Strebe, Diemut. "A House That Catches No Shadows." *Zapp Urbansim Review* (Issue 29).

A House That Catches No Shadows

Project by Diemut Strebe

In "A House That Catches No Shadows" we build a 3D architectural (with a scale of 1:100 / 16x16x12cm) model of the famous building designed by the Austrian philosopher Ludwig Wittgenstein who constructed the villa together with the Austrian architect Paul Engelmann for his sister Margaret Stonborough-Wittgenstein in Vienna.

The model is entirely covered with grown carbon nanotubes, tiny cylinders which are made entirely out of carbon atoms that will grow on a catalyst that is attached to a carrier material. The tubes absorb 99.965% of the light. Almost no photon can escape from the grown forest grid of the 1mm high grown tubes, 50 to 200 nanometers in diameter, each tube is 10,000 times thinner than a strand of human hair.

Crucially, this material is of very low-density: it's 99 % empty space. That way, when light hits the material, there's almost nothing to reflect off of. The photons, particles of light enter and become trapped in the nanotube forest, bouncing around until they dissipate as heat.

This way the coverage removes all shapes, perspectives and traceable surface features of plasticity by erasing any shadows. In his notorious "Tractatus" - Wittgenstein tried "to draw a limit to thought" - limitations about what we are able to speak in a meaningful way. He phrased it, "in order to draw a limit to thinking we should have to be able to think both sides of this limit (i.e. we should have to be able to think what cannot be thought)."

In this early work Wittgenstein did not deny the importance of aesthetics or aesthetical problems, he places it beyond the border where we can speak meaningfully. In simple words: We can obviously hear and perfectly distinguish the sound of a clarinet, but we have great problems, to actually say this very sound.

We feel that even when all possible scientific questions have been answered, the problems of life remain completely untouched. Of course there are then no questions left, and this itself is the answer. "Tractatus" 6.52 . An architectural model usually is built to give full overview about a building's structure, to manifest all sculptural qualities up to exact details at a smaller scale.

An architectural model that is actually hiding its plasticity and three-dimensionality can be seen as a quite adequate analog on ideas about limitations of thought. A sculpture that undermines or erodes its own visibility can represent the ambivalence, the conflicting nature of these thoughts. We are curious, how it will look like, as well: a house that casts and catches no shadows.

In November, 1925, Mrs. Stonborough-Wittgenstein commissioned Engelmann and her brother to design and build a large townhouse. The Wittgenstein House was built in what was then Kundmanngasse 19, now Parkgasse 18, Vienna. It consists essentially of three rectangular blocks.

Wittgenstein spent obsessive effort on details and mathematical ratios to solve symmetrical problems and problems of proportion which stretched the collaboration in all respects to its ultimate philosophical and formal limits. The house was finished by December 1928. This new project-in-progress acts as a statement against the claim of a British artist Anish Kapoor to try to monopolize this material of carbon nanotubes for his own use.

It is unacceptable that any artist tries to achieve exclusive availability for a material in artworks, by simply buying the rights for it. We use a slightly different percentage of carbon nanotubes, not traceable to the human eye - that can be used by any artist on any work.

Staff. “The Strange Story Of The First Quantum Art Exhibition in Space”. *Medium*. January 13, 2015. https://medium.com/the-physics-arxiv-blog/the-strange-story-of-the-first-quantum-art-exhibition-in-space-8504b2dca63d

ESA astronaut Samantha Cristoforetti, the first female Italian astronaut, carries one of 2 miniature telescopes on Expedition 42/43. Credit: Diemut Strebe

The Strange Story Of The First Quantum Art Exhibition in Space

How NASA, ESA and MIT joined forces with a Dutch artist to create a bizarre work of art using the International Space Station, the James Webb Telescope and the Universe itself.

When Samantha Cristoforetti blasted towards the International Space Station in November last year, she became first female Italian astronaut and something of a celebrity at the European Space Agency. Given the unusual cargo she was carrying, that fame could soon spread.

Among her possessions, was a tiny telescope just 4 centimetres long and 1 centimetre in diameter, attached to an unpowered CCD array from a smartphone camera.

The telescope is part of an art project designed by the Dutch artist Diemut Strebe in which he invokes quantum mechanics to generate all of the art ever made. In space.

At the same time, Strebe has made a second miniature telescope with a powered CCD array which people can interact with on Earth. Strebe's idea is that the two telescopes can become quantum mechanically correlated so that an individual interacting with the earthbound telescope can influence the orbiting one.

Today, Seth Lloyd at the Massachusetts Institute of Technology in Cambridge describes the quantum mechanics behind the art in an attempt to provide a scientific basis for the work.

The work in question is called "Wigner's friends" after a thought experiment developed by the Hungarian theoretical physicist Eugene Wigner. This thought experiment is an extension of the Schrodinger's cat paradox in which a cat is placed in a box with a vial of poison that is released when a radioactive particle decays.

The decay is a quantum process that, in the absence of a measurement, exists in a superposition of states. In other words, the atom can be both decayed and undecayed the same time. The paradox arises when considering the cat, which must also be in a superposition of states and so both alive and dead same time.

Wigner's extension was to imagine a friend who carries out the Schrodinger's cat experiment after he had left the laboratory. When Wigner returns, he discovers the result but the question he raised was this. When was the result of the experiment determined— when he discovered the result or at some earlier point?

The key point that Wigner's friend experiment raises is that consciousness seems necessary to determine the result of a quantum mechanical measurement process. Without consciousness, all the elements of the experiment remain in a superposition of all possible states.

Strebe uses Wigner's thought experiment to suggest that until it is observed, the CCD array in the telescope exists in a quantum superposition of all possible images, including every piece of art ever made.

Is this a reasonable assumption? According to Lloyd, it is. He imagines the CCD array in the Earth's shadow cooled to a temperature of around three degrees Kelvin, the temperature of the cosmic microwave background radiation. This radiation causes the elements of the CCD array to undergo energy fluctuations. "It seems not unreasonable to refer to this fluctuating array as containing all possible images in quantum superposition," says Lloyd.

