*

Art&Science in Evolutionary Computation

(side event for EA2013 conference)

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Nicolas Monmarché
Stefan Bornhofen
Tim Barrass

Artificial Beings

Alain Lioret
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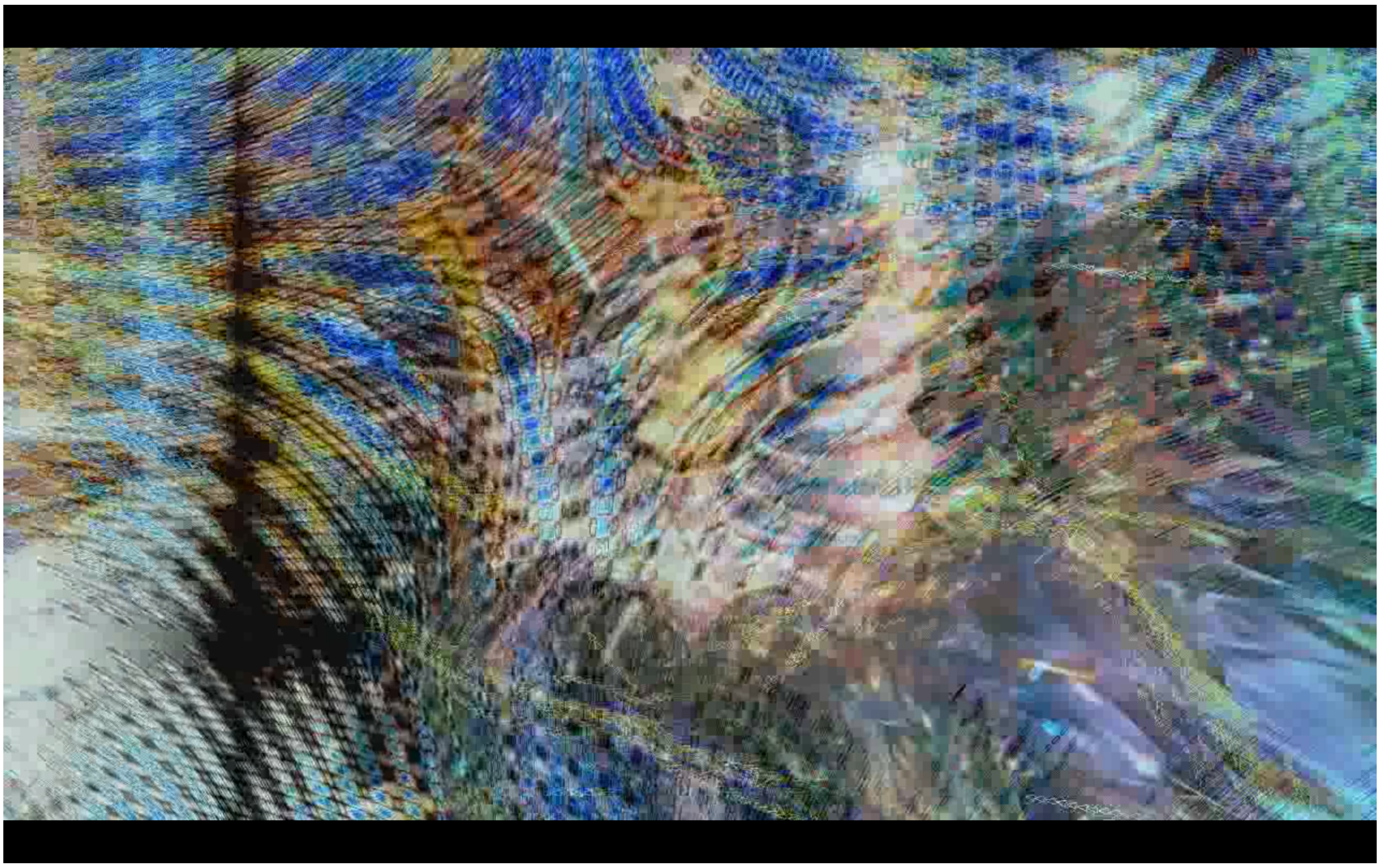

Cinema Beings

Artificial Beings are living in "Art Space" (2D Space for Painting, 3D Space for Cinema, 4D Space for Real Time Performance). They make Art, They are Art. They are "atoms" of pictures, movies, and performances. They evolve with a Genetic Algorithm, trying making more and more interesting pieces of Art.

see more on: www.alainlioret.fr

Artificial Beings

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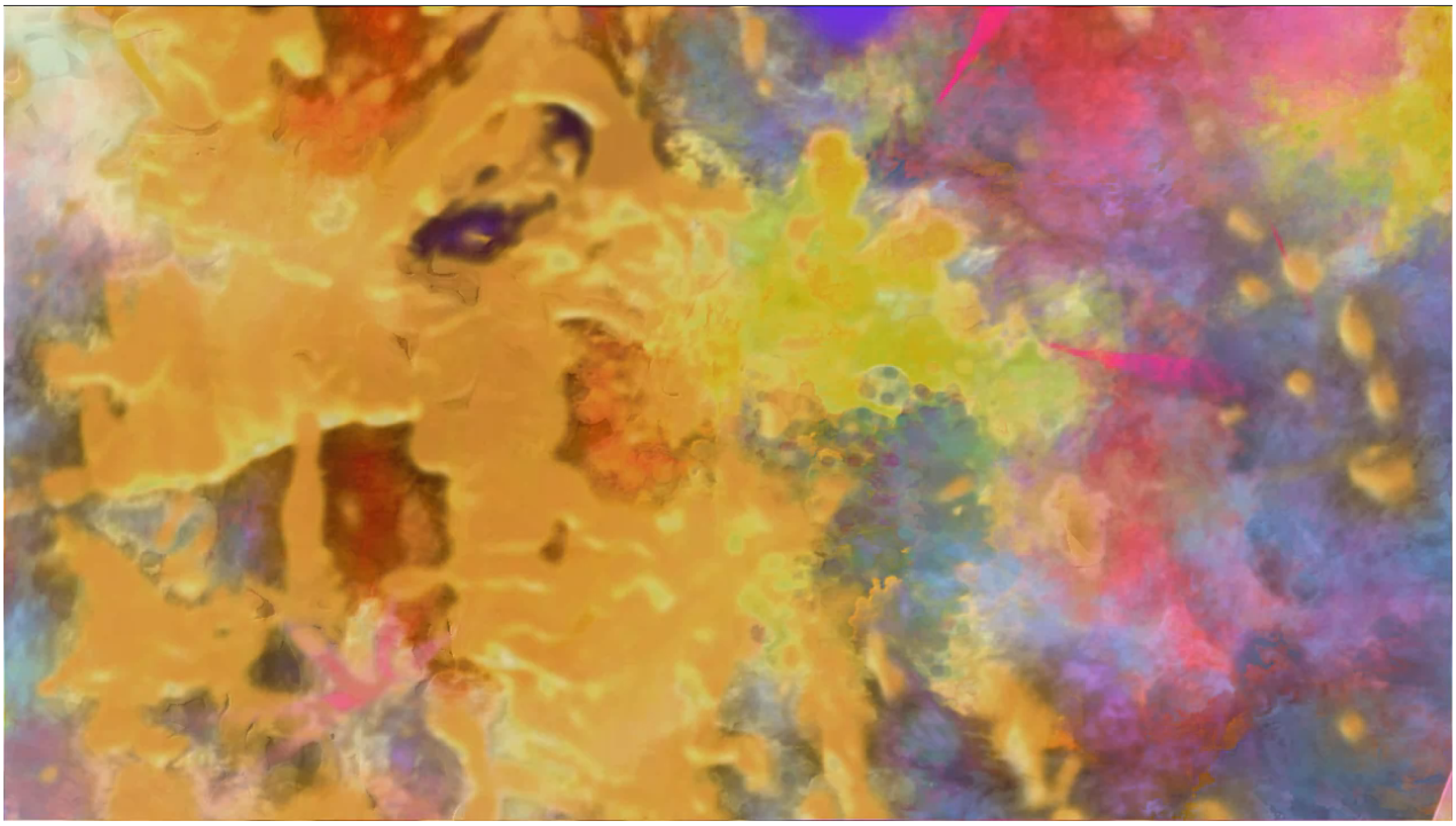

Painting Beings

Artificial Beings are living in "Art Space" (2D Space for Painting, 3D Space for Cinema, 4D Space for Real Time Performance). They make Art, They are Art. They are "atoms" of pictures, movies, and performances. They evolve with a Genetic Algorithm, trying making more and more interesting pieces of Art.

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Artificial Beings

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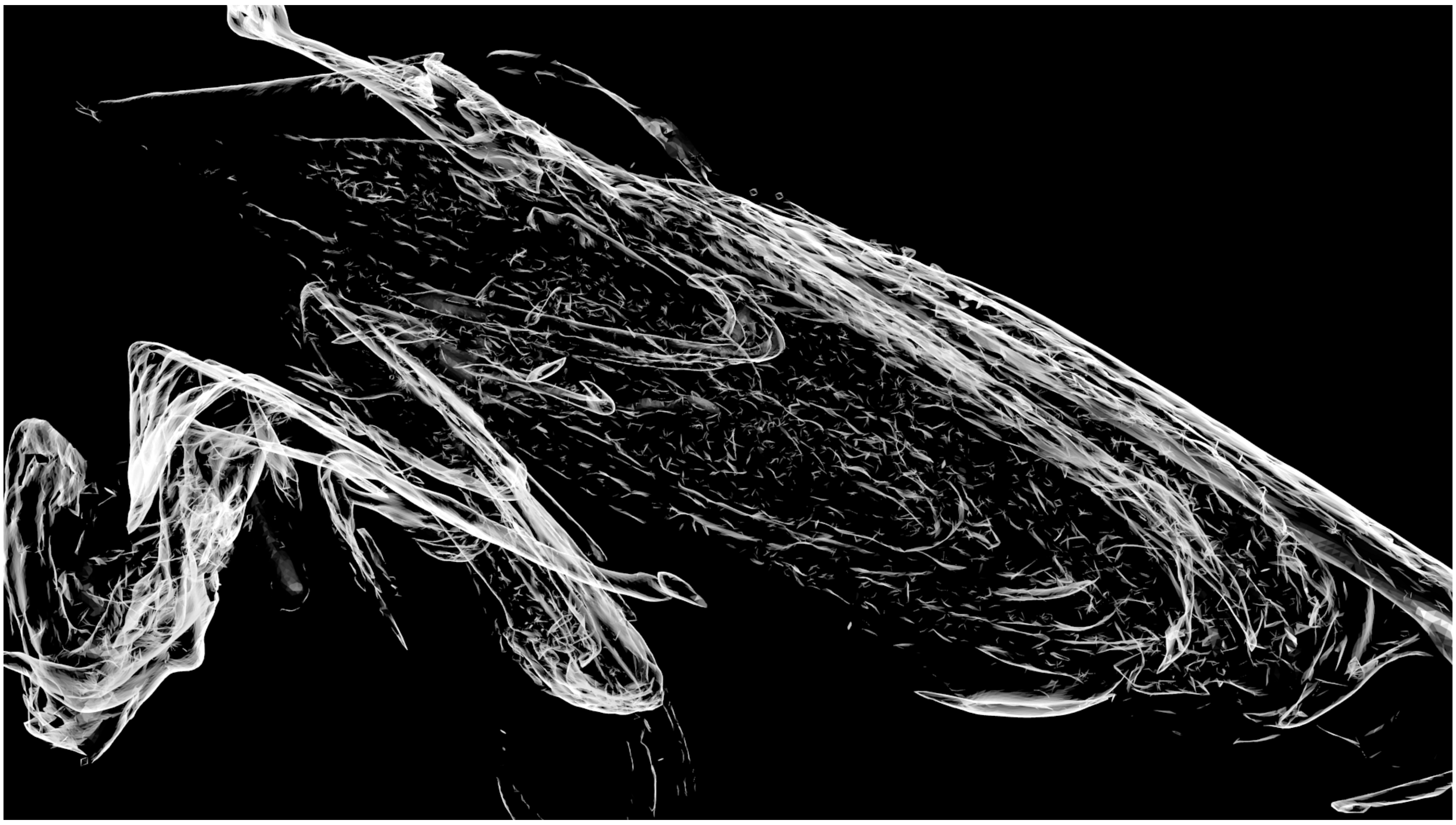


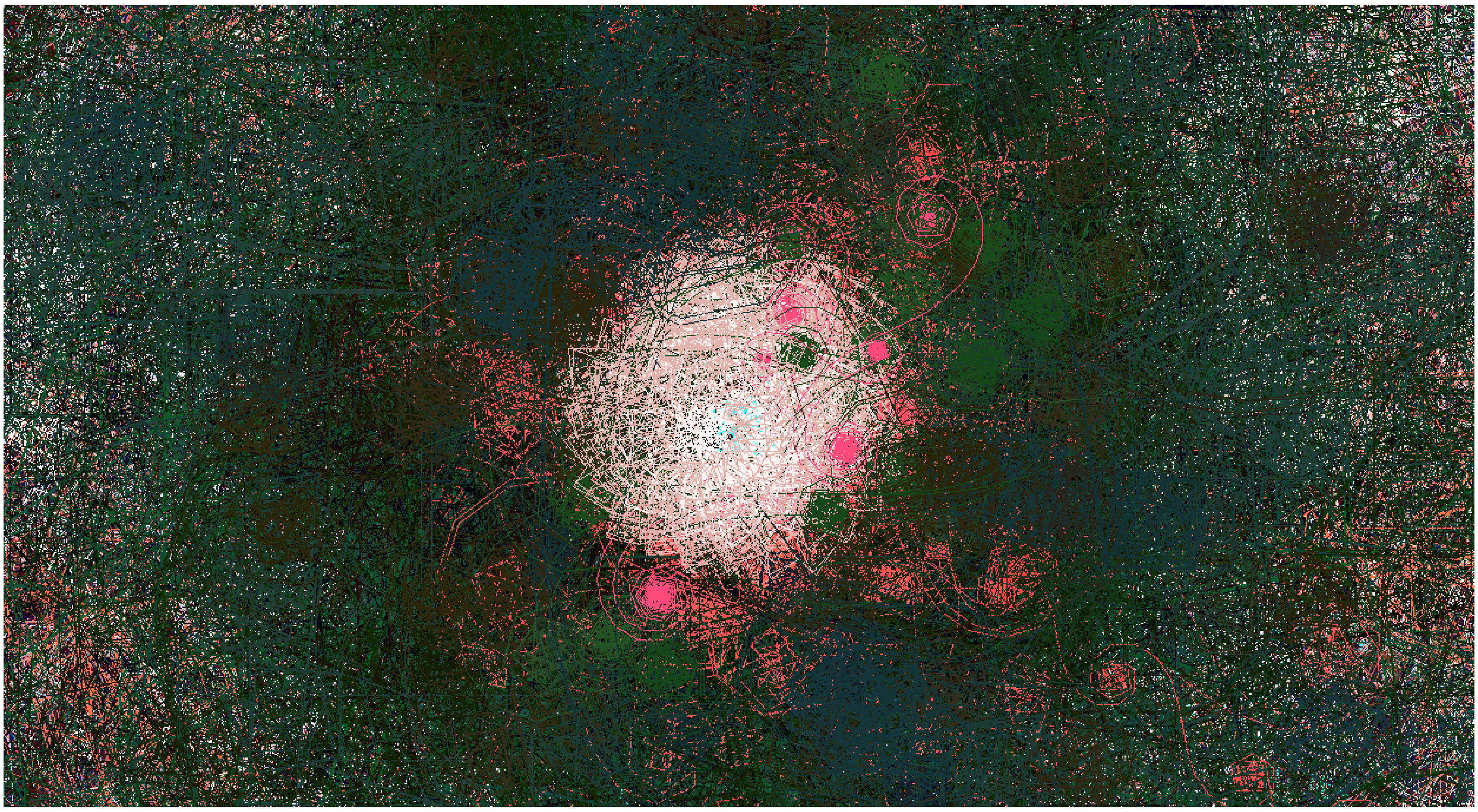
Time Beings

Artificial Beings are living in "Art Space" (2D Space for Painting, 3D Space for Cinema, 4D Space for Real Time Performance). They make Art, They are Art. They are "atoms" of pictures, movies, and performances. They evolve with a Genetic Algorithm, trying making more and more interesting pieces of Art.

