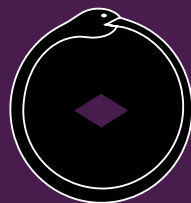
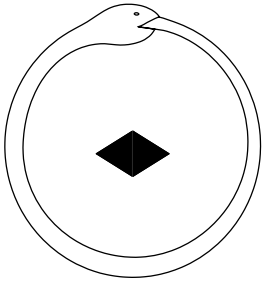


AN INVISIBLE ARROW  
Arrow 5



notebooks  
SELVAGEM



## AN INVISIBLE ARROW

arrow 5 

*Uma flecha invisível* [An invisible arrow] traces its trajectory towards the layers of life that humans cannot see. This “place” is present in reality as an internal structure that sustains everything that is alive. It shapes and designs the visible world, but it requires knowledge of experts in order to see it.

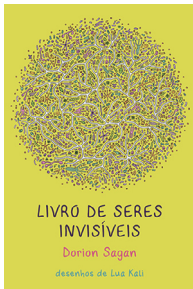
Cultures that have not disconnected from their origins, such as those of various indigenous peoples, maintain a relationship with the invisible associated with healing knowledge. Protection, care, respect, diet, treatment are very sophisticated communications with the invisible beings who cohabit the Earth. It is possible to dialogue with what is not seen through chants, the collaboration of plants, smoke or concentration.

Conversely, in academic science, with its methods of observation and systematization, optical instruments were developed with the ability to expand the spectrum of what is visible. Microscopes allow access to the microcosm and reveal its splendid power and beauty in images. They allowed the understanding of a series of life functions, and contributed to the understanding, treatment and cure of diseases.

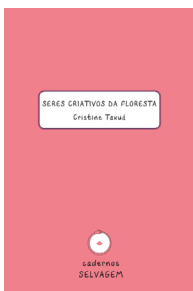
Without intending to establish direct relations between different forms of knowledge, *Selvagem* studies sometimes only invite them to cohabit. This is what happens in the conversations mediated by Ailton Krenak, in the sequence of published notebooks and also in the arrows. Each arrow is a braid of knowledge which creates its own design.

In itself, it already carries its message and tells what it came for. In the following pages we offer its script, as it is created, connecting text and image search.

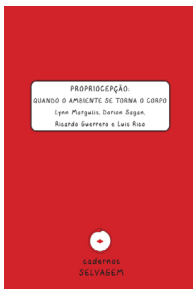
In preparing *An invisible arrow*, the following readings were essential:



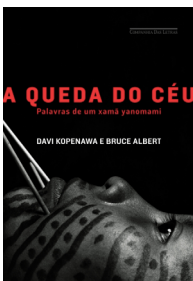
[Livro de Seres Invisíveis \[Book of Invisible Beings\]](#) (Dantes, 2021) was written by Dorion Sagan, a rare creature who navigated the Cosmos, with his father Carl Sagan, and dived into the microcosm of Gaia, with his mother Lynn Margulis. By describing 30 beings invisible to humans, Dorion reveals minute details of those who inhabit the spheres that are hidden to the naked eye.



[Seres Criativos da Floresta \[Creative Beings of the Forest\]](#) (Selvagem Notebook, 2020) is the transcription of the indigenous philosopher, healer, midwife and artisan Cristine Takuá's speech in the Selvagem 2019, held in person at Rio de Janeiro Botanical Garden's Theater. The speech was presented in the *Biosphere* conversation circle.



[Propriocepção: quando o ambiente se torna o corpo \[Proprioception: when the environment becomes the body\]](#) (Selvagem Notebook, 2020) is the Portuguese translation of an article written by scientists Lynn Margulis, Dorion Sagan, Ricardo Guerrero and Luis Rico in which they defend the vision of an autopoietic world in opposition to neo-Darwinian mechanism.



[The Falling Sky: Words of a Yanomami Shaman](#) (Belknap Press, 2013) by Davi Kopenawa and French anthropologist Bruce Albert, brings the great message of the Yanomami shaman. Recounting his own trajectory, Davi Kopenawa retraces the devastating advance of white people in the Amazon rainforest.

We also extend our special thanks to James Weiss and Penny Fenton, who kindly provided some of their microscopic images, essential for this arrow.

Shall we board?