The CCD array should remain in this quantum superposition of all possible images as long as there is nobody around to observe it. In other words, as long as Wigner has no friends in space.

That introduces the question of the second telescope, which is powered and pointed at the sky. Strebe's second idea is that both telescopes can become correlated in some quantum mechanical way. This again raises the question of whether this is a reasonable assumption.

According to Lloyd, the justification comes from a phenomenon known as the Hanbury Brown and Twiss effect. This was first observed in the 1950s when astronomers collected light from the star Sirius using two photomultiplier tubes about six metres apart. To the surprise of many physicists, the team discovered a correlation between the two light signals which was eventually explained by the wavelike nature of light that allowed it to enter both photomultipliers at the same time.

Lloyd points out that the same effect could also be at work with the two telescopes made by Strebe— that the photons entering one may be correlated with the photons entering the other. And when this happens, a person interacting with the telescope on Earth must have a small but nonzero influence on the telescope in space, a la Einstein's "spooky action at a distance."

Just how this affects the extraterrestrial display of art, is not clear. But the point is that it *can* somehow influence it, or so Lloyd would have us believe.

That's a curious scientific justification for a rather bizarre work of art. Lloyd's approach is clearly generous. When probabilistic arguments are applied in this way, they can be used to justify almost anything. For example, you could die this afternoon because all the oxygen molecules in your room could end up in the wastepaper basket. Or dropping a pencil could set in train a sequence of events that triggers World War III.

These arguments rely on the notion that although the events are highly unlikely, they are possible and so must be taken seriously.

Experts in risk analysis have a straightforward way of dealing with this. They point out that in the absence of a reasonable mechanism, NOT dropping a pencil is just as likely to trigger World War III as dropping it. So the need to worry about this eventuality effectively cancels out.

Perhaps the same argument should also apply to Strebe's art. Could the work be just as good if not observed (or not created in the first place)?

According to Lloyd, Strebe's plan is to organise various "exhibitions" on Earth and then to launch the second telescope into space on NASA's James Webb Telescope. (Whatever your opinion of the art, it's hard not to admire Strebe's powers of persuasion, having co-opted NASA, ESA and MIT in the project.)

Lloyd ends his paper with the following: "The science on which the artwork is based seems to fall within the bounds of artistic license," a statement clearly delivered with a twinkle in the eye and perhaps with tongue placed firmly in cheek.

Ref: arxiv.org/abs/1501.01610 : Analysis Of A Work Of Quantum Art

Tayag, Yasmin. “Does This Genetic Replica of Van Gogh’s Ear Still Belong To The Artist?” *Inverse*. November 20, 2015. https://www.inverse.com/article/8375-does-this-genetic-replica-of-van-gogh-s-ear-still-belong-to-the-artist

Does This Genetic Replica of Van Gogh's Ear Still Belong To The Artist?

Artist Diemut Strebe grew the legendary painter's ear from his and (his great great great nephew's) DNA. Who does the thing belong to?

Yasmin Tayag November 20, 2015

Vincent van Gogh, legendary cartilage-discarder, lives on today through his art and, now, through a genetic replica of his ear created from his DNA. It’s the creation of artist Diemut Strebe, who named it “Sugababe” and invites viewers to whisper sweet nothings into it. Noam Chomsky was the first to do so and thousands of guests from Karlsruhe to New York have followed suit. Strebe hopes guests will walk away from these one-sided conversations with this question in mind: Who the hell did I just talk to?

The ear is made from mitochondrial DNA extracted from a stamp van Gogh allegedly licked in 1883 and cartilage cells from Lieuwe van Gogh, the great-great-grandson of the artist’s brother Theo. The final product is a multi-generational cellular and genomic collage, yet guests seem to dismiss the junior van Gogh’s contribution as mere scaffolding for what *really* matters: the artist’s DNA. Linking DNA with the idea of a single human identity makes sense for now, says Strebe, but as genetic engineering makes it possible to cobble together a genome from multiple DNA sources, the link will only become more tenuous.

Conceptually, Strebe’s work is a CRISPR-age reframing of Theseus’ paradox, a 1st-century mindfuck posed by the Greek thinker Plutarch: If you replace all of a ship’s planks, piece by piece, over time, is it still the same ship? Is Van Gogh the artist really just cartilage and DNA just waiting to be Frankensteined into re-existence, or did his identity die with his body in the Auberge Ravoux?

van Gogh, Self-Portrait with Bandaged Ear

“It’s the *principle* of the scientific procedure that I was interested in,” she told *Inverse*, admitting that the stamp DNA was “probably the postman’s.” For Strebe, who the DNA actually belongs to doesn’t really matter. What matters is who we *think* it belongs to — that is, if it belongs to anyone.

Luckily for Strebe, the younger van Gogh had made the mental leap necessary for her project to work. He wasn’t offended by the fact that she only sought him out because he carries one-sixteenth of his famous relative’s DNA because he didn’t think her project violated anyone’s identity. “I don’t really think I should have a special right over his DNA,” he told *Inverse*. In his eyes, DNA is an integral part — but not the defining characteristic of — personhood.

Lieuwe van Gogh, Self Portrait

Not everyone has such an easy time divorcing identity from genomic data. Other members of his family, he admitted, had “more conservative” views and were unwilling to support the project. Strebe’s encounters with van Goghs who found her work too intrusive and “creepy” just served to strengthen her resolve to ask the questions they were unwilling to consider. “People have to realize where we are headed and which things we are navigating around,” she says.

In Strebe’s world, gene editing is already a given and bioengineering is standard practice. Avoiding the hard questions is simply procrastination. She’s here to save us time. “What’s been acceptable over the course of time changes,” she says. “We have to move the reference frame forward.”

Photos via Diemut Strebe

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Yasmin Tayag is a writer and former biologist living in New York City. A Toronto girl at heart, her writing also appears in The Last Magazine and SciArt in America, and you might recognize her as a former host of Scientific American's YouTube series Instant Egghead.