see more on: www.alainlioret.fr

Spirals turning

Alejandro Lopez Rincon
alejandro.lopezrn@hotmail.com



Galaxy

This picture was created using music and Fourier Analysis as a base. Then the user chooses which image it likes, thus instead of taking the coefficients of the music it starts to generate images “close” to the selected coefficients, similar to PSO algorithm, with the difference that the ideal solution changes by the user. If untouched by the user it uses the music to generate new images.

Spirals turning

Alejandro Lopez Rincon
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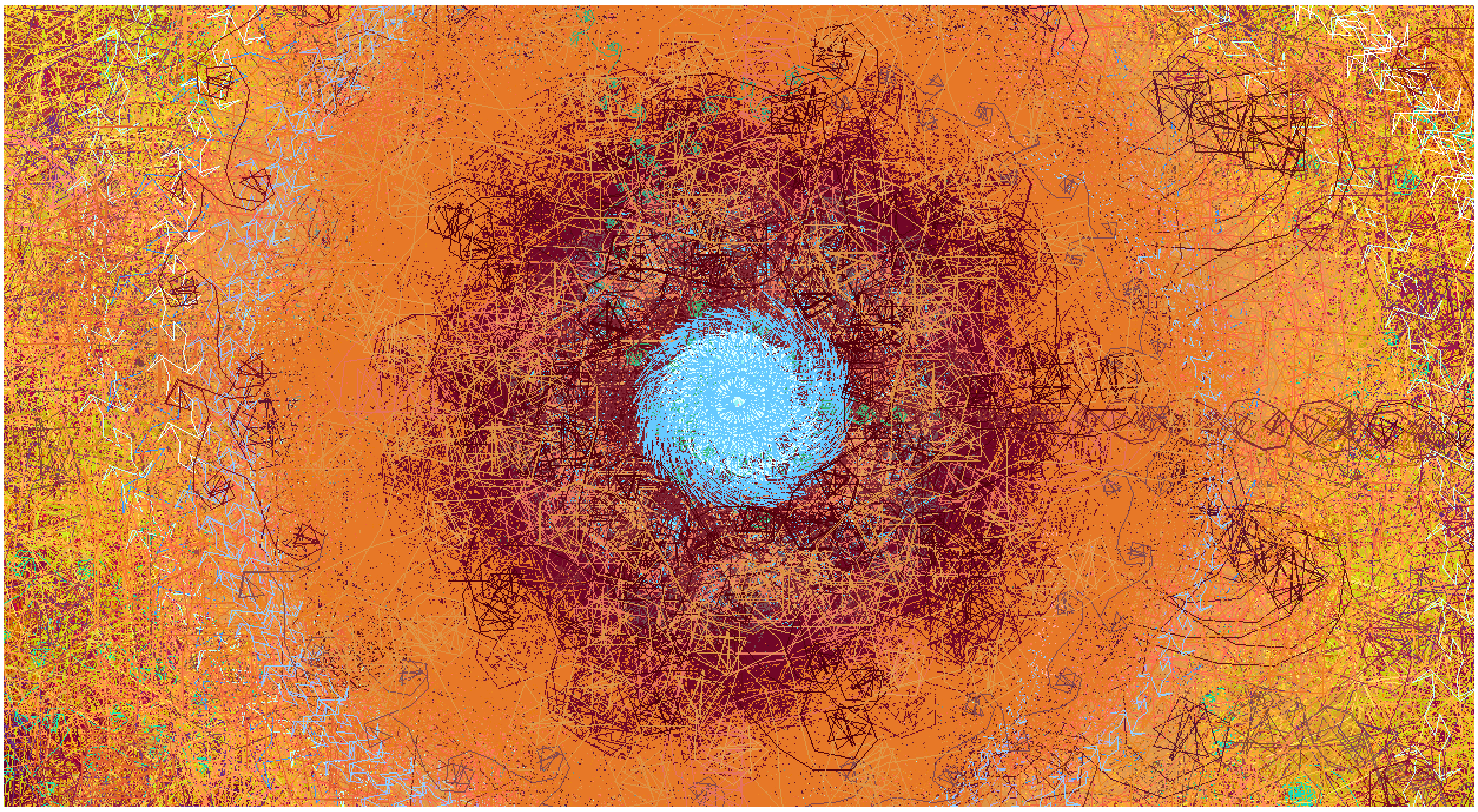
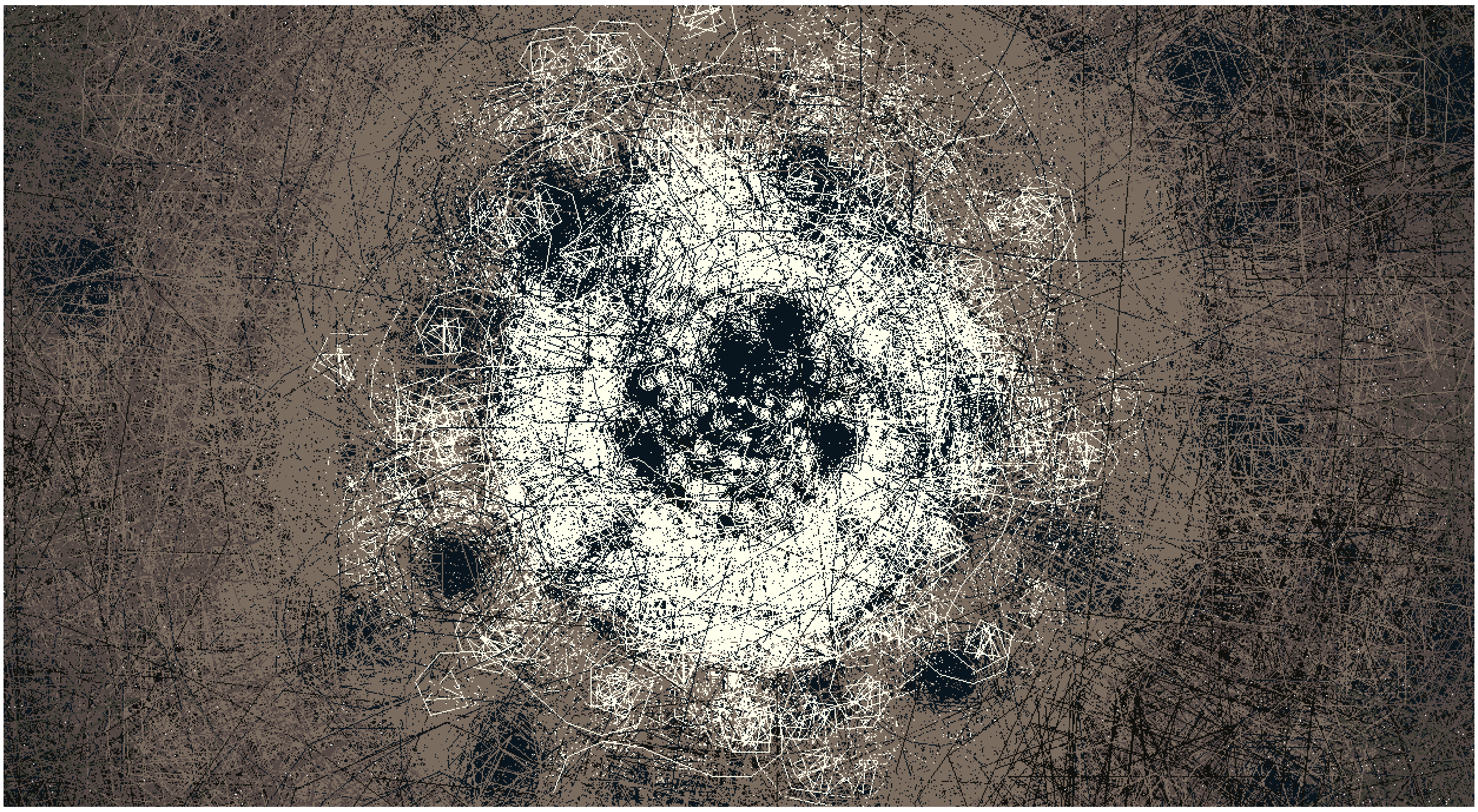


Flower

All of the images are generated using spirals turning, by different coefficients.