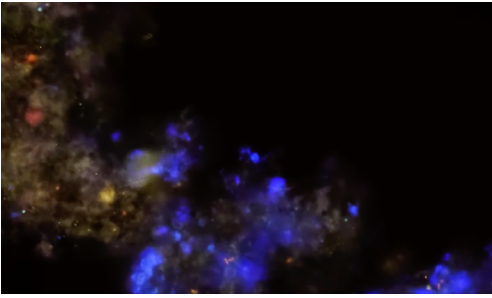




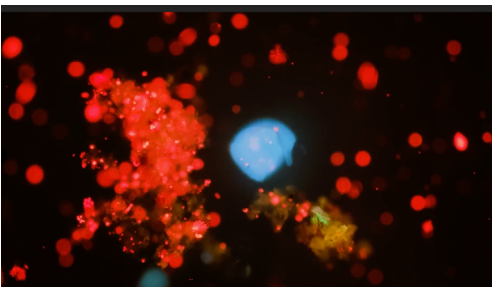
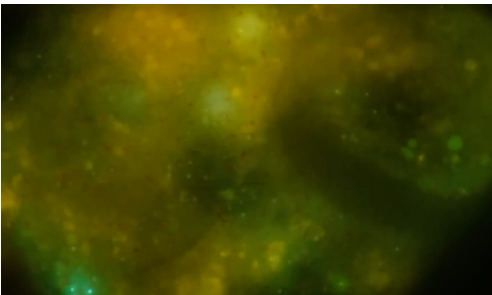
SHOMA81,  
*Crocodile closes and opens its eyes*

The Earth is much stronger than we are.

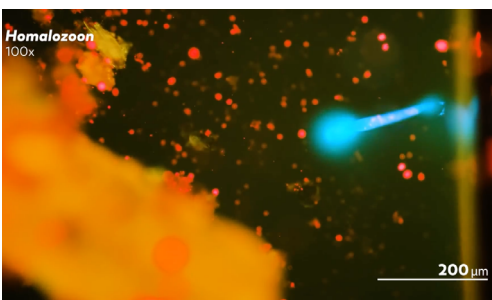
It is the forest, with all its visible and  
invisible beings.



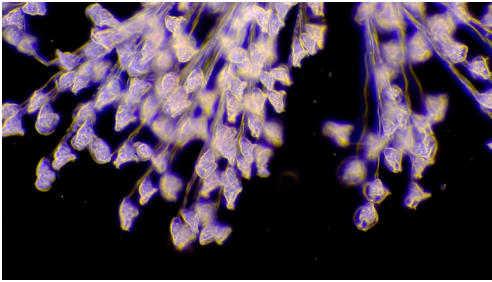
The microcosm  
is full of mystery and splendor.



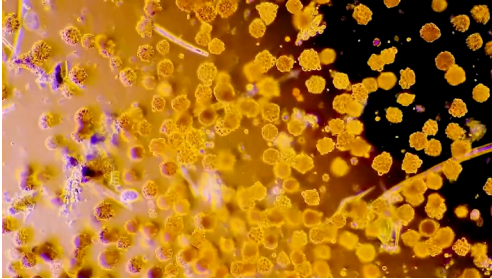
In this infinitesimal galaxy live creatures  
responsible for keeping the Biosphere alive.



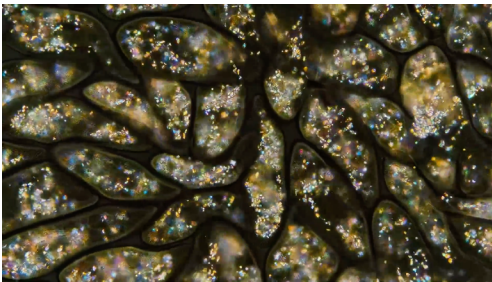
JAMES WEISS (@JAM\_AND\_GERMS),  
[Why do Microbes explode under UV Light?](#)



They are the ones who process the  
fundamental elements that sustain life.



They regulate, recompose and regenerate.

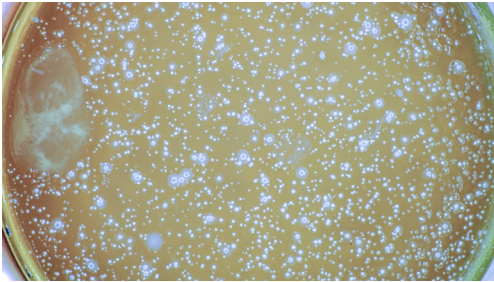


JAMES WEISS (@JAM\_AND\_GERMS),  
*How do Protozoa get around?*  
BONUS: *Microcosmos and Chill*

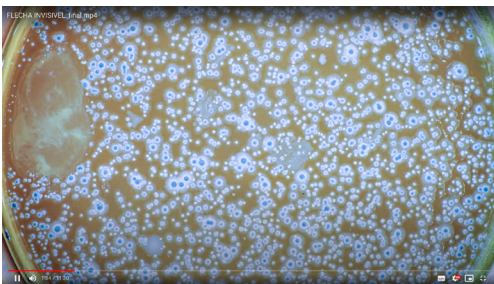


Microorganisms are ancient,  
omnipresent and our ancestors.

