, Louis Menno Kan, Sarah Meuleman, Eric de Vroedt, Petran Kockelkoren, Suzanne Anker, Susanne van Boxtel, Joleen Schipper, Hub Zwart, Lucien Hanssen, Gert van Dijk, Roel Janssen, Jan Staman, Angela van Dijk, Yoeri Albrecht, Wim van Krimpen, Dorret Boomsma, Christine Mummery, Hanne Hagenaars, Erwin van de Zande, Sanne Deurloo, Rogier Vlaming, Theo Pajmans, William de Bruijn, Adinda van 't Klooster, Grímanesa Amorós, Rachel Mayeri, Marc Adank, Susan Krause, Ximena Labra, Steven Barich, Andrew Carnie, Jan Willem*

*Wartena, Franco Angeloni, Marco A. Morales, Ramon Verberne, Karin Bos, Stefan Vervaecke, Nathan Plas, Elma van Imhoff, Coen Simon, Jenny Boulboullé, Danielle Hofmans, Stijn Huijts, Thomas Michelon, Cees de Boer, Manuela Rossini, Frans van Dam, Michael van de Meer, Jonas Sjöwall Haxø, Jens Hauser, Rommert Boonstra, Ellen de Bruijne, Johan Declercq, Marijke Cieraad, Seonghee Kim, Wim van Egmond, Debra Swack, Monika Bakke, Mark Bain, Nela Ochoa, Mark Bijl, Niels Raaijmakers, Menno Schrap, Rosi Braidotti and Annet Nienhuis*

visit the website: [www.kloone.anjeroosjen.com](http://www.kloone.anjeroosjen.com)

# kloone4000

credits

**concept/initiative/production:** Anje Roosjen  
**general support:** Lisanne Sloots, Ineke Heising, Miriam van Rijsingen, Robert Zwijnenberg, Helen Chandler  
**office assistance:** Helen Chandler (the Arts & Genomics Centre)  
**financial support kloone4000:** Stadsdeel Amsterdam Oud-Zuid, Netherlands Genomics Initiative, the Arts & Genomics Centre  
**financial support book:** the Arts & Genomics Centre  
**curator exhibition:** Anje Roosjen  
**curating advice:** Silvia B., Lisanne Sloots, Christine Sluysmans  
**graphic design:** Anje Roosjen for Showgirls International Design  
**website:** Anje Roosjen for Showgirls International Publishing  
**communication advice:** Richard de Boer  
**translations:** Anje Roosjen, Helen Chandler  
**moderators:** Danielle Arets, Marjan Slob, Raoul Teulings, Robert Zwijnenberg  
**advice debates:** Sarah Meuleman, Eric de Vroedt  
**photography:** Bas van Vlijmen, Anje Roosjen, Anoushka van Velzen  
**video:** Waag society (Sam Nemeth, Floor van Spaendonck, Margreet Riphagen)  
**audio assistance:** Louis Menno Kan, Jasper den Hertog  
**hybrid DNA isolation workshop:** Adam Zaretsky  
**hybrid DNA isolation workshops schools:** Alex Verkade (de Praktijk) (with support of Stadsdeel Amsterdam Oud-Zuid, Stefan Vervaecke)  
**kloone-geneyous discussions:** Terry Vrijenhoek, Alex Verkade, Anje Roosjen  
**laboratory tours:** Bas Defize, Jan Hoeijmakers, Koos Jaspers  
**catering assistance:** Wendela de Vries  
**technical assistance:** Simon Oud, Silvia B.