Spirals turning

Alejandro Lopez Rincon
alejandro.lopezrn@hotmail.com



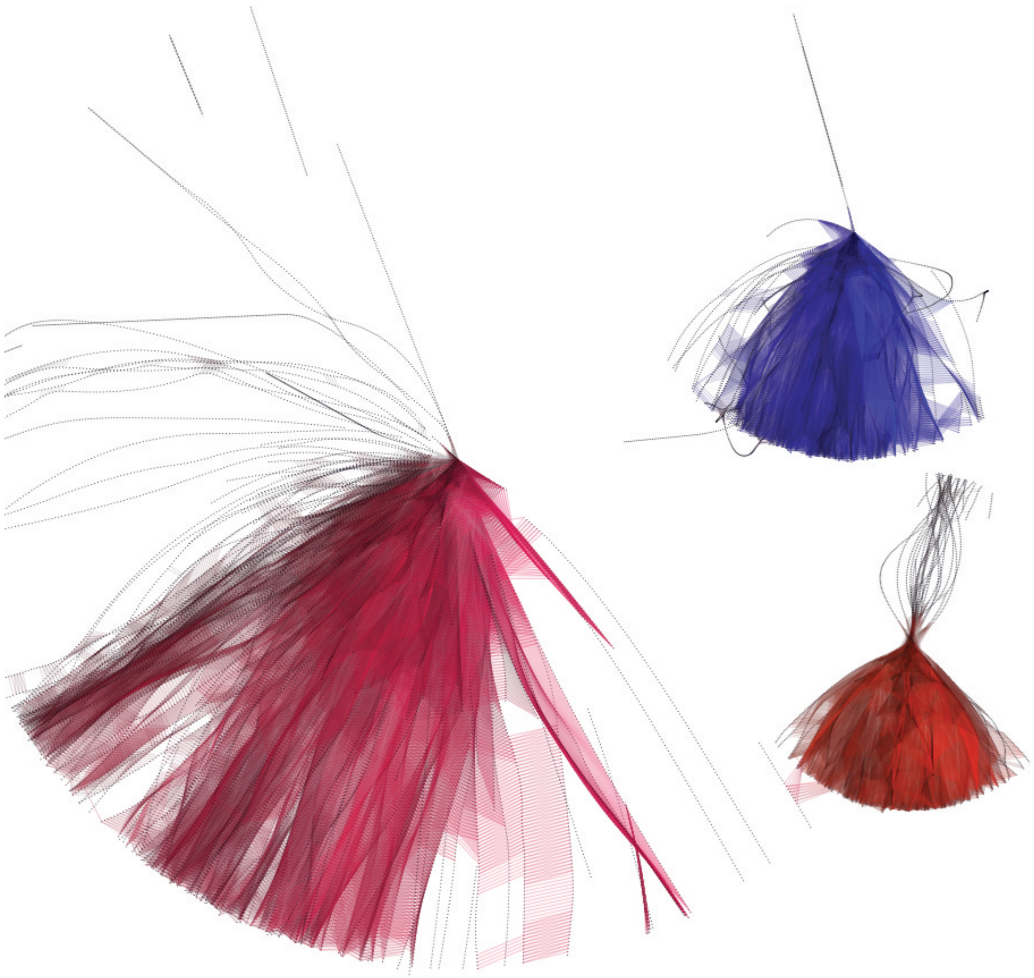
Love declaration

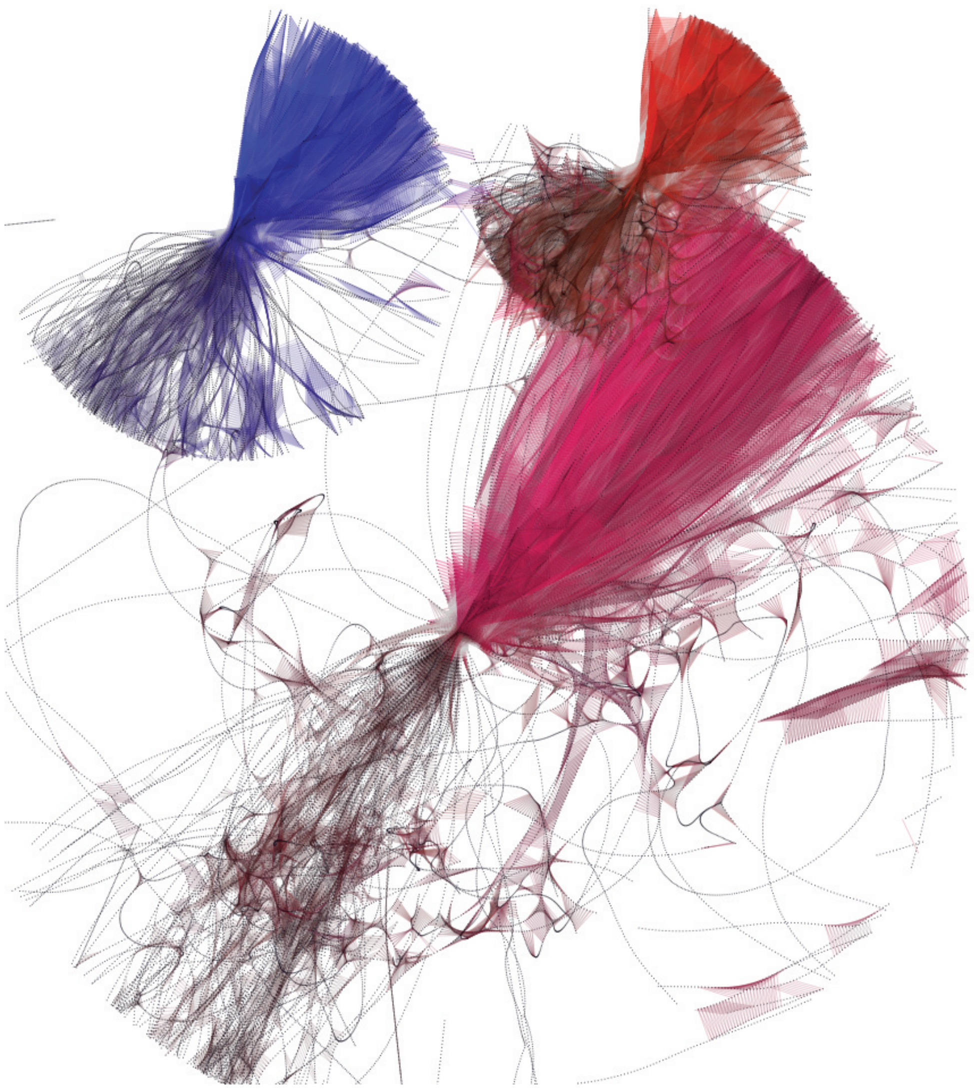
This image only has 3 colors, and it was created using my heart-beat as a base.
This image was a love declaration.

You Pretty Little Flocker

(Expanding the Aesthetic State Space of Biologically inspired Models)

Alice Eldridge
alicee@sussex.ac.uk





pob (Size Preference = Max and Mid)

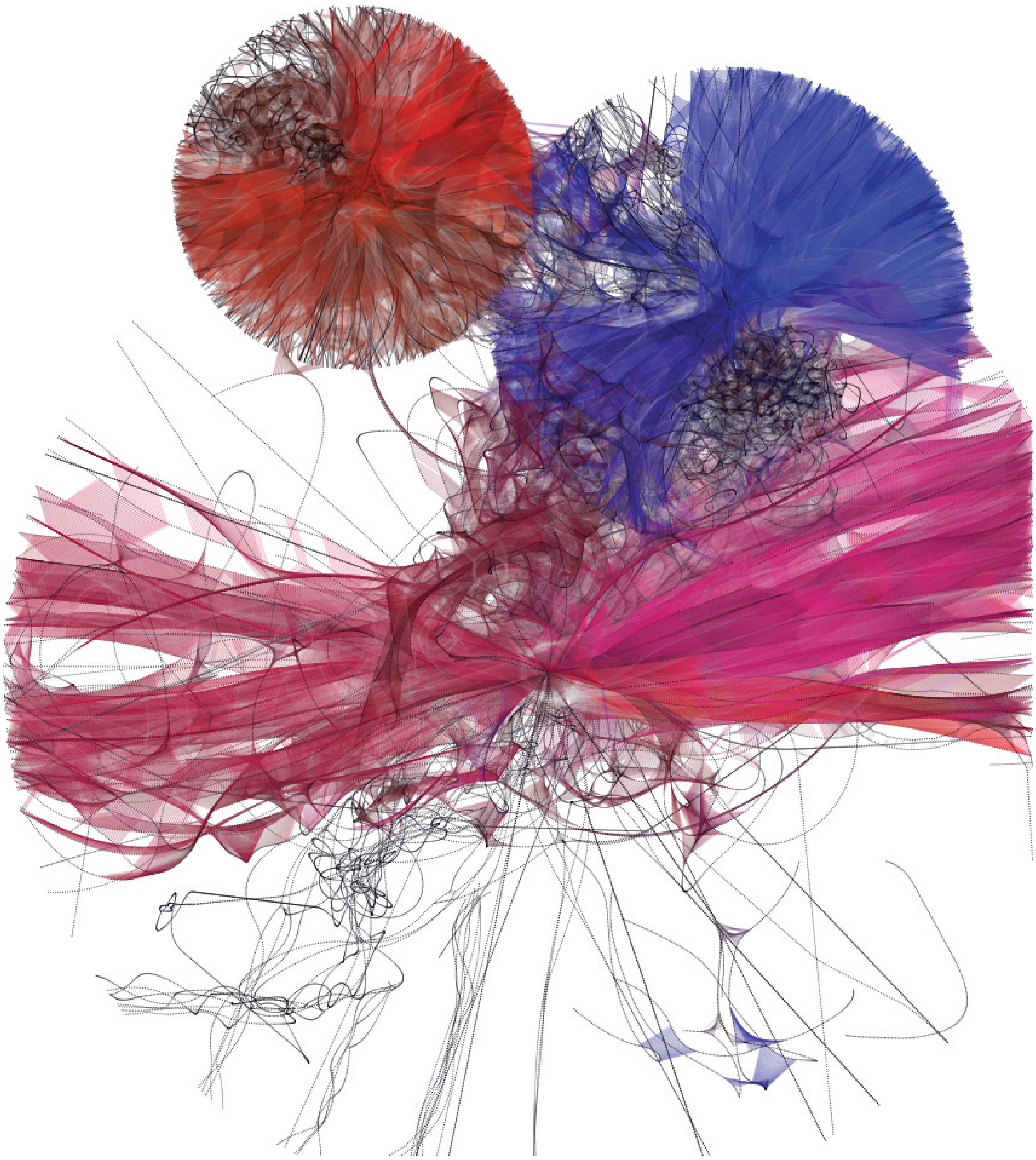
You Pretty Little Flocker began as a technical study exploring issues of control, manipulation and representation in algorithmic arts: How might we expand the space of possibilities? How might we steer the system through these without sabotaging the core self-organising processes? Is the generative potential or aesthetic appeal of these systems inherent in the model, or tied to particular rendering methods?

see more on: ecila.org

You Pretty Little Flocker

(Expanding the Aesthetic State Space of Biologically inspired Models)

Alice Eldridge
alicee@sussex.ac.uk



pob (Size Preference = Min)

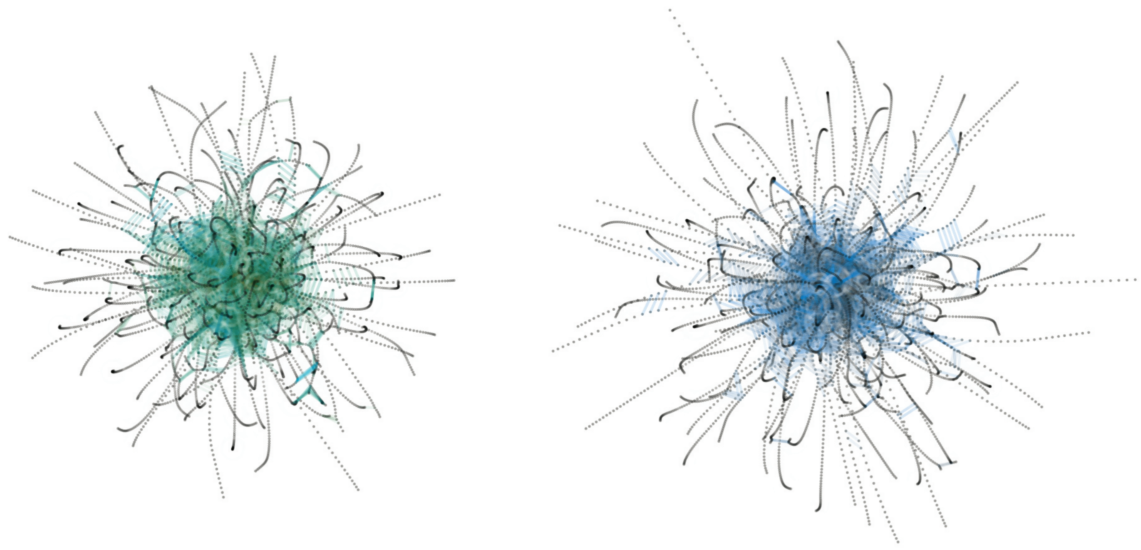
In these images, the basic flocking algorithm (Reynolds) is modified to include size-specific influence. Interactions are rendered by drawing lines between nearby boids, with HSV values mapped to agent variables (size, distance etc.). Different families of forms can be explored by altering the size preference (SP). Even in the static representations, a basic bio-logic shines through.

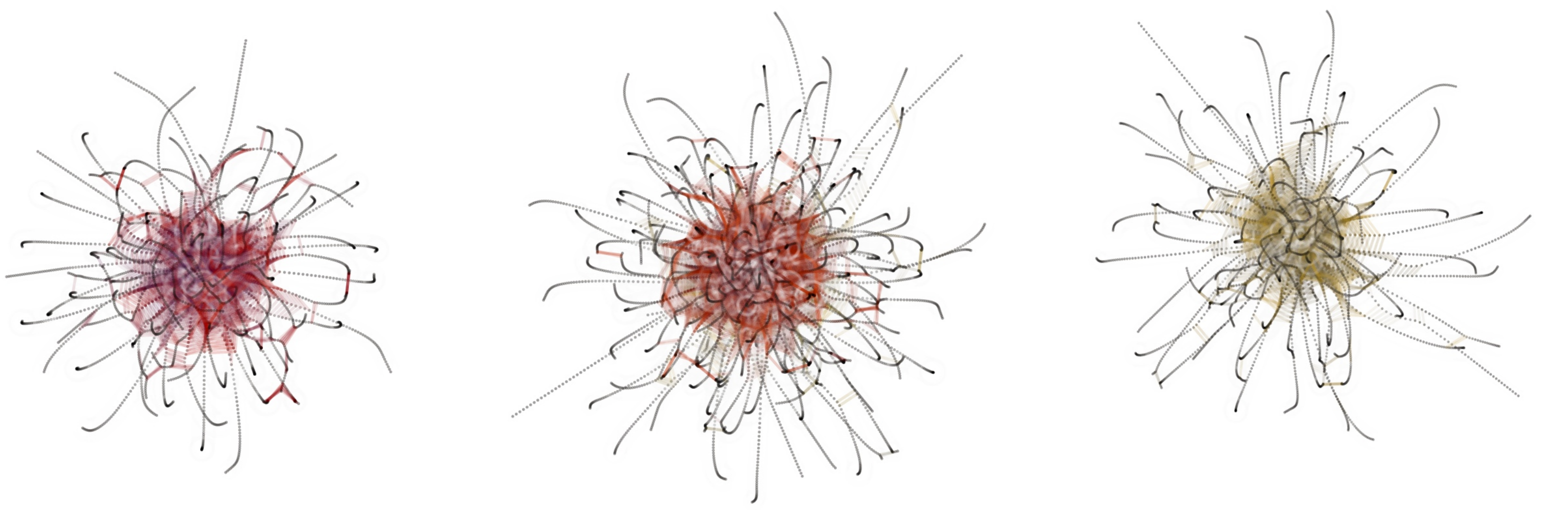
see more on: ecila.org

You Pretty Little Flocker

(Expanding the Aesthetic State Space of Biologically inspired Models)

Alice Eldridge
alicee@sussex.ac.uk

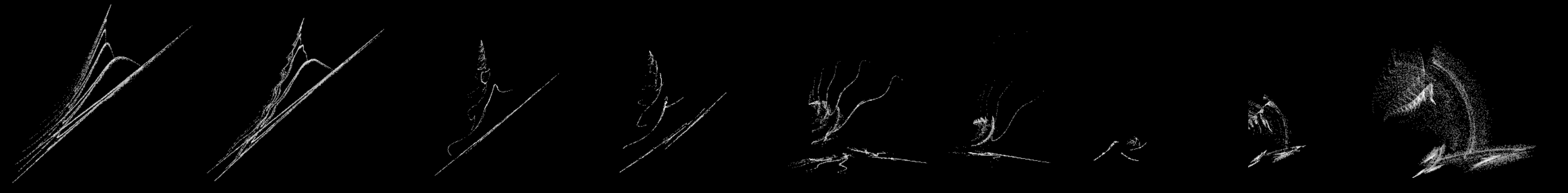




smallTriple_05blue
smallRedTriple

Biologically-inspired models promise a rich compendium for the generative arts. When playing with these models, it becomes apparent that the emergent dynamics occupy only a fraction of the entire potential state-space of the system. How then, might we go beyond simply visualising scientific simulations and manipulate these models for use in design and creative art contexts?