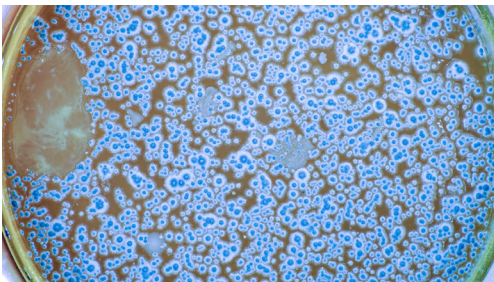
PROYECTO ÁGUA,  
*Hydra Viridis*, 2008



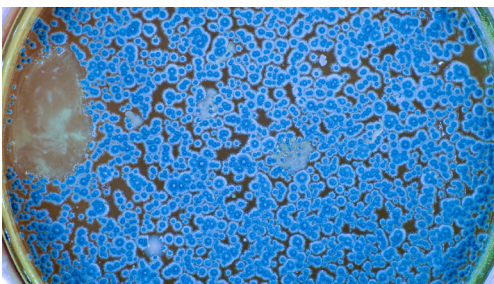
There are bacteria,



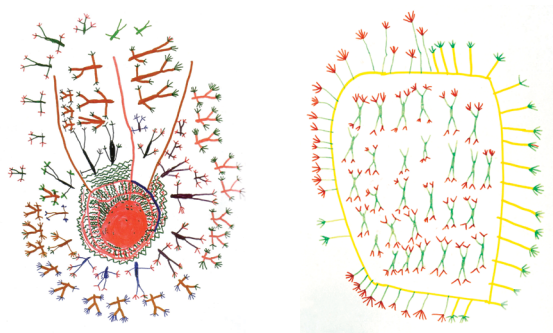
archaea who emerged billions of years ago  
and are still here,



as planetary hosts,



SCIENCE VIDEO,  
*Growing Bacterial Colonies In Petri Dish, Time  
Lapse. Growth Of Bacteria Take*



caring grandmothers,  
entities who deserve respect  
and gratitude.



ORLANDO NAKEUXIMA MANIHIPI-THERI,  
*O mutum (paruri) que simboliza a noite (titi), 1976*

*Titi – A noite*

*Motoka e os filhos, 1976*

*A casa dos espíritos – Hekurap, 1976*

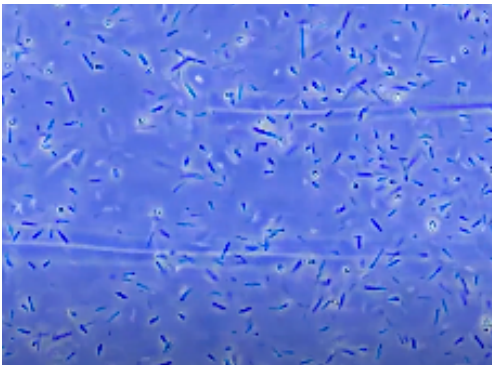
*A casa dos espíritos (com Poripo – a Lua –,  
os xapiris e os caminhos), 1976*

Laymert Garcia dos Santos and Stella Senra  
Collection





Visiting this dimension invisible to naked eyes is given to shamans and healers. It is also the area of researchers who have created machines, such as vessels, to submerge into microscopic oceans.



Two and a half billion years ago, the Earth started turning blue.



Blue comes from the scattering of light by the oxygen atoms.

JAMES WEISS (@JAM\_AND\_GERMS),  
*Gastrotrichs: Four Day Old Grandmothers*  
*Where did Eukaryotic cells come from?*  
*Slime Tubes in Search of Sunlight*



The oxygen brought by cyanobacteria which would later become the green parts of plants.

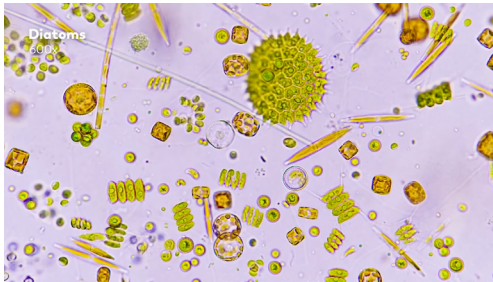
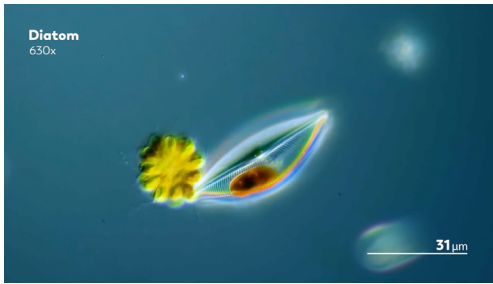


They found a way to use sunlight to break water's hydrogen bonds,

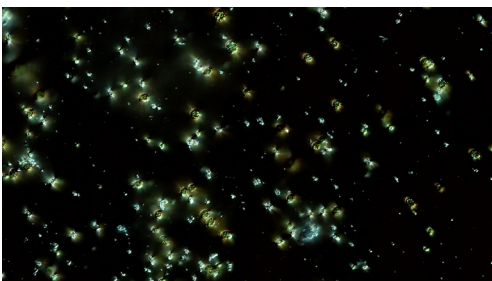
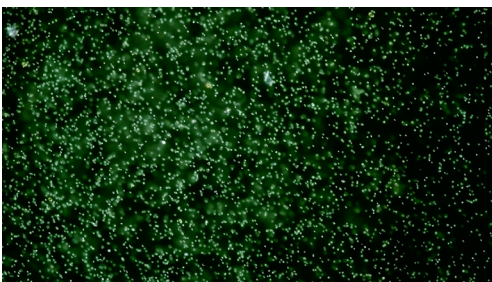


spreading like a living green fire, releasing oxygen into the atmosphere.