Storrs, Carina. “Art imitates life: Artist bioengineers replica of Van Gogh’s ear.” *CNN.* November 13, 2015. http://www.cnn.com/2015/11/13/health/van-gogh-ear-art-science/

Art imitates life: Artist bioengineers replica of Van Gogh's ear

By Carina Storrs, Special to CNN
Updated 11:24 AM ET, Fri November 13, 2015

Story highlights

- Using the science of tissue engineering, an artist created a replica of Vincent van Gogh's
- The science behind the art could give researchers a new platform to study certain diseases

(CNN) Tissue engineering has given us some important medical and scientific advances: Layers of skin grown in the lab can be grafted onto wounds to help burn victims heal. Researchers are developing artificial lungs and livers that may one day be transplanted into patients.

But can tissue engineering also give us a new medium for art? It can for Diemut Strebe, a Boston-based artist who created a replica of Vincent van Gogh's famously amputated ear that is about as close to the real thing as you can get. The artistic experiment may even lead to new advances in the world of science.

Strebe persuaded Lieuwe van Gogh, the great-great-grandson of Vincent's brother, to donate a chunk of the inside of his ear for the project. (Although it did not take much convincing because, according to Strebe, "he loved the project right away.") Then she worked with a "who's who" of engineers and scientists to grow Lieuwe's ear cells on a polymer-based scaffold that approximated the shape of Vincent's ear, based on the only known photograph of the artist showing the body part that was famously removed.

The result is a piece named "Sugababe," currently on display at the Ronald Feldman Fine Arts Gallery in New York City, in a show of Strebe's work. The ear, which an art writer called "creepy" and Stephen Colbert called "the craziest (explicative) thing," made its debut last year at a museum in Karlsruhe, Germany. It gets is name in part because of the sugar-white color of the ear.

"I was looking for a more challenging, inspiring method to create contemporary art," said Strebe, a mother of five who started her art career only several years ago.

Strebe's artistic experiment with the ear began in 2010 but it was inspired by a thought experiment dating back to ancient Greece, called Theseus' paradox. It asks whether an object that has had all of its parts replaced is still the same object. Scientific methods gave Strebe the means to explore this question with "maybe the most famous romantic and stereotypical image of the artist as a genius," Strebe said.

"(In general), science and art go very well together," she said. "The Renaissance (period) showed that. Science can produce mediums for art, and perhaps art can give back to science."

Can science imitate art?

Strebe and her scientist collaborations are trying to create a new version of the ear that would be even more genetically related to the van Gogh original. But in order to do so, they are developing a new technology that would open the door to study a whole group of human diseases.

Although most of the genetic material in the cells that make up "Sugababe" is related to Vincent's, the exception is the mitochondrial DNA, which is sort of an auxiliary set of genes that help cells generate energy. Lieuwe van Gogh has different mitochondrial DNA because he descended from a woman unrelated to van Gogh (and Vincent's brother), and mitochondrial DNA is inherited exclusively through the mother.

To find related mitochondrial DNA, Strebe tracked down a descendent of Vincent's sister and got another van Gogh family biological sample. Unlike Lieuwe, this descendent did not have to follow in her great-great-great uncle's footsteps and cut off some ear; mitochondrial DNA can be extracted from cells in the saliva.

Now comes the hard part. Strebe turned to Jef Boeke, director of the Institute for Systems Genetics at NYU Langone Medical Center, and his research lab. The scientists are cloning the mitochondrial DNA of Vincent's sister's descendant, and then they will attempt to replace the mitochondrial DNA in Lieuwe's cells with that of the other donor.

No research group has ever convincingly managed to deliver cloned mitochondrial DNA into cells, Boeke said. Although it is fun to be part of a cool art project, figuring this out has important medical applications, and is "absolutely the reason we are involved with this," he added.

The ability to introduce cloned mitochondrial DNA into cells would give researchers a new platform to study mitochondrial diseases, which affect about one in 5,000 people, Boeke said. Researchers could mutate the cloned DNA and see how it affects cells growing in the lab. They could tease apart the cellular processes that go awry in diseases such as Leber hereditary optic neuropathy, which causes vision loss; and MERRF Syndrome (myoclonic epilepsy with ragged-red fibers), which causes seizures and muscle dysfunction.

More than just a cool "creepy" art piece

The principles that Strebe used to create "Sugababe" are the same ones scientists have been developing for the past several decades to make all matters of organs, including a U.S. Army-funded project to engineer ears for wounded soldiers, said Robert Langer, a professor of chemical engineering at Massachusetts Institute of Technology.

But that's not to say that the making of "Sugababe" does not make a contribution to the field of tissue engineering. "Anytime anybody does anything in an area like this, I think it advances it. You learn something...every scaffold that you make is kind of different," said Langer, who consulted with Strebe on her project.

Strebe also worked with an auditory scientist to give "Sugababe" a hearing component. Although the ear itself does not hear -- as Strebe put it, "the ear is missing Vincent to make that work" -- the piece does have a microphone that visitors can speak into. Then a computer program processes the sound into a series of static bursts, which mimic how the brain perceives sounds. The bursts play back through a speaker for visitors to hear.

Although the ear itself probably does not help advance auditory science, it would be nice if it helped visitors get a better sense of how the brain interprets sound, said Peter Cariani, a senior research scientist at the Hearing Research Center at Boston University. Cariani built the sound system for "Sugababe."

For Strebe's part, she hopes visitors to the ear will not simply write it off as "creepy."

"These images are very important documents of our time and that try to capture our time," Strebe said.