see more on: ecila.org

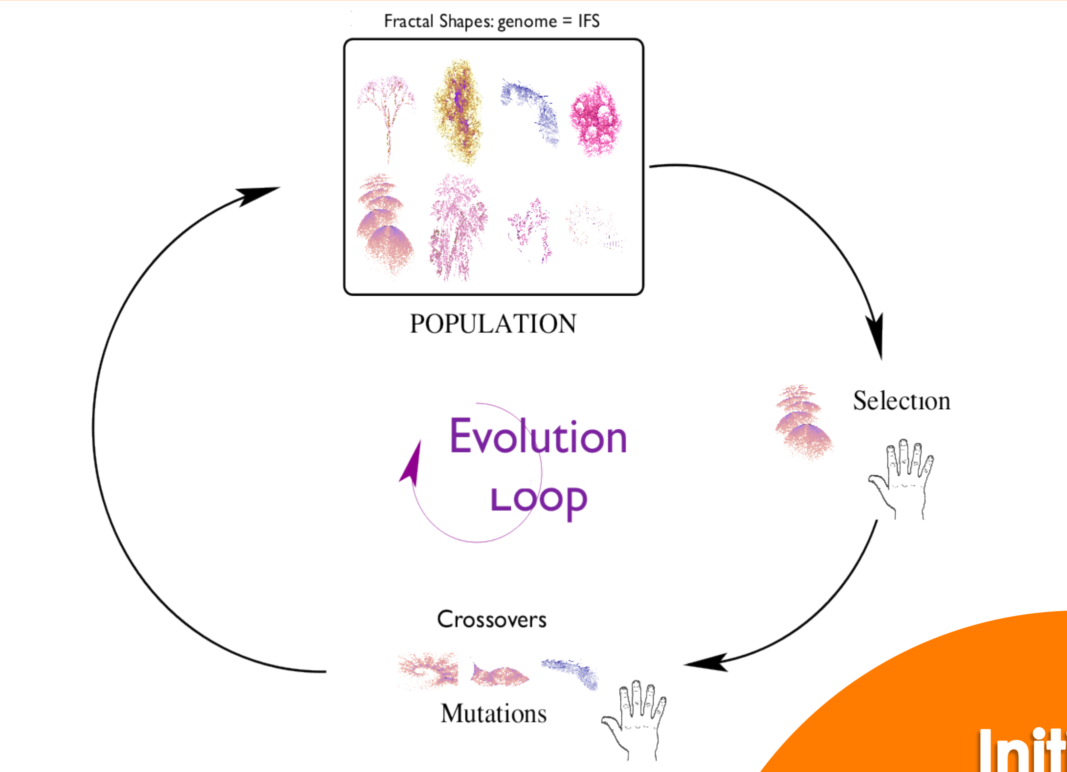


ArtiE-Fract, used by Anabela Costa, visual artist

Evelyne Lutton
INRIA Saclay-Ile-de-France, AVIZ team, France

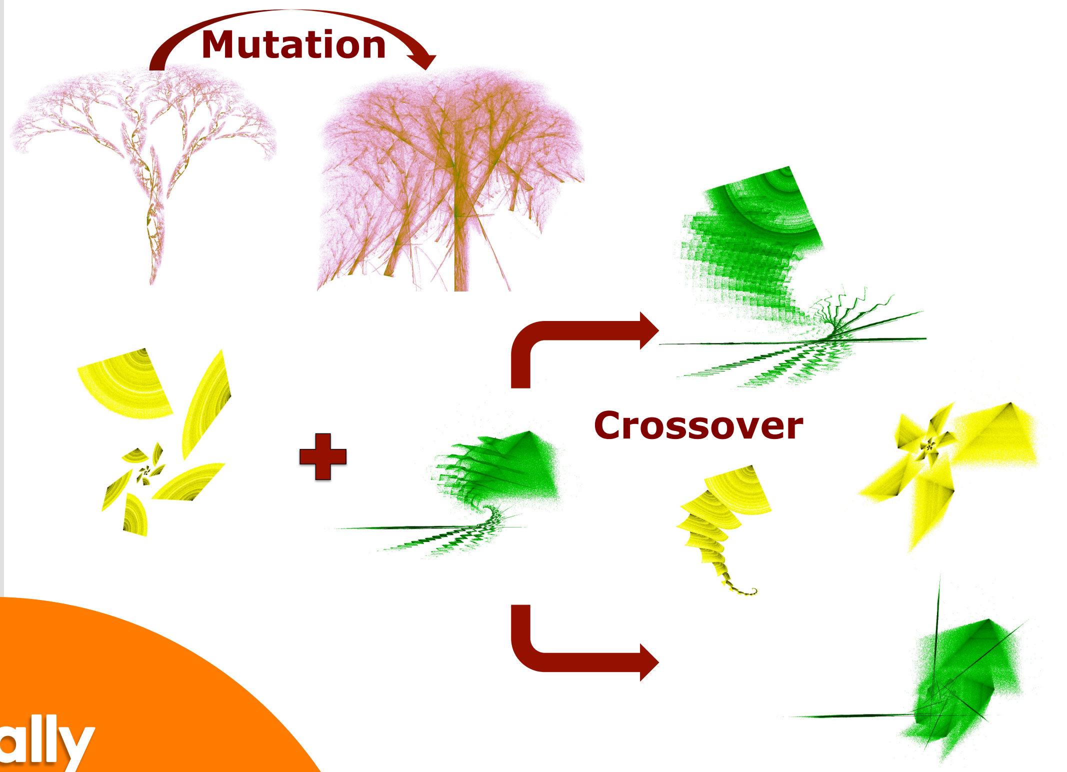
Anabela Costa
http://wwwanabelacostacom.blogspot.fr/p/landscape-2012.html

ArtiE-Fract : an interactive tool for shape design



A population of images is evolved, submitted to external pressure (aesthetic evaluation), offsprings of the best ones are obtained by mutation and crossover, to build a new generation.

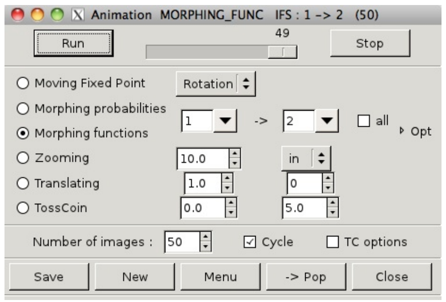
Simulated evolution of a population of fractals



The genetic operators can be randomly or manually controlled

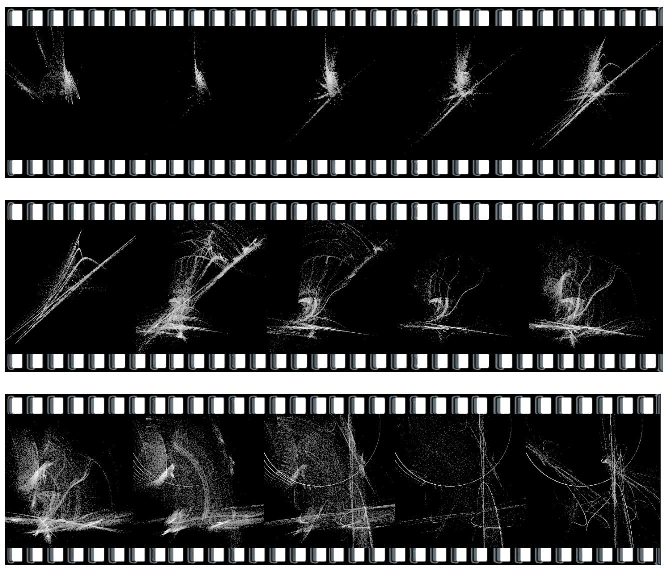
Initially developed for static images design, ArtiE-Fract is also convenient for video creation.

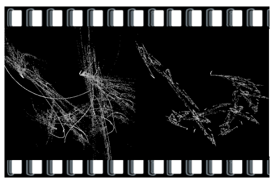
The video sequences design tool



Various animation tools are available: linear morphing of functions, of probabilities, controlled movements of fixed points, zooming, or progressive computation precision.

Landscapes : the making of





A complex morphing with several attractors

- Focus on aesthetic of movements more than on image content.
- Evolved sequences are used as raw material for video montage.

INVENTEURS DU MONDE NUMÉRIQUE

For further information:
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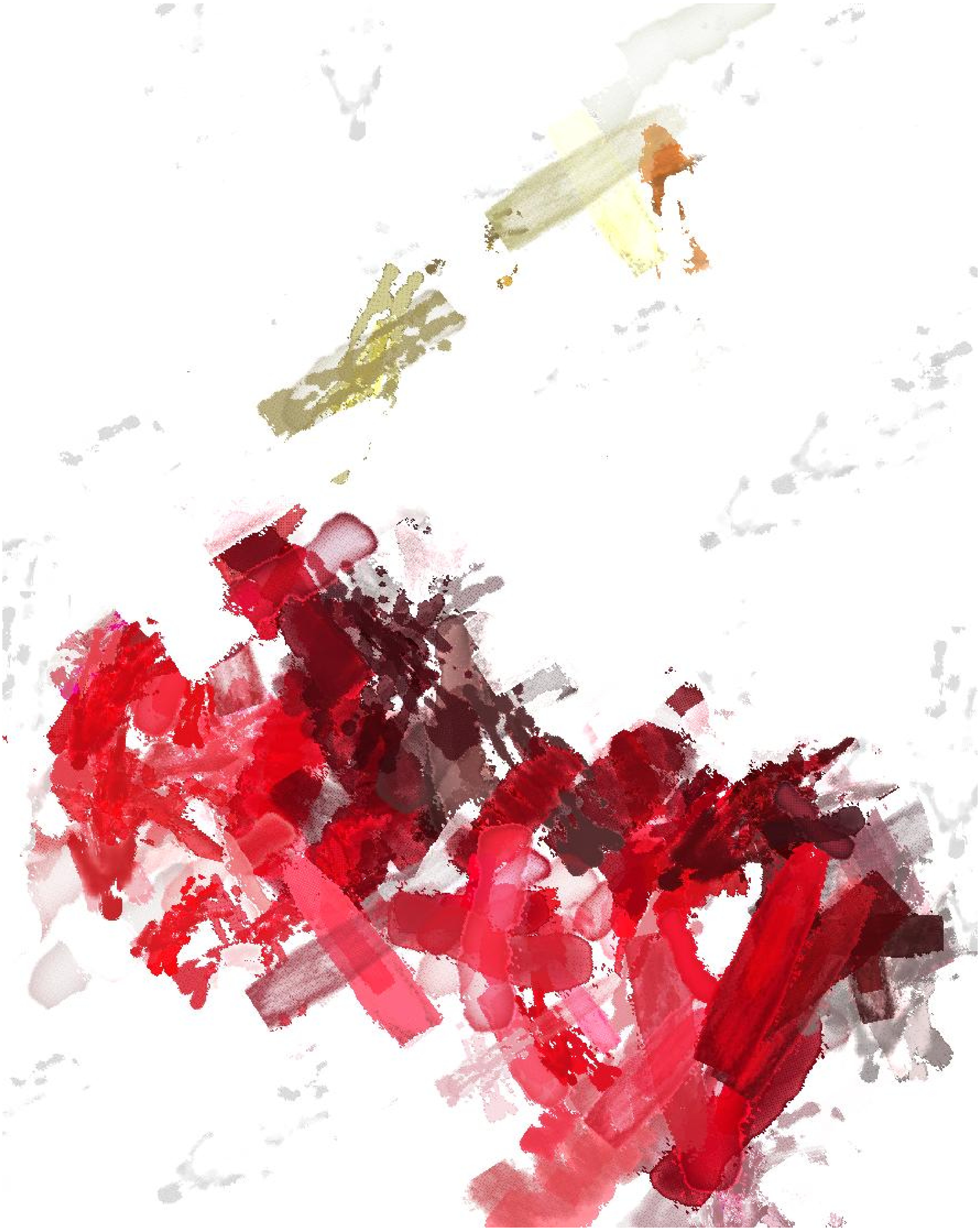
Genetic Programming

(non-photorealistic images evolved through genetic programming)

Brian J. Ross – Maryam Baniasadi

bross@brocku.ca, mary_baniasadi@hotmail.com



Cherries

Genetic programming is used to evolve painterly, non-photorealistic images. The genetic programming system takes an input image, and re-renders it by applying computed colour and paintbrush effects. A number of aesthetic measurements evaluate the quality of the final rendered image.

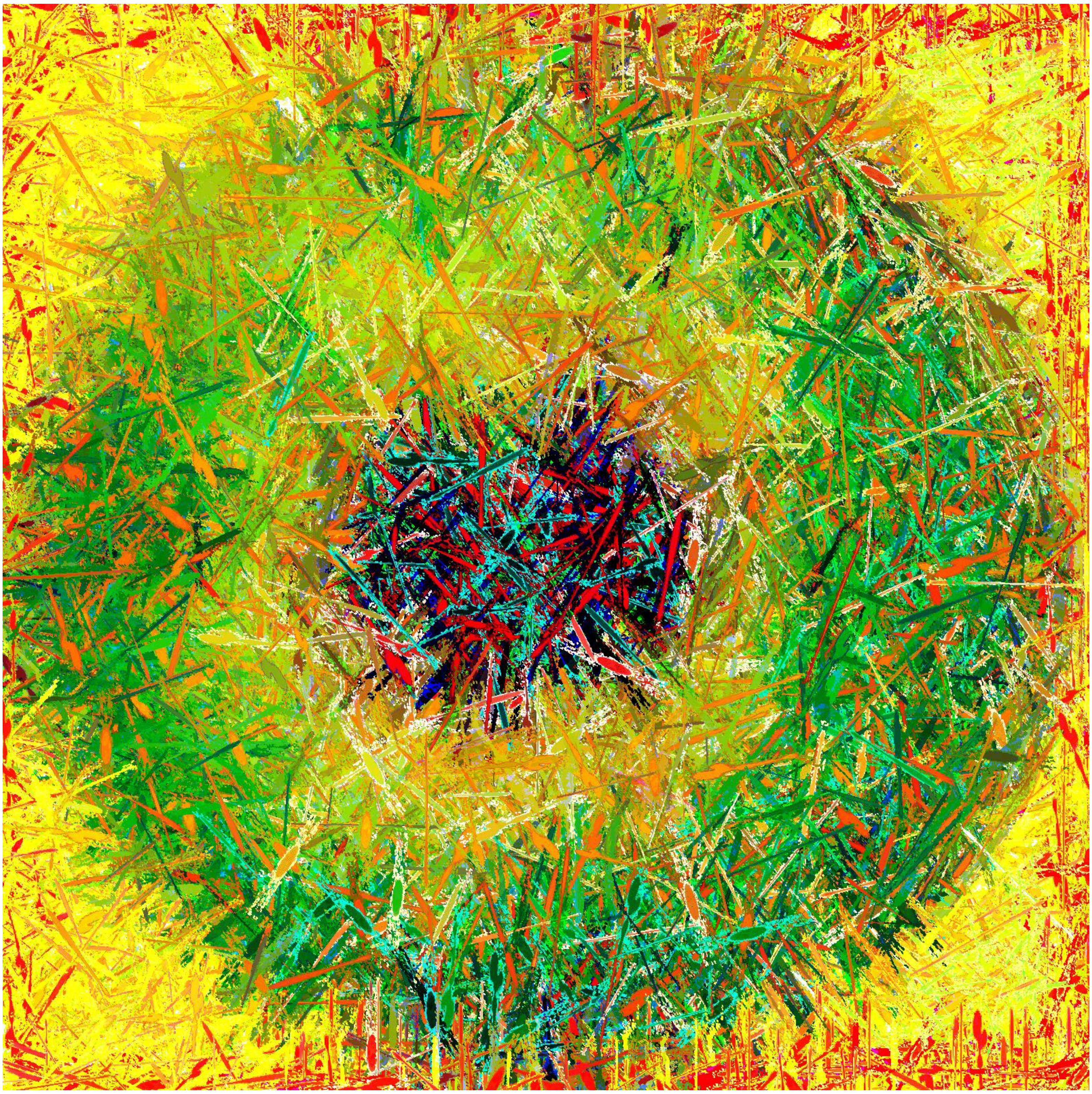
see more on: www.cosc.brocku.ca/~bross/gpnpr/

Genetic Programming

(non-photorealistic images evolved through genetic programming)

Brian J. Ross – Maryam Baniasadi

bross@brocku.ca, mary_baniasadi@hotmail.com



Mandala

Genetic programming is used to evolve painterly, non-photorealistic images. The genetic programming system takes an input image, and re-renders it by applying computed colour and paintbrush effects. A number of aesthetic measurements evaluate the quality of the final rendered image.