JAMES WEISS (@JAM\_AND\_GERMS),  
*Slime Tubes in Search of Sunlight*  
 BONUS: *Microcosmos and Chill*



JAMES WEISS (@JAM\_AND\_GERMS),  
*How Diatoms Build Their Beautiful Shells*



#PLANKTONCHRONICLES

*Plankton*, by Noé Sardet

© CNRS 2010

In the oceans, phytoplankton,  
photosynthetic beings, generate most of  
the oxygen in the atmosphere.

They are like living jewels

who make their own bodies out of silica and  
other elements they remove from the sea.



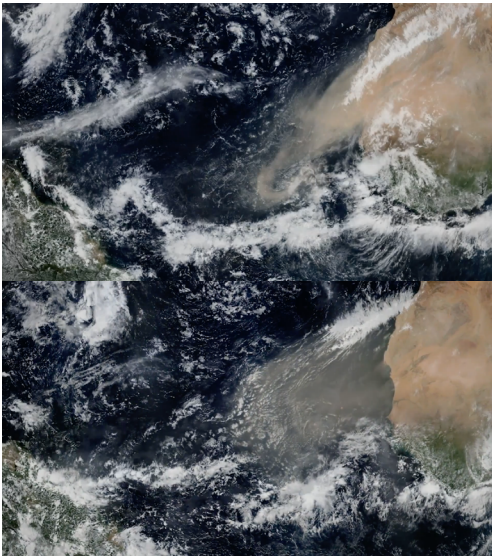


Fish and whales can see the beautiful underwater blizzard caused by the collective death of Emilianas and diatoms.

#PLANKTONCHRONICLES

*Plankton*, de Noé Sardet

© CNRS 2010

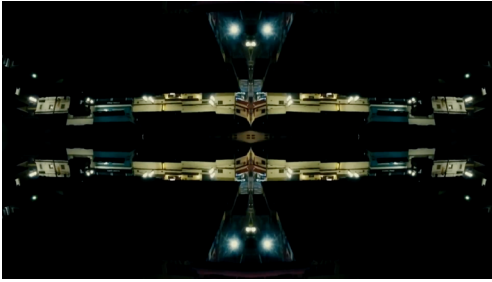


Even the death of invisible beings is capable of amplifying, enlivening, increasing the cycle of elements on a planetary scale.

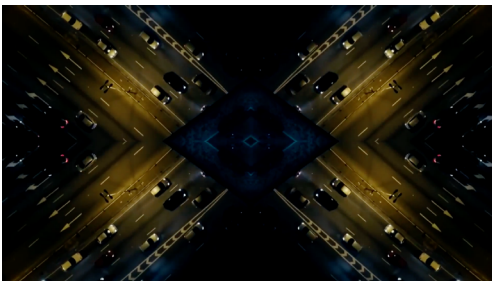
NASA GODDARD, WARMER OCEAN

*Temperatures May Decrease Saharan Dust*

*Crossing the Atlantic*, 2021



The petroleum,



the salt deserts



and the movement of tectonic plates

LUCAS SANTTANA,  
*Streets Bloom*, 2017.  
Director: Patrícia Lobo



have their origin in the decomposition  
of these entities.

DENILSON BANIWA,  
*Petróglifos na Selva de Pedra*, 2019.  
Photo: Rafael Avancini



CHAIYON S021,  
*White ants or termites on decomposing wood*

Conversely, the first living beings



have migrated to entrails far from the reach  
of oxygen, which is toxic to them.

They inhabit the intestines of termites,  
cows and humans.

*Symbiotic Earth: How Lynn Margulis Rocked  
the Boat and Started a Scientific Revolution.*

A film by JOHN FELDMAN.

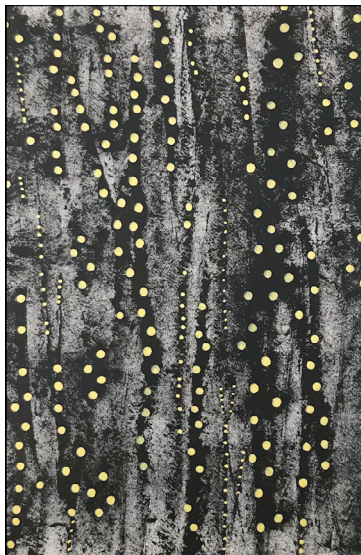
Produced by Hummingbird Films, New York



A termite's intestine



is like an oxygen-free  
time capsule,



where a myriad of beings who are crucial for  
the digestion of wood cellulose live.