Osberg, Molly. “Diemut Strebe’s Technologically Advanced Thought Experiments.” *Artsy*. December 8, 2015. https://www.artsy.net/article/artsy-editorial-diemut-strebe-s-technologically-advanced-thought-experiments

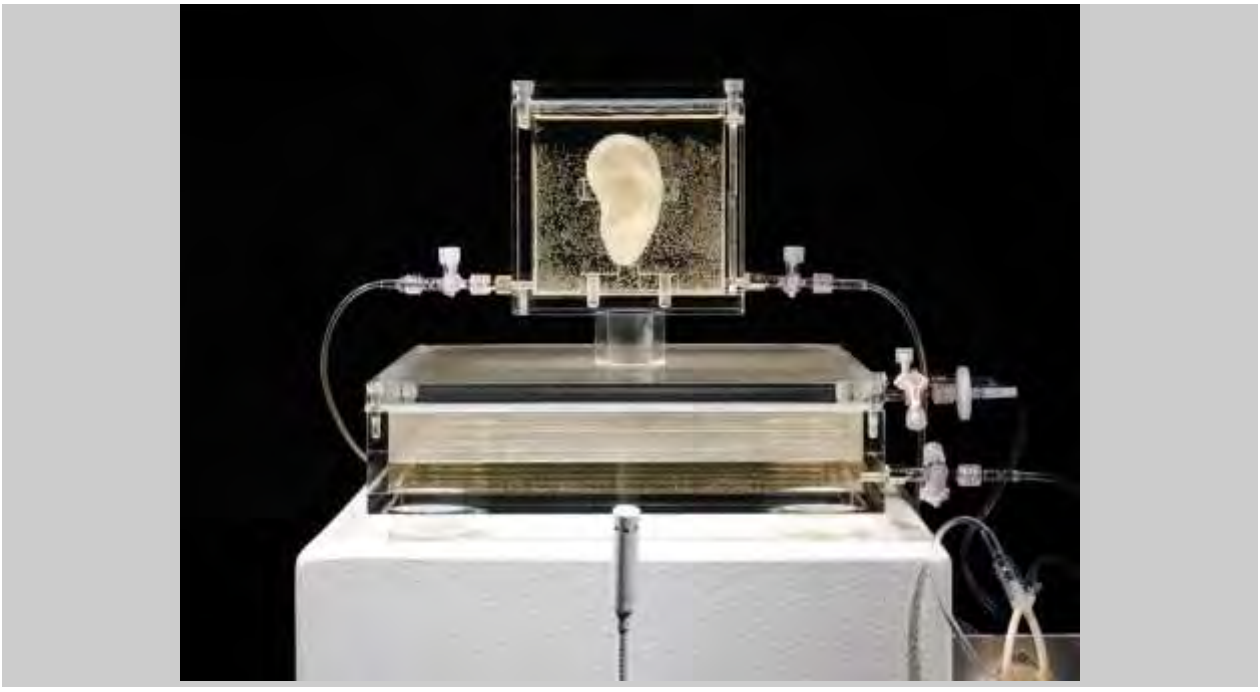
Diemut Strebe’s Technologically Advanced Thought Experiments

ARTSY EDITORIAL

BY MOLLY OSBERG

DEC 8TH, 2015 6:45 PM

The Ship of Theseus—an ancient thought experiment otherwise known as the Theseus paradox—was first recorded by Plutarch in the late first century. The intellectual puzzle asks whether an object, in this case a ship, is fundamentally the same if every one of its parts is replaced. This past month, the Dutch artist Diemut Strebe brought her fantastic and complicated exploration of the Theseus paradox, along with other high-concept works, to Ronald Feldman Fine Arts in “Free Radicals: Sugababe, and Other Works.”



Diemut Strebe
Sugababe, 2014
Ronald Feldman Fine Arts

The show featured Strebe's best-known work, *Sugababe* (2014), an intriguing living recreation of legendary artist Vincent van Gogh's ear, which he famously cut off—or lost in a fight, according to some historians. To create it, the artist consulted numerous scientists, initially working from mitochondrial DNA extracted and sequenced from an archival envelope from the Custodia Foundation in Paris, and later using samples from the great-great grandson of Van Gogh's brother, who donated a piece of tissue. Having tracked down a rare image of Van Gogh's right ear, Strebe created a model and 3D-printed a scaffolding onto which tissue was grown in a bioreactor over the course of a year. The full-grown ear is housed in a chamber that supplies it with nutrients and oxygen. A microphone, attached to computerized sensors, sends electrical pulses to the ear to simulate the sensation of hearing.

Diemut Strebe
Man-Made Range, 2014
Ronald Feldman Fine Arts

Strebe has said she is interested in bringing cutting-edge technologies like these to the art world "because science has so much creativity and inspiring processes, which I love to involve in my work." Some of her other works bring together literary devices with novel scientific processes. For *The Scent of Joseph Beuys* (2015), a tribute to the Beuys's seminal 1974 performance *I Like*

America and America Likes Me—in which Beuys lived for three days with a wild coyote in a New York gallery for eight hours a day—Strebe collaborated with perfume scientists to recreate the scent of "Gallery," as well as "Felt" and "Wall Street Journals"—two materials he used in his performance. The scents were modeled partially on data taken from olfactory molecules.

Diemut Strebe
Le Scale della Divina Commedia (from Wigner's Friends), 2015
Ronald Feldman Fine Arts

In another quite complicated piece, *Wigner's Friends* (2014-15), Strebe collaborated with MIT, NASA/ESA. The piece is named after a quantum science thought experiment that evolved out of the famous Schrödinger's Cat conundrum. Here, Stebe plays with notions of quantum correlation and quantum measurement. She placed one tiny telescope on Earth and gave another to an astronaut to take up to space. The telescopes were quantum mechanically correlated to show images of "all the art ever made" it its digital display. Documentation from that experiment, including 3D printed PVP models of the concepts invoked, are on display at the gallery.

—Molly Osberg

"Free Radicals: Sugababe and Other Works" was shown at Ronald Feldman Fine Arts, New York, Nov. 7–Dec. 5, 2015.