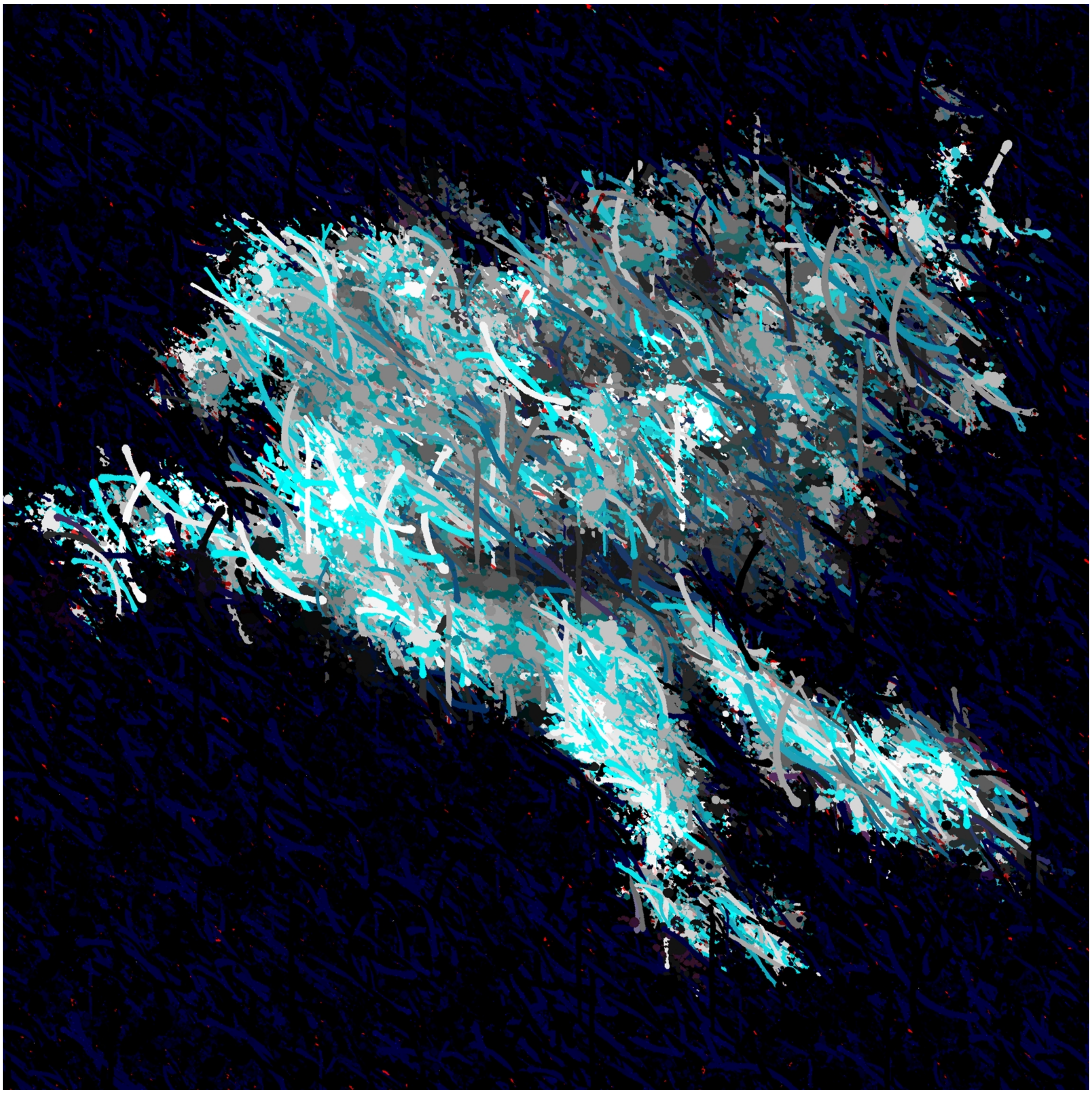
see more on: www.cosc.brocku.ca/~bross/gpnpr/

Genetic Programming

(non-photorealistic images evolved through genetic programming)

Brian J. Ross – Maryam Baniasadi

bross@brocku.ca, mary_baniasadi@hotmail.com



Pegasus2

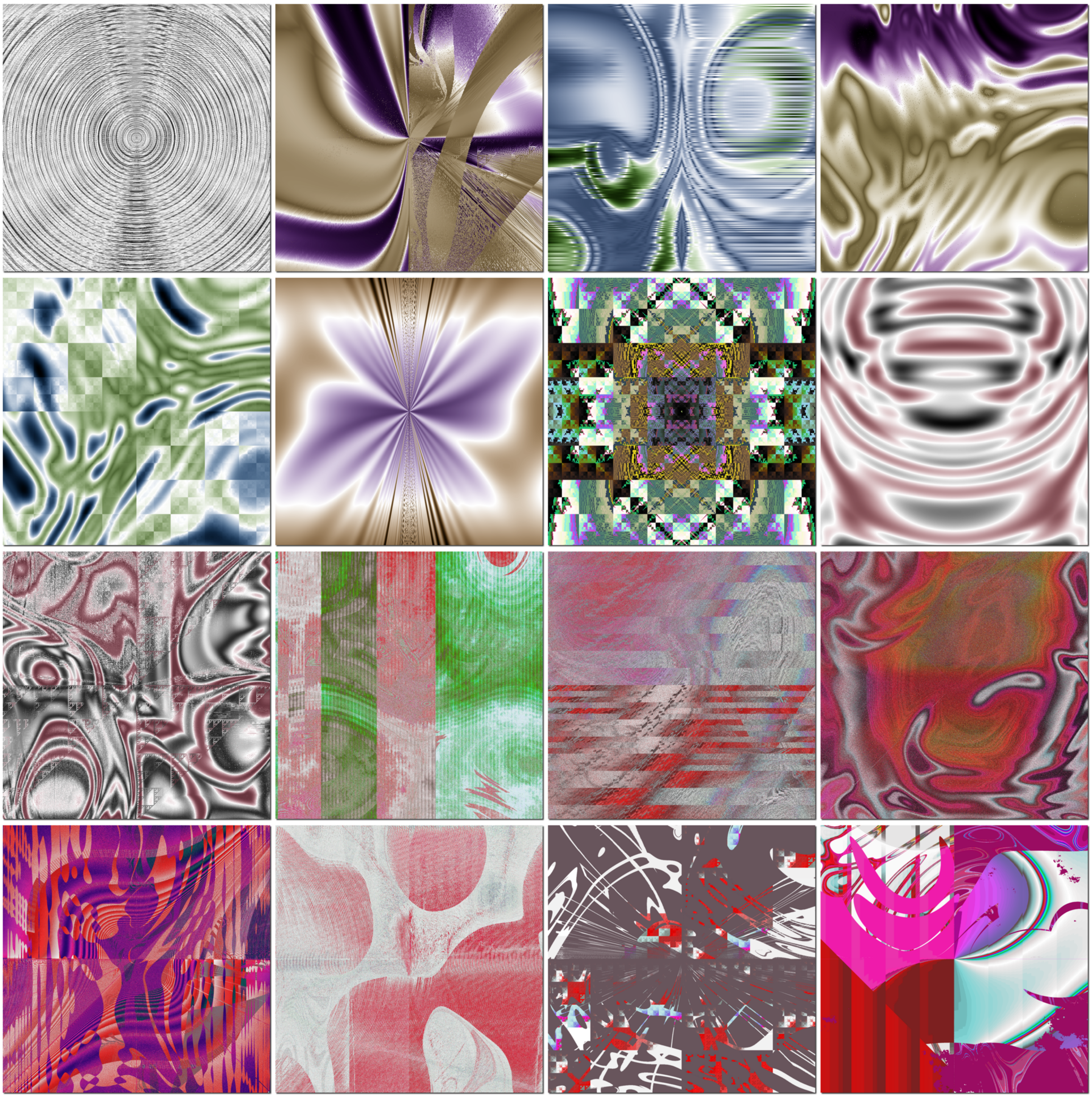
Genetic programming is used to evolve painterly, non-photorealistic images. The genetic programming system takes an input image, and re-renders it by applying computed colour and paintbrush effects. A number of aesthetic measurements evaluate the quality of the final rendered image.

see more on: www.cosc.brocku.ca/~bross/gpnpr/

Autonomous Evolutionary Art

(Symbolic Expressions)

Eelco den Heijer
eelcodenheijer@gmail.com



*All images were evolved using symbolic expressions as the genotype (Sims style), and an aesthetic measure as the fitness function (These images were **not** evolved using Interactive Evolutionary Computation (or IEC))*

see more on: `flickr.com` (search Eelco den Heijer)

(Autonomous) Evolutionary Art

(Scalable Vector Graphics)

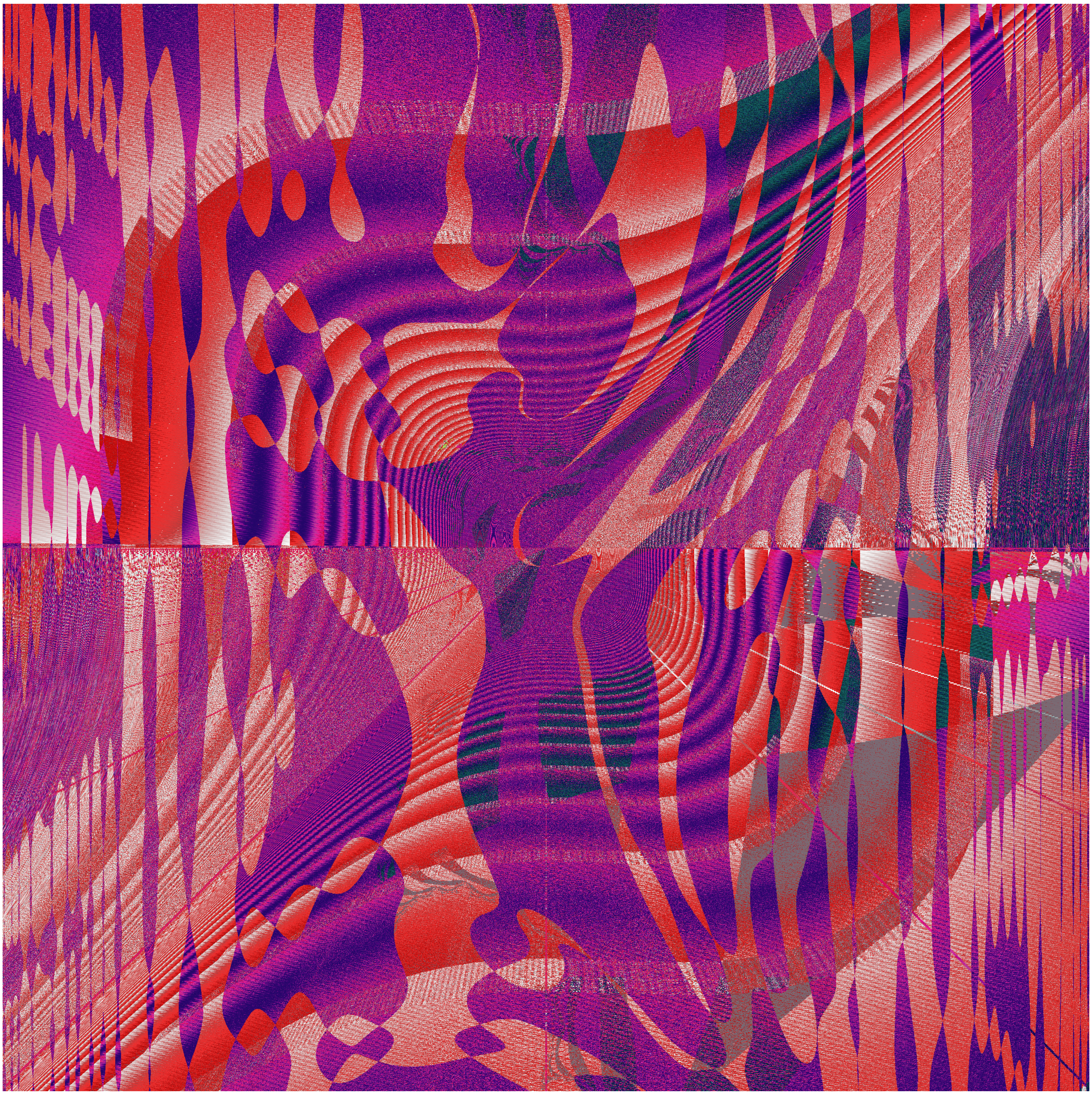
Eelco den Heijer
`eelcodenheijer@gmail.com`

*These images were evolved using the SVG genotype, which is more powerful than the symbolic expression genotype, and enables **representational** content (which is very difficult with symbolic expressions). Both IEC and autonomous evolution were used.*

see more on: `flickr.com` (search Eelco den Heijer)

Autonomous Evolutionary Art
(Symbolic Expressions)

Eelco den Heijer
eelcodenheijer@gmail.com



20130930_182616_355_7634

This image was evolved using symbolic expressions as the genotype (Sims style), and an aesthetic measure based on Facticity as the fitness function (this image was ***not*** *evolved using Interactive Evolutionary Computation (or IEC)).*

see more on: flickr.com (search Eelco den Heijer)

ArtiE-Fract

(artificial evolution of fractals attractor models)