AISLAN PANKARARU,

*Untitled*, 2021.

Acrylic on Canson paper.

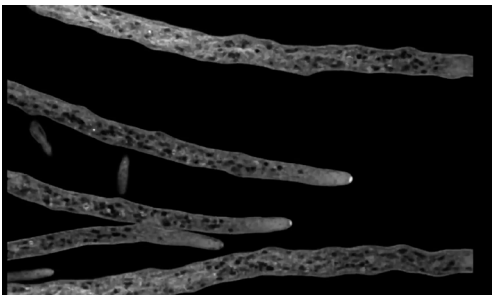
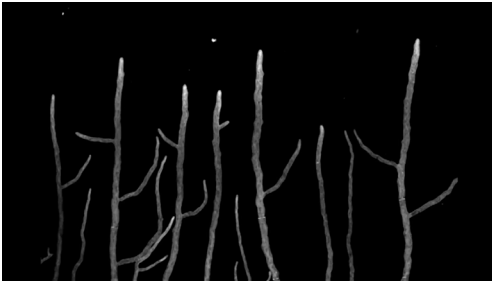
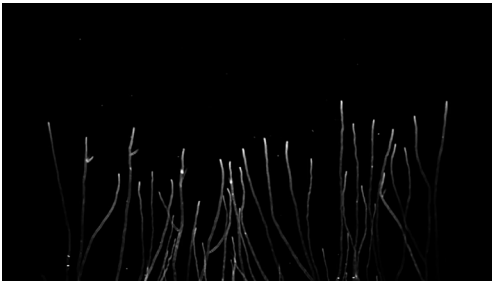
*Ondas germinantes*, 2021.

Charcoal and posca on Canson paper.

*Ondas germinantes*, 2021.

Charcoal on Kraft paper.





AMAZINGFUNGI,  
*Mycelium microscopy shots* , 2011

Thanks to them – and to the immense  
fungi network which envelops the  
entire world – the forest is a  
continuous transformation process.



JOHN BONNER,  
*Slime mold movies*

It is in the invisible world  
that lives enlance into one only, Gaia.



Chief Seattle says:  
Earth does not belong to humans.  
Humans belong to the earth.

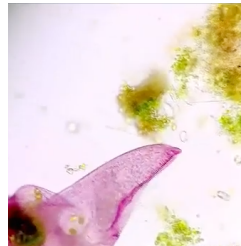
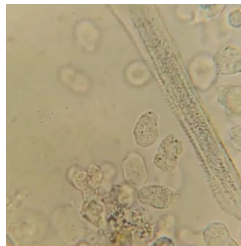
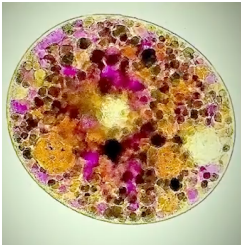
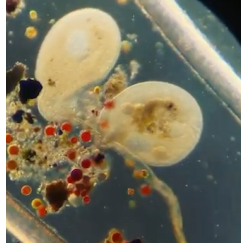
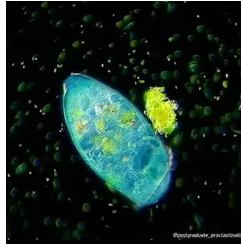


All things are connected,  
like the blood that unites us all.



What happens to the earth,  
happens to the children of the earth.

HEATHER BARNETT,  
*The Physarum Experiments, Study No.024:*  
*Interspecies Encounter*, 2016



Only bacteria and protozoa are individuals.

All other organisms are complex communities, composed of intimately integrated beings from different origins.

Living communities formed by different types and stories, where even the membranes that separate beings are permeable and constantly change.

PENNY FENTON (@postgraduate\_procrastination)

*Female daphnia with eggs surrounded by Volvox*

*Polarized light daphnia*

*Volvox aureus*

*Spirostomum teres*

*Tardigrade*

*Hydra flinches away from Blepharisma*

*Stentor coeruleus*

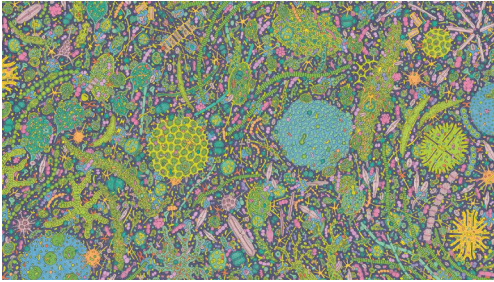
*Colpoda*

*Blepharisma cannibal giant*

*Tardigrade*

*Nassula Ornata*

Images courtesy of the artist



LUA KALI,  
*Untitled*, 2021.  
Ink and sharpie pen

It is in the nature of life to interact.  
Collaboration is one of its attributes.  
Symbiosis is when organisms interrelate  
in mutual benefit.