Cascone, Sarah. “A Living Copy of Vincent van Gogh’s Ear Makes Its New York Debut.” *artnet news*. November 9, 2015. https://news.artnet.com/art-world/vincent-van-gogh-ear-replica-358550

ART WORLD

A Living Copy of Vincent van Gogh's Ear Makes Its New York Debut

Sarah Cascone, Monday, November 9, 2015

Diemut Strebe, *Sugababe* (2014). A living bioengineered replica of Vincent van Gogh's ear, grown from tissue engineered cartilage cells procured from a direct male descendant.
Photo: Courtesy of Ronald Feldman Fine Arts.

A little piece of a long-dead artist is coming back to life in New York this fall when Diemut Strebe's creepy living copy of Vincent van Gogh's ear makes its New York debut at Ronald Feldman Fine Arts.

Titled *Sugababe*, the ear was created using genetic samples Strebe collected from Lieuwe van Gogh, the great-great-grandson of Theo van Gogh, the Post-Impressionist artist's brother. Strebe used computer imaging technology to recreate the ear's shape based on its appearance in van Gogh's self-portraits, and a computer processor the simulates nerve pulses allegedly allows the ear to hear.

Though *Sugababe* is admittedly macabre, visitors at the original exhibition at the Centre for Art and Media in Karlsruhe, Germany, "loved the ear," Strebe insisted in an e-mail to artnet News.

Vincent van Gogh, *Self-Portrait with Bandaged Ear* (1889).
Image: Courtesy of Wikipedia.

"I'm not sure that everyone understands the full scientific and biological implications," the artist writes. "The scientific approach is based on the Theseus's paradox by Plutarch... He asked if a ship would be the same ship if all its parts were replaced. This paradox is brought into a 21st-century context by using a living cell line (from Lieuwe van Gogh) in which we replaced (at least as a proof of principle) his natural DNA with historical and synthesized DNA."

Perhaps the most famous detached body part in all of art history, van Gogh allegedly cut off his ear when he had a mental breakdown, although some German historians now think Paul Gauguin may have cut off van Gogh's ear with a rapier following a heated argument between the two artists, according to the book *Van Goghs Ohr: Paul Gauguin und der Pakt des Schweigens* (Van Gogh's Ear: Paul Gauguin and the Pact of Silence). Though the ear has been recreated, scientists haven't been able to slow the fading of van Gogh's paintings.

Joseph Beuys, *I Like America and America Likes Me* (1974).
Image: Courtesy of e-flux.com.

The scientifically-minded show also includes *Social Sculpture: The Scent of Joseph Beuys*, a scent-based piece inspired by the German Fluxus artist's 1974 performance at René Block's gallery in New York titled, *I Like America and America Likes Me*. With the help of International Flavors & Fragrances Inc., Strebe has reduced Beuys's original work into seven scents, like "gallery" and "coyote," which are meant to evoke Beuys's experience living for a week with a wild coyote in the gallery space.

Diemut Strebe's "Free Radicals: Sugababe & Other Works" is on view at Ronald Feldman Fine Arts, 31 Mercer Street, New York, November 7–December 5, 2015.

ARCHITECTURAL DIGEST

Mafi, Nick. “New Yorkers Can Find Out What Vincent van Gogh’s Severed Ear Actually Looked Like.” *Architectural Digest.* November 11, 2015. http://www.architecturaldigest.com/story/vincent-van-gogh-ear-diemut-strebe-ronald-feldman-fine-arts-new-york-city

New Yorkers Can Find Out What Vincent van Gogh’s Severed Ear Actually Looked Like

A German scientist used a tissue sample from one of Van Gogh’s living descendants to generate a replica of the 19th-century painter’s ear

Posted November 11, 2015

Sugababe (2014) by Diemut Strebe. The ear is enclosed in a plasma acrylic container.

TEXT BY
NICK MAFI
PHOTOGRAPHY BY
RONALD FELDMAN FINE ARTS, NEW YORK

In late December of 1888, police officers rushed into a yellow house in Arles, France, to find a semiconscious Dutch painter lying in bed, a bandage fixed around his head where blood ran from one side. Although no one knows exactly why the

most famous artist of the 19th century cut off his left ear—popular belief is that he did it in a fit of rage, handing the ear to his favorite prostitute, while recent evidence suggests that artist Paul Gauguin sliced it off during a drunken dispute—the story of Van Gogh's ear continues to fascinate art lovers. So much so that in 2014, German-born artist and scientist Diemut Strebe created a replica of Van Gogh's ear using genetically engineered cartilage.

Earlier this week, the infamous missing ear was resurrected—sort of—at the Ronald Feldman Fine Arts in New York City. *Architectural Digest* sat down with Strebe to ask her about her fascination with Van Gogh, the science behind the ear, and how Van Gogh's living descendants reacted to the project.

Architectural Digest: What led you to re-create Van Gogh's ear?

Diemut Strebe: I started as an artist, and Van Gogh was among my biggest inspirations. His vision, his brushstrokes, his colors—I couldn't get enough. But over time I began to fall in love with science, too. I had the idea to merge my two passions in forming a new approach to the craft. This is what led me to use science and technology as a tool to create, or re-create, art.

AD: Can you walk us through the process?

DS: The plan from the beginning was to use tissue samples and genetic engineering to clone Van Gogh's original ear. I did this with the generous help of Lieuwe van Gogh [the great-great-grandson of Vincent's brother Theo], who provided two samples of his own ear cartilage, which gave us the Y chromosome. From there we obtained saliva samplings from another Van Gogh descendant, Rosine Weenink. And finally, we used historical DNA from an original stamped letter sent from Vincent van Gogh to Joseph Roulin [coincidentally around the time of the ear-cutting incident].

AD: Was Van Gogh's family receptive to the idea?

DS: The Van Gogh family now takes on two very different roles. On one end, you have the artists who are very creative and were eager to help with my project [Lieuwe van Gogh is an artist]. On the other side, there are those who handle the administrative duties of Van Gogh's brand. This part of the family wasn't nearly as receptive to the idea of creating a replica of Vincent's missing ear. It was very interesting to witness this division. I suppose ears don't continue to haunt without reason.