Emmanuel Cayla

emmanuel.cayla@laposte.net

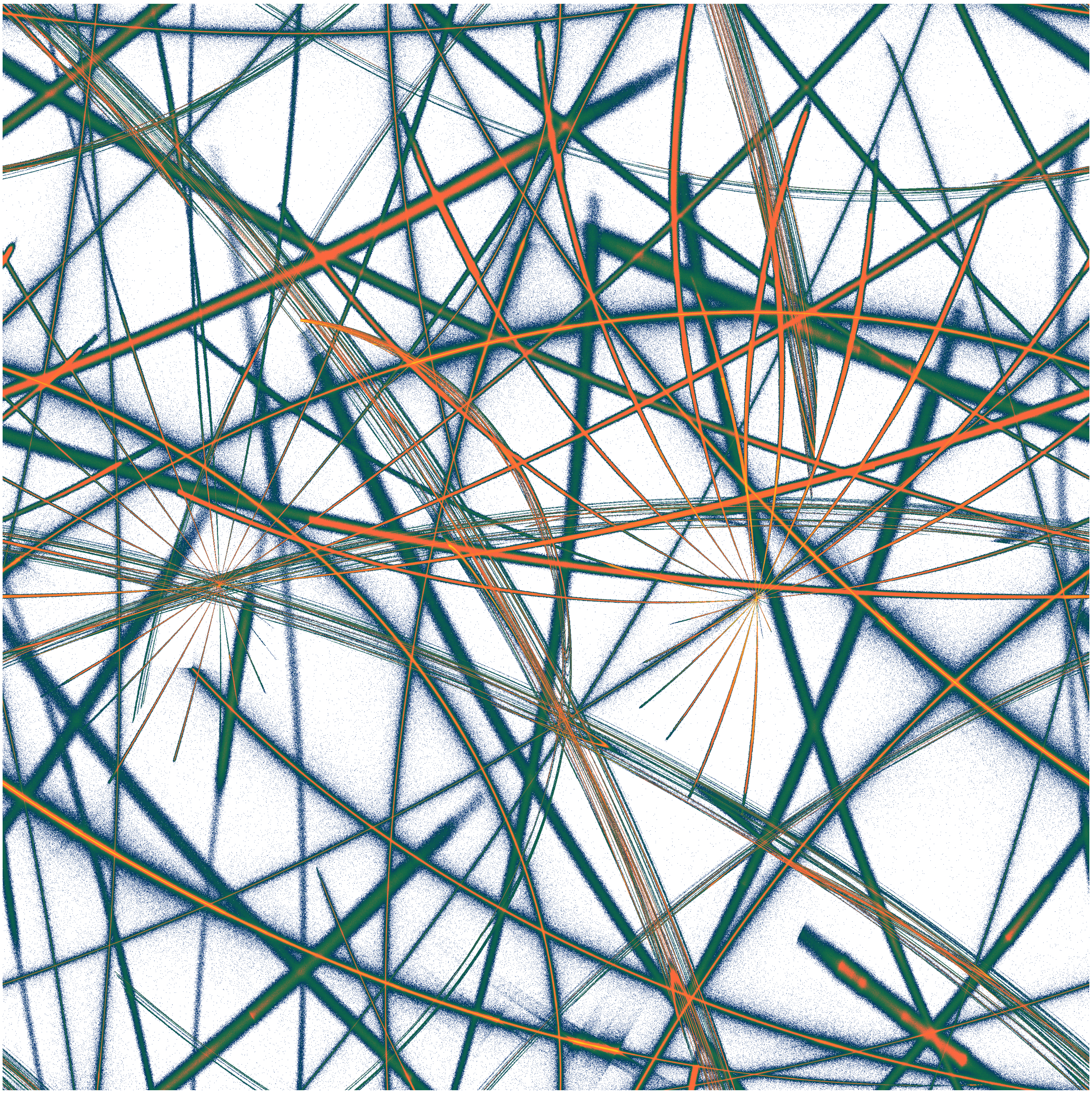
Arbres sombres

$$
\begin{aligned}
f_1^{mix} &= \begin{cases} \left(0.89\left(\left(\left(-0.25\left(cos\left(((0.19x)+(-0.15y))^2\right)\right)\right)+0.75\right)(x-0.48)\right)\right)+0.47 \\ \left(\frac{-0.08}{log((-19x)+26)}\right)+((0.47y)+0.12) \end{cases} \\
f_2^{mix} &= \begin{cases} \left(((0.19x)+(-0.15y))^2\right)+(-0.49x) \\ (-0.018x)+(0.49y) \end{cases} \\
f_3^{aff} &= \begin{cases} (-0.8x)+(0.56y) \\ (-0.26x)+(-0.32y) \end{cases}
\end{aligned}
$$

ArtiE-Fract

(artificial evolution of fractals attractor models)

Emmanuel Cayla
emmanuel.cayla@laposte.net



Bluegrass autumn

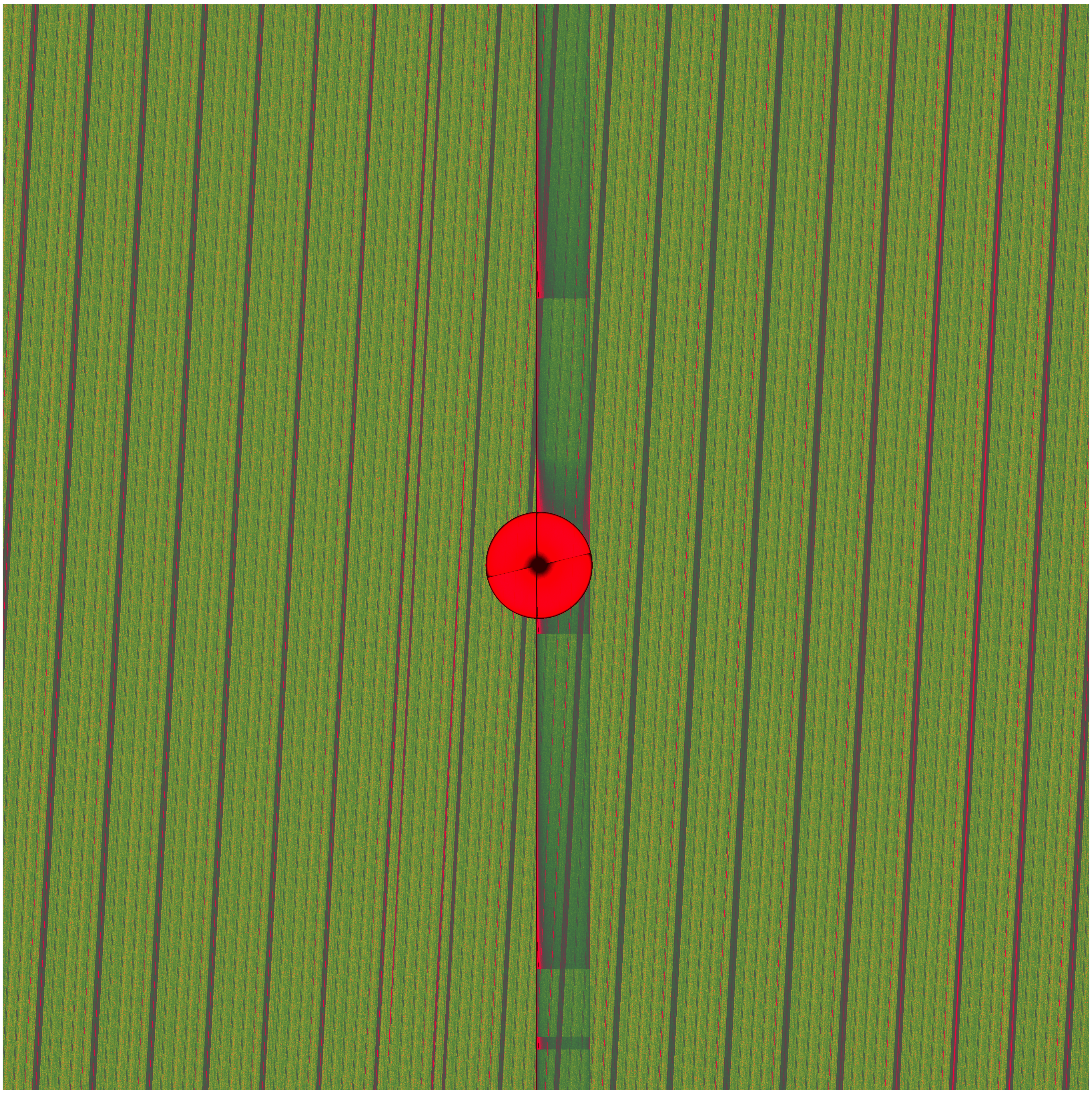
$$
\begin{aligned}
f_1^{pol} &= \begin{cases} noisex\left(0.08-(0.77\,(mod\,(-8-(mod\,((mod\,(\theta-5,6))-5,6))\,,6)))\,,3{\cdot}10^{-4}\right) \\ \left(noisex\left(\left(\left(cos\left(((0.31\,(mod\,(\theta-5,6)))+0.99)^2\right)\right)+(-0.84\,(mod\,(\theta-5,6)))\right)-\ \ldots \right.\right. \end{cases} \\
f_2^{pol} &= \begin{cases} 0.08-((mod\,(-8-(mod\,(\theta-8,6))\,,6))\,0.77) \\ (-0.046\rho)+(-0.84\theta) \end{cases} \\
f_3^{pol} &= \begin{cases} ((0.44\,(mod\,(2\theta,0.92)))+(0.56\,(mod\,(2\theta,0.92))))+((-0.22\rho)+(-0.028\theta)) \\ \left(\left(0.39\left(noisen\left(\left(\frac{-0.08}{log((0.49(mod(2\theta,0.92)))+26)}\right)+((0.88\theta)+0.12)\,,0.004\right)\right)\right)+\ \ldots \right. \end{cases} \\
f_4^{pol} &= \begin{cases} noisex\left(0.08-(0.77\,(mod\,(-8-(mod\,((mod\,((mod\,(-8-(mod\,(\theta-8,6))\,,6))-\ \ldots \right. \\ 2-\left(noisex\left(\left(\left(cos\left(((0.31\,(mod\,((mod\,(-8-(mod\,(\theta-8,6))\,,6))-2,6)))+\ \ldots \right.\right.\right.\right.\right. \end{cases} \\
f_5^{pol} &= \begin{cases} ((0.44\,(mod\,(2\theta,0.92)))+(0.56\,(mod\,(2\theta,0.92))))+((-0.22\rho)+(-0.028\theta)) \\ \left(\left(0.39\left(noisen\left(\left(\frac{-0.08}{log((0.49(mod(2\theta,0.92)))+26)}\right)+((0.88\theta)+0.12)\,,0.004\right)\right)\right)+\ \ldots \right. \end{cases}
\end{aligned}
$$

ArtiE-Fract

(artificial evolution of fractals attractor models)

Emmanuel Cayla

emmanuel.cayla@laposte.net



papillons Point-rouge

$$f_1^{pol} = \begin{cases} sin\left(noisen\left(0.064, -2\right)\right) \\ \left(\left(\left(\left(-8-\rho\right)^4\right)+0.11\right)^{0.5}\right)+2 \end{cases}$$

$$f_2^{mix} = \begin{cases} exp\left(-\left(0.57\left(noisex\left(\left(mod\left(y-5,6\right)\right)+3,x\right)\right)\right)^2\right) \\ y+1 \end{cases}$$

$$f_3^{mix} = \begin{cases} \left(\left(-0.048\left(exp\left(-\left(0.57\left(noisex\left(147-y,x\right)\right)\right)^2\right)\right)\right)+\left(0.055\left(\left(\left(\left(-9-\ \ldots \right.\right.\right.\right.\right.\right. \\ \left(\left(1\left(\left(\left(\left(-9-\left(root\left(\left(x^2\right)+\left(y^2\right)\right)\right)\right)^4\right)+0.11\right)^{0.5}\right)\right)-\left(-0.048\left(\left(\left(\left(-8-\ \ldots\right.\right.\right.\right.\right.\right. \end{cases}$$

Studies for the 2013 ECJ Cover page

(computer images built using ArtiE-Fract)