MICHAEL ISHAK,  
*Bobtail squid trying to bury itself into the sand*

Such as the little bobtail squid,



DIVELVANOV,  
*Berry's bobtail squid - Euprymna berryi*

which, inhabited by a luminescent bacteria,  
camouflages itself as a starry night.





#PLANKTONCHRONICLES,  
*Pleurobrachia*, by Véronique Kleiner  
© CNRS Images - 2010

The environment and organisms do not  
make a house,  
but rather a body that thinks and dances.



ELISA MENDES,  
*Nhe'ery*, 2021

The smell of rain comes from small  
bacteria who live in the soil  
and break free on the impact  
of the first drops that fall.



DIMASID,  
*Processo de fermentação para assar pão*

Breads, beers, cheeses  
are the work of fermenting bacteria.



JAMES WEISS (@JAM\_AND\_GERMS),  
*We upgraded our microscope!*

Any animal or plant can be considered a teeming world of microbes.

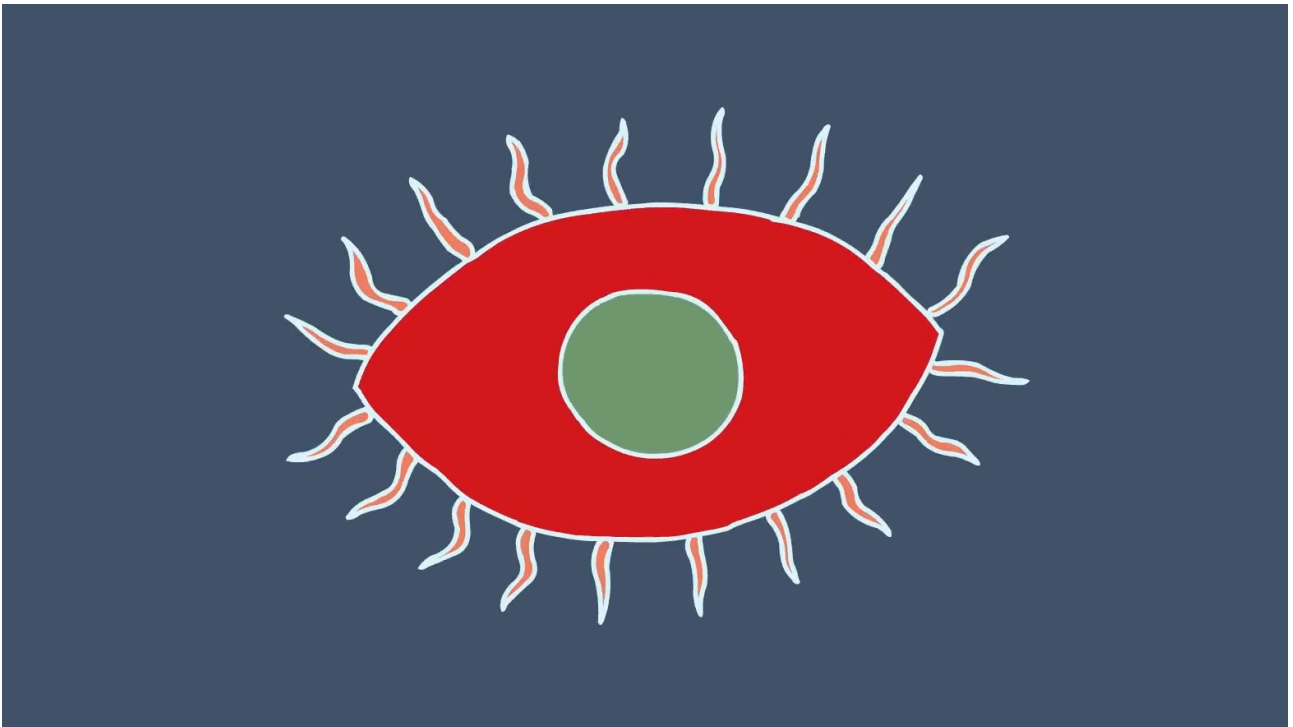
Bodies evolved, joined and transformed themselves several times in time, in space and inside everything.



JAMES WEISS (@JAM\_AND\_GERMS),  
*Tiny freshwater crustacean*

Organs as well.

All eyes have predecessors in microbes' photosensitive membranes.



Drawing by LÍVIA SERRI FRANCOIO

Everything we see  
is an expression of the invisible.

Activated by the sun,  
life unfolds in the invisible  
forming its wild web.

BIOS:

**AILTON KRENAK (1953)**

Thinker, environmentalist and one of the main voices of indigenous knowledge. Ailton has created, along with Dantes Editora, the *Selvagem*, cycle of studies about life. He lives in the Krenak village, by the margins of rio Doce, in Minas Gerais, and is the author of *Ideas to postpone the end of the world* (House of Anansi Press, 2020) and *A vida não é útil* [Life is not useful] (Companhia das Letras, 2020).