"Free Radicals: Sugababe & Other Works" is on view through December 5 at Ronald Feldman Fine Arts, 31 Mercer Street, New York; feldmangallery.com

Solon, Olivia. “Living Sculpture of Van Gogh’s Ear Grown Using Relative’s Cells.” *Wired*, June 4, 2014. http://www.wired.co.uk/news/archive/2014-06/04/van-gogh-ear-bioart

Living sculpture of Van Gogh's ear grown using relative's cells

04 JUNE 14 by OLIVIA SOLON

A bioartist has 'grown' a living replica of Vincent Van Gogh's ear using cells taken from a living relative of the Dutch painter. The piece -- called *Sugababe* -- is on show at The Centre for Art and Media in Karlsruhe.

Diemut Strebe worked with a range of scientist including 'ear mouse' creator Charles Vacanti to develop the living replica. The first challenge was to find genetic material. She scoured collections for some original genetic material from the artist, examining a hair and other artefacts before gaining access to an envelope owned by the Custodia Foundation in Paris. This envelope was used by Van Gogh in 1883, and samples of biological material were extracted from the back of the stamp in September 2012, with mitochondrial DNA extracted and sequenced by Strebe, but it couldn't be verified.

Sugababe*Diemut Strebe*

At the same time, Strebe approached the great-great-grandson of Vincent Van Gogh's brother Theo -- Lieuwe van Gogh, who shares a sixteenth of the Dutch artist's genome. Also an artist, Lieuwe was intrigued by the project, and willingly donated a tissue sample (cartilage) -- taken by a "great plastic surgeon" -- taken from behind his ear. "He liked the idea right away so it wasn't hard to convince him," Strebe told Wired.co.uk.

The envelope-extracted mitochondrial DNA (used merely for symbolic purpose in the artwork) was attached to entirely synthetic segments of DNA that produce a fluorescent protein and then introduced to the donated living cells. The cells were grown on a scaffold in the shape of an ear.

The scaffold was made to match Vincent Van Gogh's ear as accurately as possible. Strebe first of all found a rare photograph of the artist's right ear (only one is known to exist) and created an accurate 3D model. This was 3D printed, a mould was then created, before that mould was filled with a degradable polymer that would act as a scaffold for the cells.

The scaffold and the cells were placed into a bioreactor and grown over the course of a year in a nutrient rich gel that is filtered and kept continually supplied with oxygen. Over that time, the scaffold has dissolved, leaving a fleshy sculpture behind.

"The bioreactor is like a human body," explains Strebe, "the acrylic is like skin, the nutrition is like plasma. We filter the air coming in through an oxygen exchange chamber."

Strebe told Wired.co.uk that she was inspired by Theseus's paradox, a thought experiment that asks whether an object which has had all of its constituent parts replaced remains the same object. In Theseus's case it related to a ship that had all of the wood replaced, but it equally applies to living organisms made up of evolving masses of cells with much shorter lifecycles than the body they are a part of.
The biggest challenge for Strebe was "working from historical DNA". "I would have hoped to have found more letters from Vincent to research in order to get better genetic material," she said.

She added that she was excited to be exhibiting such a scientific piece in an art context, "because science has so much creativity and inspiring processes which I love to involve in my work".

In the museum, the ear is presented on a stand along with a microphone. Visitors can "speak to" the ear through the microphone and the sound "as perceived by the ear" is rendered audible through a sound installation. Noam Chomsky -- someone Strebe corresponds with -- flew over for the opening and was the first person to speak to the ear.

THE WALL STREET JOURNAL.

Umlauf, Taylor. “Vincent van Gogh’s 3-D Printed Ear on Display”. *The Wall Street Journal*. June 4, 2015. http://blogs.wsj.com/photojournal/2014/06/04/vincent-van-goghs-3-d-printed-ear-on-display/

Vincent van Gogh’s 3-D Printed Ear on Display

By TAYLOR UMLAUF

12:00 pm ET
Jun 4, 2014

A replica of Vincent van Gogh’s severed ear is on display at The Center for Art and Media in Karlsruhe, Germany, Wednesday, as part of the exhibition “Sugababe” by Diemut Strebe. Thomas Kienzle/Agence France-Presse/Getty Images

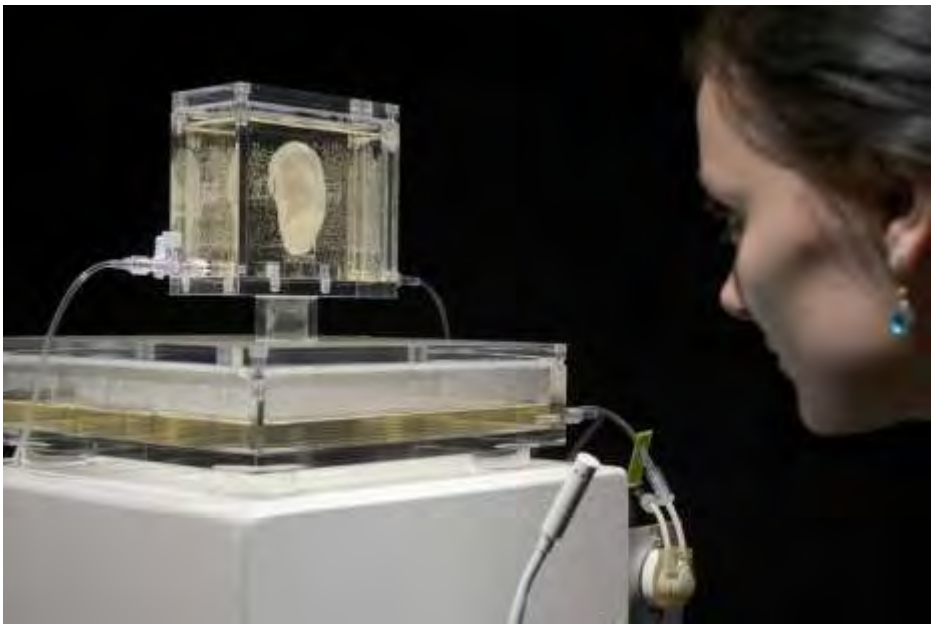
A living replica of the ear Vincent van Gogh is said to have cut off during a psychotic episode in 1888 is now **on display** at a museum in Germany.