Evelyne Lutton
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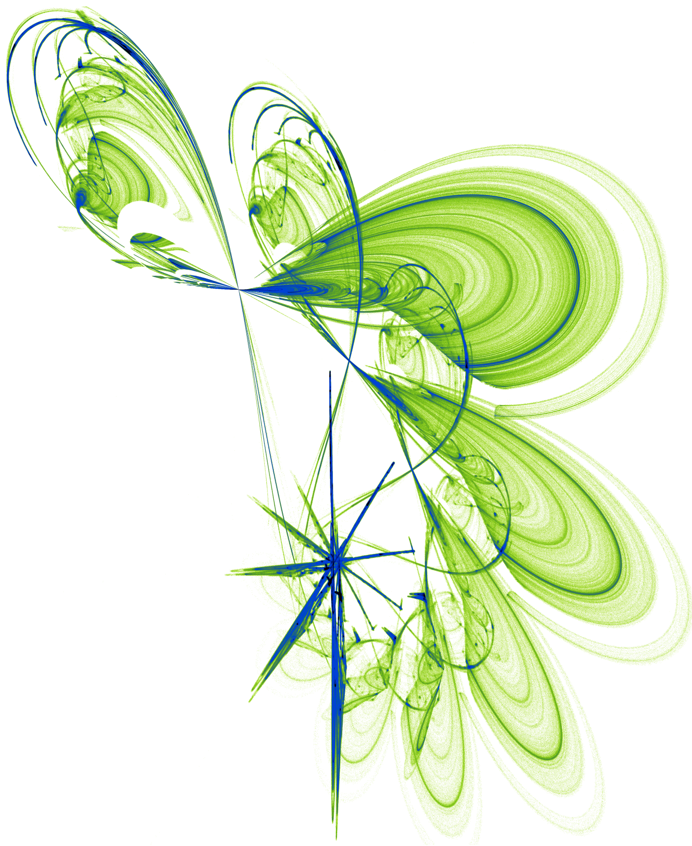
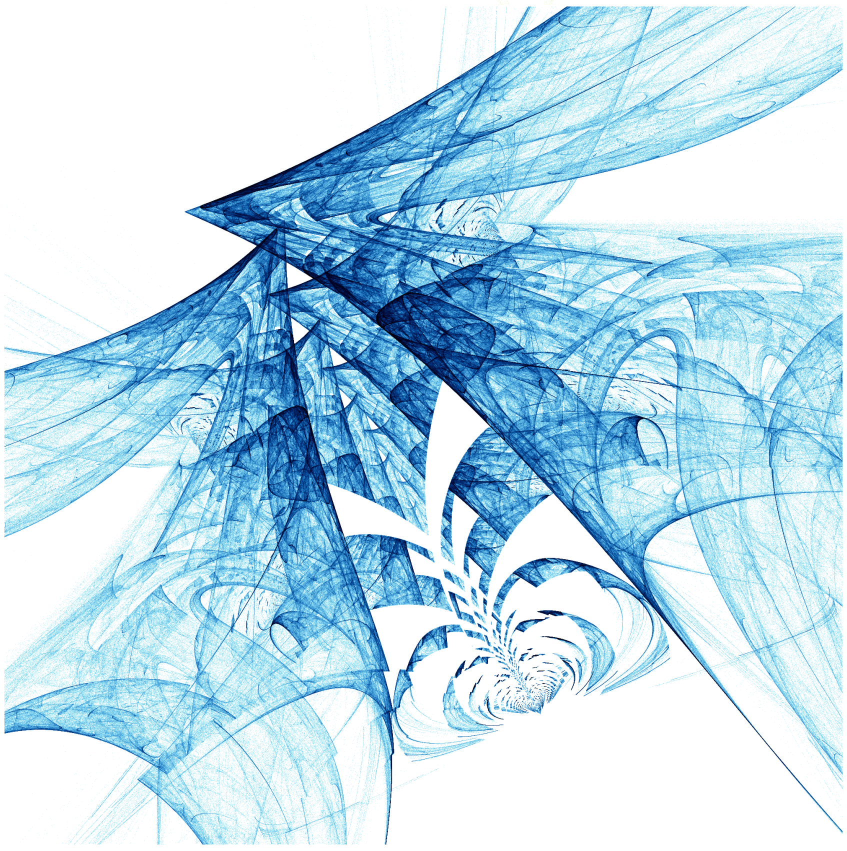
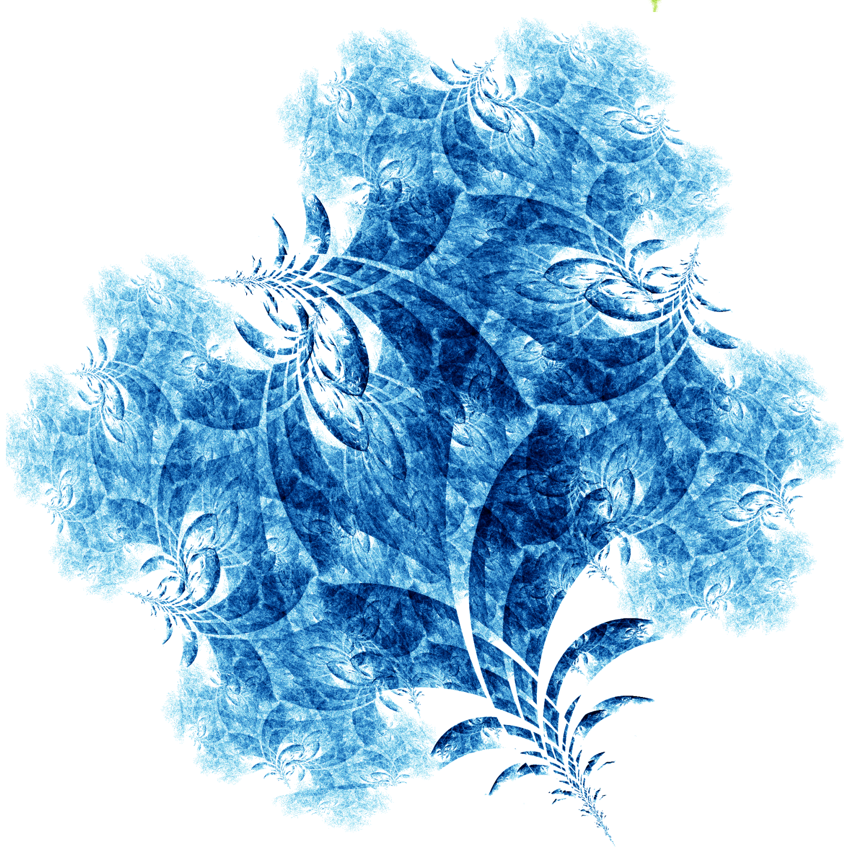






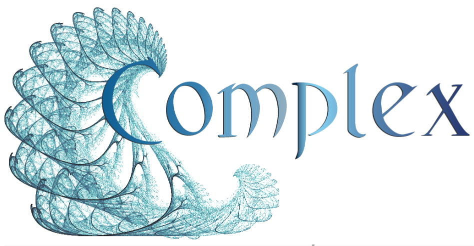
This collection of images is a study for the design of the cover page of the Evolutionary Computation Journal, published by MIT Press. They have been created using ArtiE-Fract, an interactive evolution tool for the design of images based on fractal attractors models.

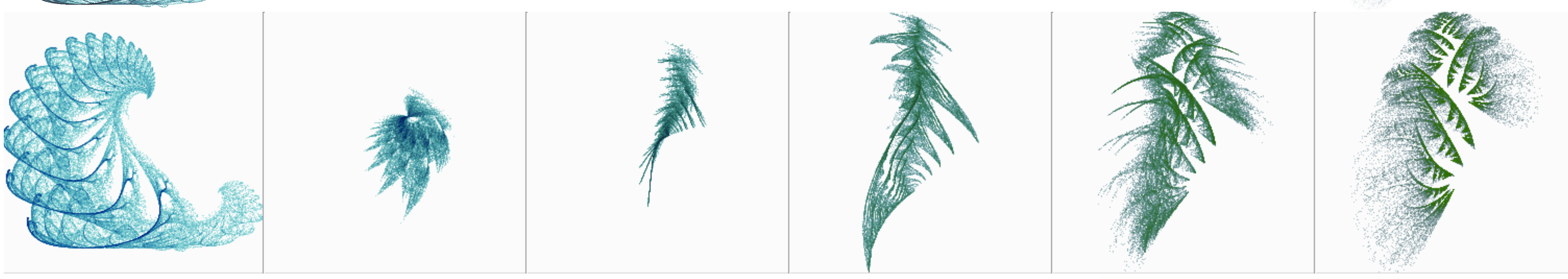
see more on: `http://evelyne.lutton.free.fr/Presentation-Cetoine-Avril2013.pdf`

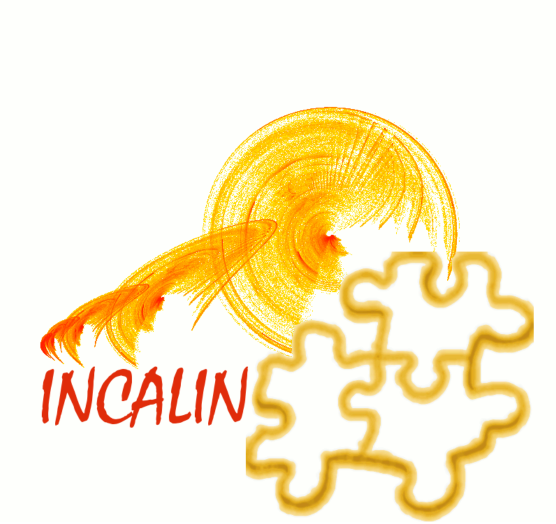
Logos and Morphings

(computer images built using ArtiE-Fract)

Evelyne Lutton
evelyne.lutton@grignon.inra.fr







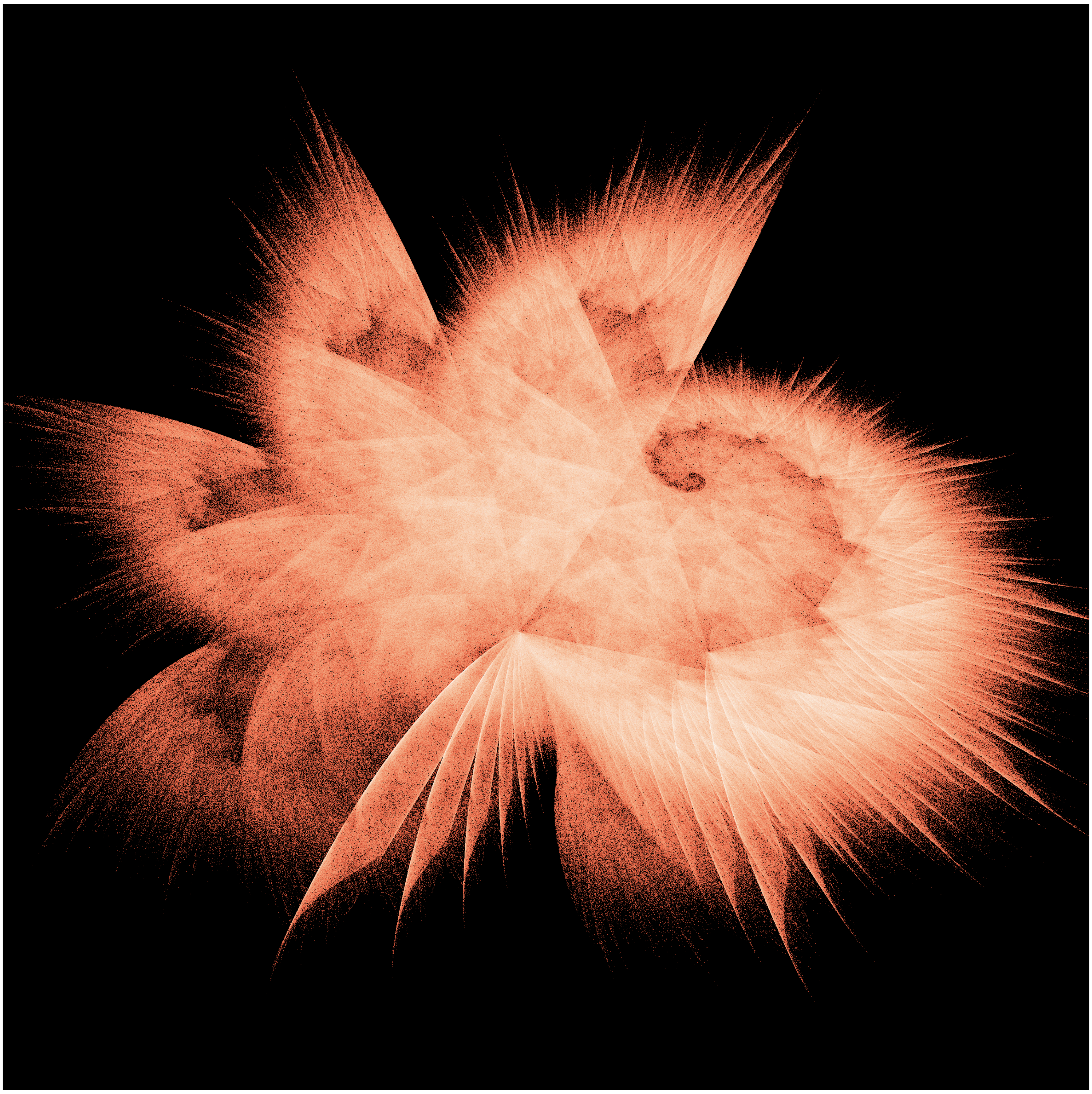
These pictures are showing various examples of logos created using ArtiE-Fract, an interactive evolution tool for the design of images, based on fractal attractors models.

see more on: `http://evelyne.lutton.free.fr/Presentation-Cetoine-Avril2013.pdf`

Red Spirals

(computer images built using ArtiE-Fract)

Evelyne Lutton
evelyne.lutton@grignon.inra.fr

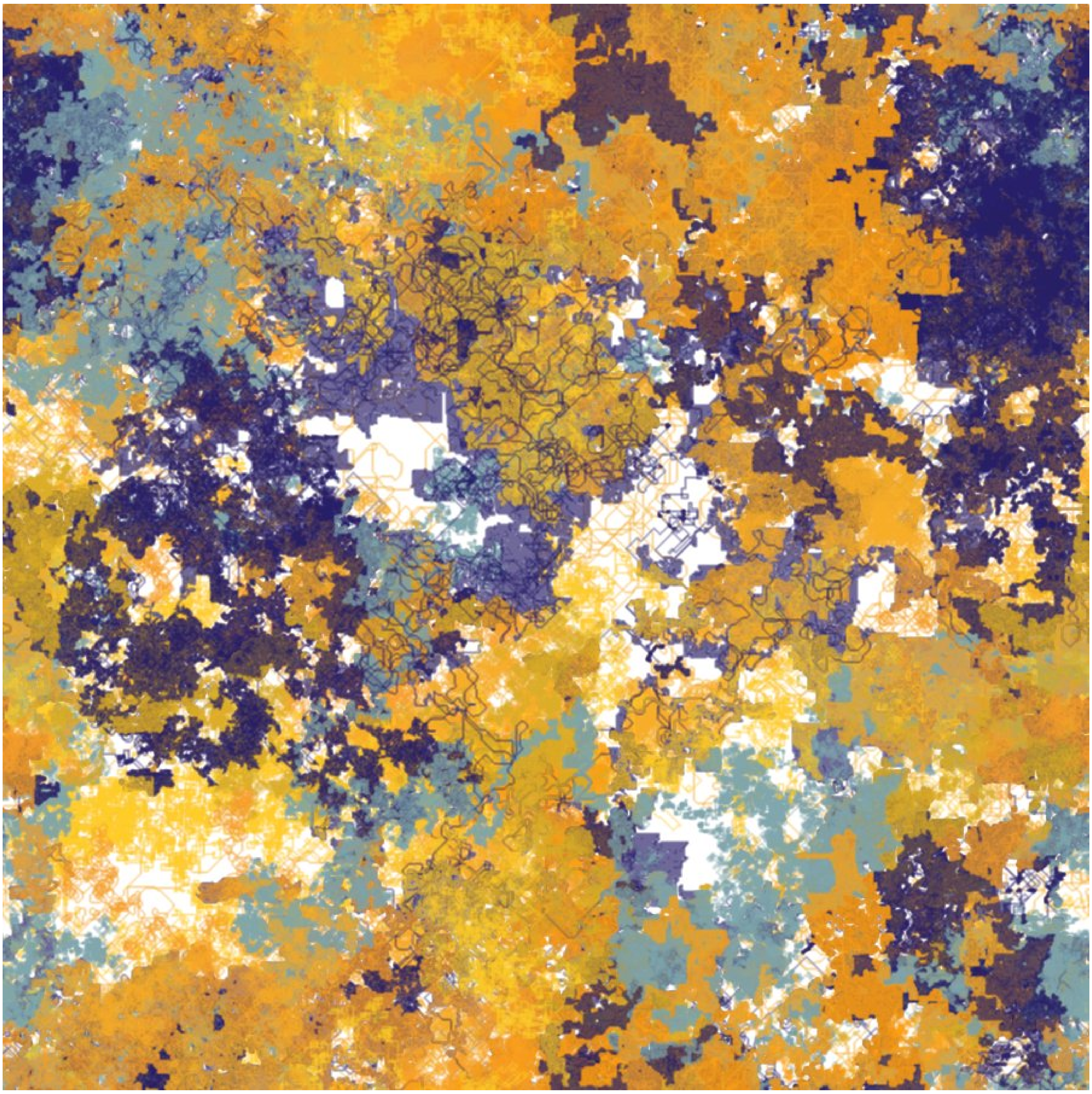


This image has been created using ArtiE-Fract, an interactive evolution tool for the design of images based on fractal attractors models.