**ANNA DANTES (1968)**

Her work extends the editing/publishing experience to other formats in addition to books. For ten years, Anna has been carrying out, along with the Huni Kuĩ people, in Acre, the project *Una Shubu Hiwea, Livro Escola Viva* [Living School Book]. In 2018, she created *Selvagem*.

**LYNN MARGULIS (1938-2011)**

American biologist, author of the Endosymbiotic Theory, the one that transformed the understanding of the evolution of cells with a nucleus. Lynn described her theory in the article *On the origin of mitosing cells*, published in the *Journal of Theoretical Biology* in 1967, and, although it came under heavy criticism when it was released, it is now considered one of the most important documents of biology.

[https://pt.wikipedia.org/wiki/Lynn\\_Margulis](https://pt.wikipedia.org/wiki/Lynn_Margulis)

**DORION SAGAN (1959)**

Award-winning author, essayist and theorist, Dorion Sagan writes on culture, history and philosophy of science. Son of Carl Sagan and Lynn Margulis, he has 25 books translated into 15 languages, including several with biologist Lynn Margulis on planetary biology and symbiosis. His work is published in *Smithsonian*, *Wired*, *Cabinet* and *The New York Times Book Review*, among others. Sagan participated in [Selvagem in 2019](#).

<https://dantes.com.br/produto/livro-de-seres-invisiveis/>

**CRISTINE TAKUÁ (1981)**

She is an indigenous philosopher, healer, midwife, educator and artisan. Cristine Takuá lives in the village of Rio Silveira. She is an independent

teacher at the Rio Silveira community. She is also founder and advisor of Instituto Maracá. Cristine represents the unit of indigenous education at the São Paulo Secretariat of Education and is a founding member of the Forum for the Articulation of Indigenous Teachers in the State of São Paulo (FAPISP).

<https://www.youtube.com/watch?v=7hzJVxUOjc8>

**JAMES WEISS (@JAM AND GERMS) (1991)**

A microbiologist who discovered his interest in the microscopic world for the first time when he was feeling lost in life. With his own microscope and a bit of homemade ingenuity, he began to capture thousands of hours of impressive footage of the creatures he found around him: in the local pond, at the beach, in a puddle. What he found surprised him, and his mission has become to reveal to everyone the beauty of the microcosm. From the simplest single-celled life to complex micro-animals, he reveals the secrets of a world we rarely consider. Navigating through the births, parties, tragedies, idiosyncrasies and deaths of a cast of little characters, one learns how these life forms work and what lessons they can teach us about our own existence.

[https://www.instagram.com/jam\\_and\\_germs/](https://www.instagram.com/jam_and_germs/)

**PENNY FENTON (@POSTGRADUATE PROCRASTINATION)**

Researcher, doctoral student in aquatic toxicology and freelance videographer of the micro aquatic world.

[https://www.instagram.com/postgraduate\\_procrastination/](https://www.instagram.com/postgraduate_procrastination/)

**ORLANDO WAKATAUTHERI (?-1976)**

Indigenous artist whose drawings, produced in 1975, gained space in the collection of the National Museum of Fine Arts of Rio de Janeiro (MNBA). The drawings were exhibited in 2004 at the *Trama Espiritual da Arte Brasileira* [Spiritual Weave of Brazilian Art] show, at the Tomie Oh-take Institute, in São Paulo, and at the Oscar Niemeyer Museum, in Curitiba. Orlando Wakathautheri died in March 1977, a victim of a measles epidemic, one of the many harmful consequences of the opening of a section of the BR-210 highway that cut through the southeastern portion

of the *Yanomami* Indigenous Territory as part of the Brazilian government's Plan for National Integration, and that has been swallowed by the forest a long time ago.

<https://terrasindigenas.org.br/noticia/14237>

**LUCAS SANTTANA (@LUCASSANTTANA) (1970)**

He is a Brazilian singer, songwriter and producer. He has already collaborated with Chico Science and Nação Zumbi, Caetano Veloso, Gilberto Gil and Marisa Monte; and had his songs recorded by artists like Céu, Marisa Monte and Arto Lindsay. His discography has 8 authorial albums, the most recent being *O céu é velho há muito tempo* [The Sky has been Old for a Long Time], from 2020.

[https://pt.wikipedia.org/wiki/Lucas\\_Santtana](https://pt.wikipedia.org/wiki/Lucas_Santtana)

**DENILSON BANIWA (1984)**

Jaguar-artist of the Baniwa indigenous people. Denilson's works express his experience as an indigenous being of present time, mixing traditional and contemporary indigenous references with western icons to communicate native peoples' thought and struggle in different languages, such as canvas, installations, digital mediums and performances.

<https://www.behance.net/denilsonbaniwa>

**JOHN FELDMAN (1954)**

Acclaimed American filmmaker, John Feldman's professional path unfolds for more than 40 years, encompassing a varied spectrum of genres: from independent dramas to documentaries, passing through experimental, educational and corporate productions. His movies have already received various nominations and international awards.