Artist Diemut Strebe used cells from Lieuwe van Gogh, the great-great-grandson of Vincent’s brother Theo, to grow the ear and a 3-D printer to shape it. The artist said the ear, which was grown at Boston’s Brigham and Women’s Hospital, is being kept alive inside a case containing a nourishing liquid and could theoretically last for years. The ear is identical in shape to van Gogh’s ear, according to the museum.

Lieuwe and Vincent van Gogh share about one sixteenth of the same genes, including the Y-chromosome that is passed down the male lineage. Work is underway with a female relative to include mitochondrial DNA — passed down the mother’s line — for future installations, according to the Associated Press.

Visitors to the museum can speak into the ear through a microphone. The sound is processed by software that simulates nerve impulses to produce a crackling sound.

The exhibition runs through July 6 at **The Center for Art and Media** in Karlsruhe, Germany. The artist plans to display the ear in New York next year.



A woman uses a microphone to speak to the ear. Thomas Kienzle/Agence France-Presse/Getty Images

A close-up view. Thomas Kienzle/Agence France-Presse/Getty Images

Van Gogh painted this work entitled “Self-Portrait with Bandaged Ear,” in 1889 after severing his ear. Everett Collection

The New York Times

Holcomb-Holland, Lori. "An Unusual van Gogh Work at a German Museum – His Ear." *The New York Times*, June 4, 2014. http://artsbeat.blogs.nytimes.com/2014/06/04/a-rather-unusual-van-gogh-work-at-a-german-museum/?_php=true&_type=blogs&_r=0

ArtsBeat The Culture at Large

An Unusual van Gogh Work at a German Museum – His Ear

By LORI HOLCOMB-HOLLAND

JUNE 4, 2014 12:46 PM

Diemut Strebe, via Associated Press

The ear is on display in Karlsruhe, Germany.

A replica of Vincent van Gogh's left ear — you know, *the* ear — is on display at a German museum, with plans to eventually bring it to New York.

Created using 3D printers and genetic material from a living relative of van Gogh, it was shaped to be the exact size of the Dutch painter's ear and is kept alive in a nourishing liquid.

It is the first major work from the German-born artist Diemut Strebe, who is based in Boston. Ms. Strebe, 47, said in a telephone interview on Wednesday that she had spent three years working with a

team of scientists to regrow the ear that van Gogh is said to have cut off in 1888. It was produced partly by using DNA from Lieuwe van Gogh, the great-great-grandson of van Gogh's brother, Theo, who shares the Y chromosome and one-sixteenth of the painter's genome.

The exhibition, titled "Sugababe," is on display at Center for Art and Media in Karlsruhe through July 6. Equipped with a microphone, visitors are offered a chance to speak into the ear and hear their words through a sound installation as the ear perceives them.

Ms. Strebe is represented by the SoHo gallery Ronald Feldman Fine Arts, which plans to display the ear sometime before April.

THE HUFFINGTON POST

Brooks, Katherine. “This Is A Replica of Vincent Van Gogh’s Ear, Grown Using Real Genetic Material.” *The Huffington Post*, June 4, 2014. http://www.huffingtonpost.com/2014/06/04/van-gogh-ear_n_5445222.html?utm_hp_ref=arts

This Is A Replica Of Vincent Van Gogh's Ear, Grown Using Real Genetic Material

The Huffington Post | By Katherine Brooks

Vincent van Gogh is known for many things. His monstrously famous "Starry Night" painting, his love of wilting sunflowers, his obsession with self-portraits, his paintings' record-breaking sales at auctions after his death. And -- who could forget? -- that time he allegedly sliced his own ear off with a razor.

So the story goes, Vincent cut off his own ear in 1888 following a confrontation with artist-friend Paul Gauguin, a bloody scene that ended in Vincent's hospitalization. The tale of mutilation has gone down in history as evidence of the late painter's serious mental illness, as well as fodder for mythologizing the mysterious life of an art world legend.

Well over 100 years after his death, art admirers and history nerds are still fascinated with Vincent's severed body part. Case in point: artist Diemut Strebe and her artificially engendered replica of that notorious left ear:

(AP Photo/Diemut Strebe.Sugababe)

Strebe used living cells "grown" from genetic samples provided by one of Vincent's distant relatives -- Lieuwe van Gogh, the great-great-grandson of the artist's brother Theo, the Associated Press reports. On view at the Centre for Art and Media in Karlsruhe, Germany, the 3D-printed oddity was grown at Boston's Brigham and Women's Hospital and shaped to resemble Vincent's actual ear.

It sits in a case of liquid for preservation purposes, but that doesn't the stop the ear from "hearing" viewers around it. "You can talk to the ear," the exhibition description states. "The input sound is processed by a computer using software that converts it to simulate nerve impulses in real time. The speaker remains in soliloquy. The crackling sound that is produced is used to outline absence instead of presence."

The spooky project was originally based on DNA plucked from an envelope thought to be licked by the Post-Impressionist master. But "the postman messed it up," Strebe explained to AP, so the floating ear consists of only 1/16 Vincent's genetic material. Strebe hopes to obtain mitochondrial DNA from a female relative for future installations (get excited for 2015, New York!).

Vincent van Gogh's 1889 self-portrait with bandage (Photo by Universal History Archive/Getty Images)

The strange and slightly macabre Vincent van Vogh tribute, on view in Germany until July 6, is a perfect reflection of contemporary culture's sensational fascination with famous figures... even deceased ones. Still, there's something spiritual about the desire to preserve Vincent's memory through methods generally associated with mad scientists or religious zealots.

"Just as the fingers and even heads of saints were kept in medieval cathedrals as precious connections with the Christian martyrs," The Guardian's Jonathan Jones writes, "so Van Gogh's ear is a thrilling relic of the most visionary painter of the modern world."

INTERALIA MAGAZINE

Strebe, Diemut. “Wigner’s Friends.” *Interalia Magazine*, December 2014. http://www.interaliamag.org/articles/wigners-friends/

Wigner’s friends

Diemut Strebe

December 2014

The Soyuz capsule roared into the pre-dawn darkness just after 3 a.m. Monday (2100 GMT Sunday) from the Russian manned space facility in Baikonur, Kazakhstan, en route for the International Space Station. Aboard the capsule are Russian Anton Shkaplerov, NASA’s Terry Virts and European Space Agency astronaut Samantha Cristoforetti of Italy. There was also a small telescope, that will be used in an extraordinary project, Wigner’s friends, that will create a universal show consisting of all possible works of art at once.

In **Wigner’s friends** we create a universal show of all art ever in outer space .

Two miniature telescopes, shaped like the simplest version of a telescope, such as a plastic sliding toy, will be launched into outer space.

The project, which refers to the various interpretations of quantum theory, is a collaboration with/ ESA/ NASA and the Italian astronaut Samantha Cristoforetti has taken one of the telescopes we are going to launch for this purpose up to space on mission Expedition 42/43 on Nov. 23rd, 2014 on a Soyuz 41 rocket, launched from the Baikonur Cosmodrome in Kazakhstan.

Samantha Cristoforetti has taken one of the 2 telescopes to outer space, each carrying a CCD chip to create a show of all art ever in outer space by using quantum correlations.

Each telescope carries a CCD chip that will be hit by radiation from distant stars and galaxies. According to one of the various interpretations of the theory of quantum mechanics, this radiation simultaneously generates all possible patterns on the pixels of each chip, creating a universal show consisting of all possible works of art at once.
The CCD array converts the photons in the light that enters the telescope into a string of electrical signals. The light comes from the universe — galaxies, stars, planets.
When the two telescopes image the same star, each photon from the star enters both telescopes at once in a quantum fashion. This induces quantum correlations between the telescopes creating a state of superposition of all configurations simultaneously.

The chip encapsulated in the telescope has 5,000,000 pixels. In the described state at least 2^40000000 different configurations are created. This is more than the number of particles in the observable universe and larger than all the possible artworks that have been created to date.
To a certain extent the project refers to a famous novel by the Argentinian writer Jorge Luis Borges, ‘The Library of Babel’. Besides the content of the story, describing the search for the origin of the universe, the art-project establishes similarities to the formatting principle applied to the stored books, as described in the novel.Rather than single and individual features of appearance and content, the books are described and defined by the way they are formatted. This forms an equivalent to the pictures in the universal art-show.

Wigner's friends focuses on how the subatomic world would couple to our macroscopic everyday world and how our concept of reality is built. The set of concepts in quantum theory regarding time, space, information transmission and 'reality' seems to put our evidence of reality into the context of the illusionary state of the people inside 'Plato's cave'. In this allegory about human perception, Plato claims that knowledge gained through the senses is no more than opinion.

On earth a series of art pieces is planned to be shown in the course of time which refer to the show in space, amongst them a masterpiece of art that stands for art itself, dealing with the edges of its elements, such as Malevich's Black Square presented as a 'collapsed' picture from the show in the universe.

In reference to the original painting, varied colored squares are generated in the size of the original black square from the amplified string of bits that are present on the chips when they are hit by the photons simultaneously, so the observer can participate by a mailed download from a possible state of the show in space.

The download installation is placed on the top of a 2 room filling staircase installation 'Scala Regia', which refers to a particular interpretation in quantum mechanics.

Other pieces use concepts in quantum mechanics such as painting with spooky action, entangled, undetected photons, photons that never touched the photographed object.

The project deals with the very nature of science as an intertwined matrix of scientific knowledge and myth as 'an everincreasing ocean of mutually incompatible or even incommensurable alternatives'.

The interesting question is whether the accumulation of knowledge and read-outs in increasingly sophisticated and complex systems would ever lead to a final and ultimate "Eureka" ?

Although science and art differ with regard to method, to the use of their means and to the idea of the aim, they seem to be interrelated in some respect in their nature of depicting / describing an unknown reality in a potentially endless process of representation.

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Wigner's friends consists of 2 interconnected parts:-
One telescope has been launched on 23rd November 2014 via the International Space Station by the Italian astronaut Samantha Cristoforetti, the second one is planned to be launched attached to the James Webb Telescope on its mission to deep outer space in 2018.
When launched into space, the two telescopes will continue to generate quantum correlations by the mere act of observing the cosmos. Though launched at different periods in time and separated by enormous distances, the 2 telescopes will be connected by a very small amount of quantum correlation, an instant way of communication, which Einstein called 'spooky action at a distance'.

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Diemut Strebe

in collaboration with Seth Lloyd , MIT,

Stefan Strauss, Harry Buhrman, CWI (- Jan. 2014) ,

Telescope, technical part: Jon Petrucelli, MIT / Albany,

For additional support with many thanks to Dirk Englund, MIT , Catherine Lee, MIT, Frank Vacanti, Charles Vacanti, Harvard, Jim Webber and The Department of Anesthesia of the Brigham and Women's Hospital

With the official support of, and in collaboration with, John Mather ,NASA Goddard Space Flight Center and Samantha Cristoforetti, Jules Grandsire, Romain Charles, Alessandra Vallo, ESA- EAC European Astronaut Centre

ABOUT DIEMUT STREBE

The crossover between science and art is the main focus in my art work, displayed with different media such as living / biological material as well as photography and installations. Current projects include close cooperation with scientists in the fields of biology, human and plant genetics, tissue engineering and other areas of scientific research. On bio-art projects I work, amongst others, with living objects, cells, genetic material, and various forms of intervention. The projects are related to different areas of research and involve work with various scientific tools, methods and concepts.