<https://hummingbirdfilms.com/johnfeldman/>

<https://hummingbirdfilms.com/symbioticearth/>

**AISLAN PANKARARU (@AISLANPANKARARU) (1993)**

He is a visual artist. From the Pankararu people, he was born in Pernambuco and currently lives and works in Brasília, where he is a medical student at the University of Brasília (UnB). The *Yeposanóng* exhibition,

at the Memorial of the Indigenous Peoples, is an invocation of the cleansing of body and soul in favor of life. It is the search for healing within our reality, portraying much of what we want for this moment we are living, cleaning and celebration of life.

<https://rectyty.com.br/aislan-pankararu/>

**JOHN BONNER (1920-2019)**

He was an American biologist, professor in the Department of Ecology and Evolutionary Biology at Princeton University. He worked with cellular fungi, shedding light on the mechanisms of microbial life and illuminating the behavior of cells in all life forms. He passed away at age 98.

[https://en.wikipedia.org/wiki/John\\_Tyler\\_Bonner](https://en.wikipedia.org/wiki/John_Tyler_Bonner)

**HEATHER BARNETT (@HEATHERABARNETT) (1970)**

She is an artist, researcher and educator working with natural phenomena and living systems, often in collaboration with scientists, artists, participants and organisms. Making use of a variety of media, including print, photography, animation, video, installation and participatory experimentation, and working with biological materials and imaging technologies, her work explores how we observe, understand and relate to the world around us.

<https://heatherbarnett.co.uk>

**LUA KALI (1998)**

Lua Kali does graphic research exploring imaginary living systems and intersections between arts and sciences.

<https://www.behance.net/luakali>

**ELISA MENDES (1983)**

Elisa experiments images and words in works of photography, photography direction, audiovisual direction and poetry.

<https://elisamendes.com/director-dop>

The editorial production work of the Selvagem Notebooks is carried out collectively with the Selvagem community.

More information at [selvagemciclo.com.br](http://selvagemciclo.com.br)

This notebook features the special participation of Natália Amarinho, who wrote the biographies of the artists, and Isabelle Passos, who carried out the editing.

#### **TRANSLATION:**

##### **GABRIEL PAIXÃO**

Interpreter, translator, and multimedia artist. Master of Film Narratives and Bachelor of Cinema and Audiovisual, he has written, directed, and acted in several short films, besides dwelling in music, poetry, drawing, and painting. Through words and images, his work is driven by an ever-present desire for evocation and dialogue.

##### **MAURICIO BOFF**

A communication and advocacy consultant for sustainable development initiatives in South America, and also a writer. He lives in Brasília.

#### **PROOFREADING:**

##### **ANA LOUREIRO JUREMA**

Educator, she has developed and participated in several projects in Brazil and other countries – but she has always been a teacher, mainly focused on teacher's capacity building. She did a doctorate, does research, has academic, technical and didactic publications, is a consultant and an everlasting learner.

##### **DANIEL GRIMONI**

An artist, Portuguese grad student and Language teacher at a community pre-university course in Rio de Janeiro. He has published poems and short stories in literary magazines and anthologies, and is the author of *Todo (o) corpo agora* (2019), a poetry book. He also studies matters related to the dialogues between geography, ecology, art and education.



## CREDITS

ORIGINAL IDEA AND NARRATION Ailton Krenak  
DIRECTION, SCREENPLAY AND RESEARCH Anna Dantes  
PRODUCED Madeleine Deschamps  
AUDIOVISUAL ARROW EDITING Elisa Mendes  
ANIMATION Livia Serri Francoio  
SOUNDTRACK Gilberto Monte and Lucas Santtana  
COMMUNICATION Laís Furtado  
ASSISTANT PRODUCER Victoria Mouawad  
ASSISTANT DESIGNER Isabelle Passos  
ARROW TRANSLATION Gabriel Paixão e Christophe Dorkeld  
COMMUNICATION TEAM Christine Keller, Cris Muniz Araujo, Daniela Ruiz,  
Esther Lopez, Mauricio Boff and Natália Amarinho (Selvagem Community)

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Orlando Nakeuxima Manihipe-Theri  
Patrícia Lobo  
Penny Fenton  
Princeton University - Iris G. Rubinstein  
Rafael Alves  
Rafaela Campos  
Raquel Florence

“Gas composition of the lower atmosphere, the temperature, the oxidation state, these things, these aspects of the lower atmosphere are modified by the presence of living organisms in such a way as to regulate the atmosphere, to keep these aspects within a range suitable for life on the surface. It says therefore that the lower atmosphere is not a passive environment, but it is an actively modulated environment for life on the surface. There is something more than chemistry on the surface of the planet, and this more than chemistry turns out to be life. And that is the basic idea.”

**LYNN MARGULIS**



*Lynn Margulis presenting the Gaia Hypothesis at  
NASA in 1984.*

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