see more on: http://evelyne.lutton.free.fr/Presentation-Cetoine-Avril2013.pdf

Evolved Ant Painting

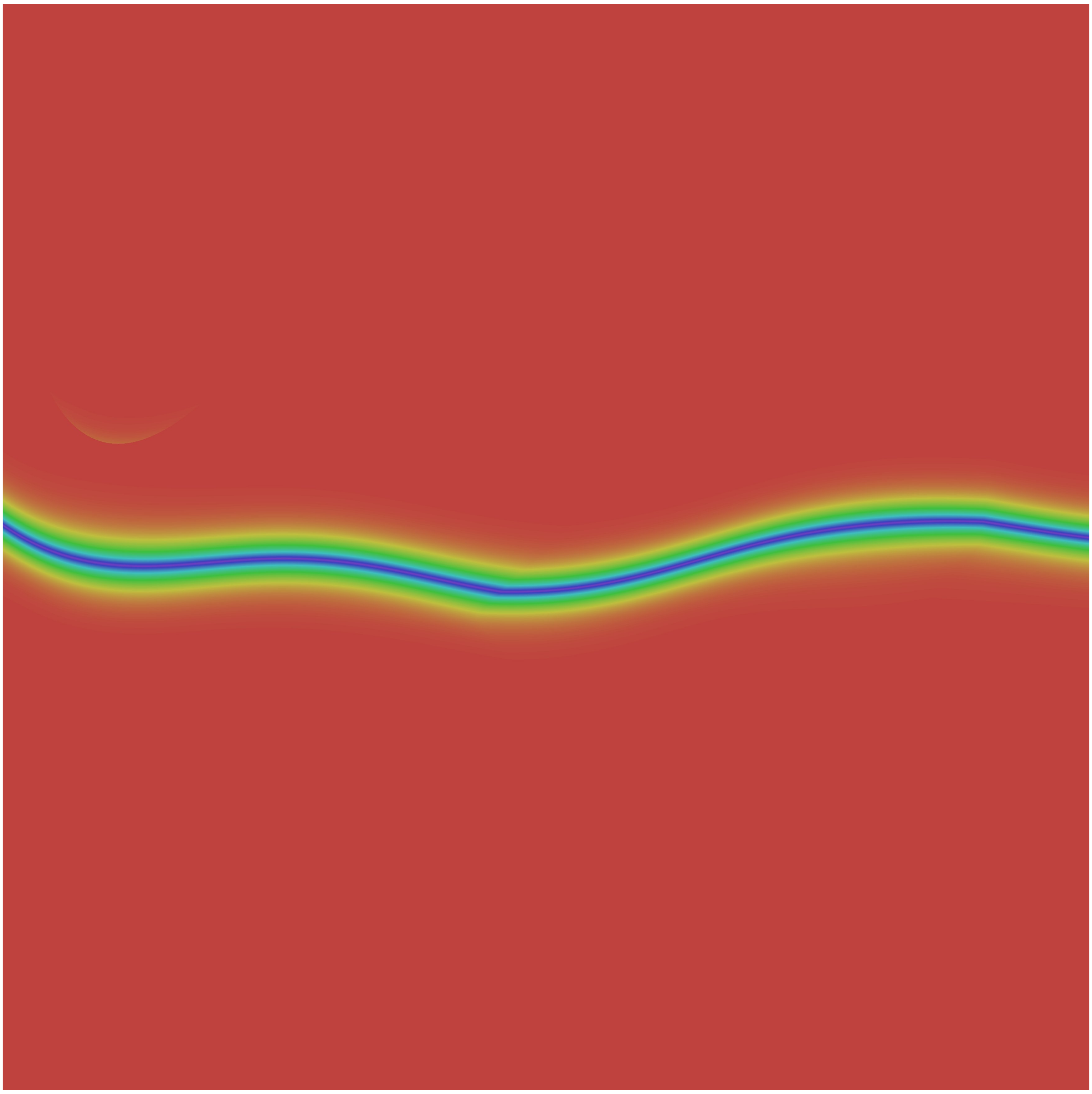
Gary Greenfield
ggreenfi@richmond.edu



This ant painting was evolved by optimizing an elementary function whose two arguments were the number of time steps ants spent searchimg for a preferred color (exploring) and the number of time steps ants spent following a preferred color (exploiting). Thus they are the first ant paintings evolved on the basis of ant behavior. The genomes used for the twelve ants are a variant of genomes devised for ant paintings introduced by Nicolas Monmarché.

Evolved Minimalist Art

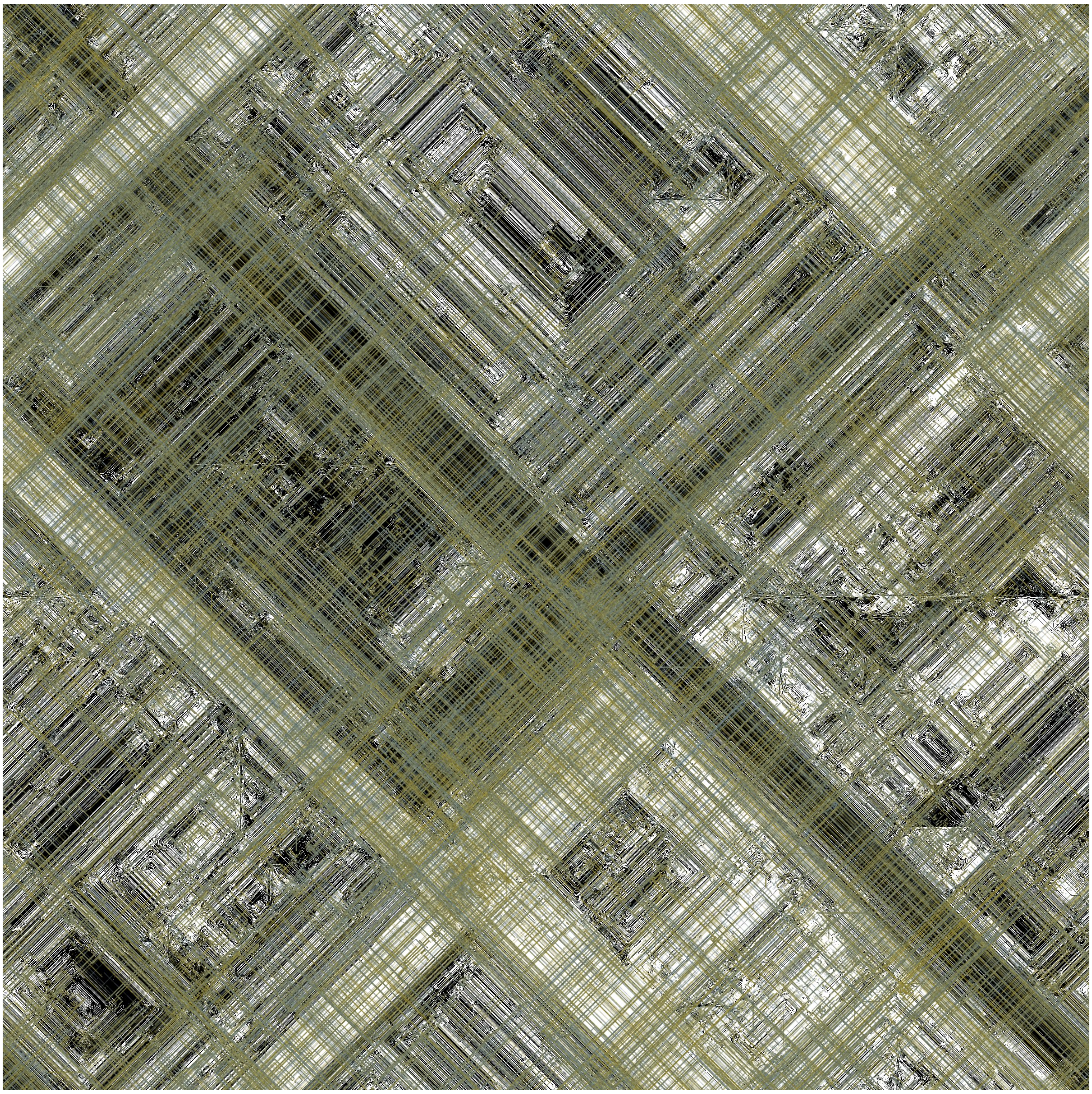
Gary Greenfield
ggreenfi@richmond.edu



This minimalist artwork was evolved by color segmenting abstract images that were generated using the "Evolving Expressions" method of Karl Sims into twenty-five, simply-connected regions and optimizing the number of region adjacencies. By identifying regions as vertices and adjacencies as edges, it can be shown that this is equivalent to evolving maximal planar graphs on twenty-five vertices.

Ant Pheromone Painting

Gary Greenfield
ggreenfi@richmond.edu



White and black colonies of simulated ants are placed on a virtual toroidal environment. Each cell of the environment exudes an invisible scent which evaporates and diffuses until it is first visited by an ant at which point it ceases to exude scent and is colored according to the deignated color of the visiting ant. The ants themselves exude attracting amd repelling pheromones which also evaporate and diffuse and they control the overpainting that is composited on previously visited cells. Here a total of 1000 ants were allowed to roam on a 2400 $\times$ 2400 grid for 30000 time steps.

Evolutionary Art Processes for non-objective and objective motifs

Günter Bachelier
guba@evogenio.com

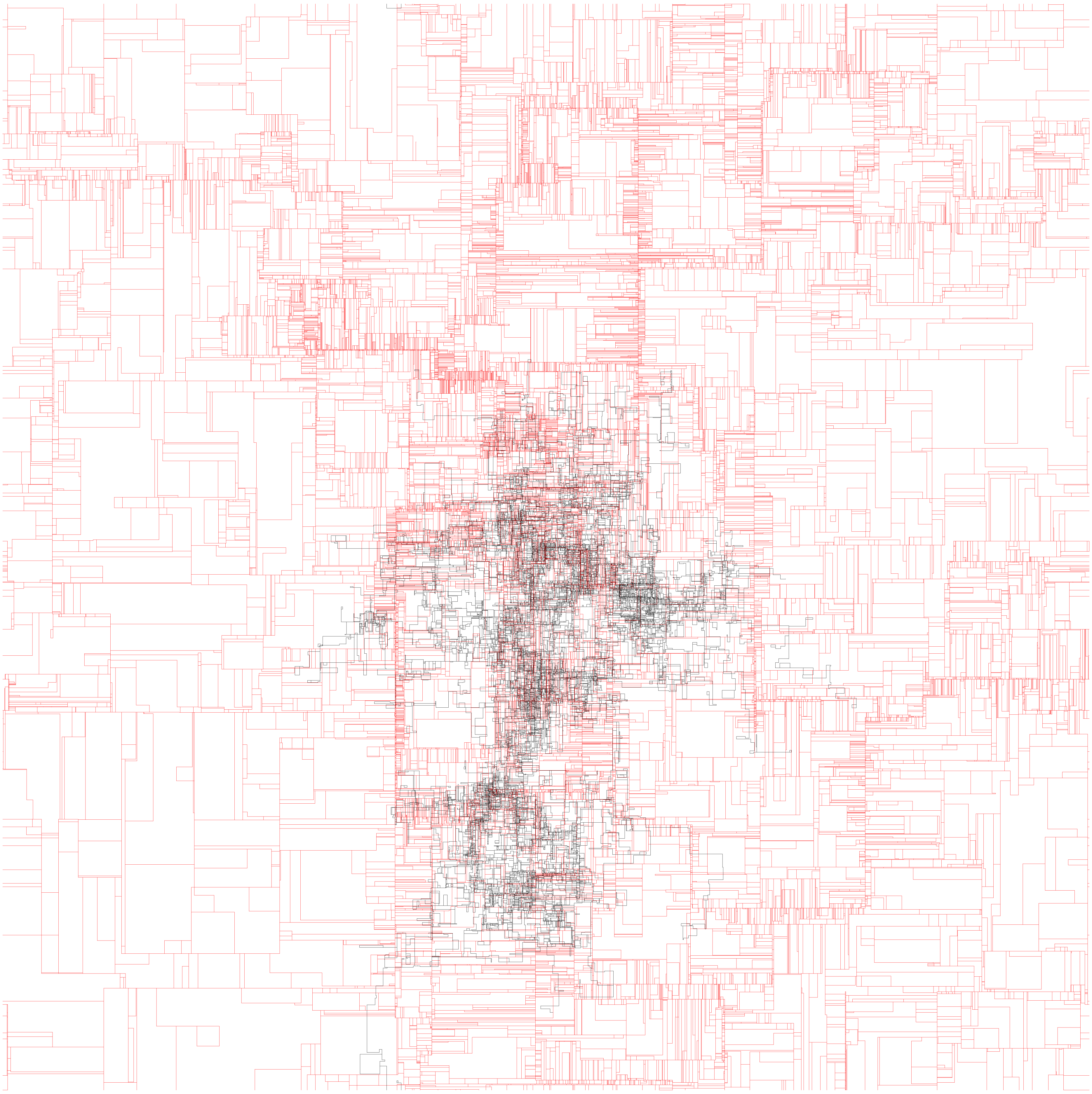
After developing some evolutionary art processes for non-objective geometric motif types for over a decade I extended my art processes in 2007 to be able to process objective motifs. The main focus were human portraits but I have also researched what kind of other motif types are working well with my art processes which are animal photography, erotic photography, photography of objects esp. technical objects (sub-genre of still live) and architecture photography (like the World Heritage site Völklingen Ironworks).
Based on those experiences with different types of photographic motifs I started in 2010 a long term project "Evolutionary Art History Appropriation" about self-reflection in art ("art comes from art") researching what kind of art oeuvre (in the public domain) can be assimilated by my evolutionary art processes. I have experimented among others with old masters like Caravaggio, some classical Modernism artist like Modigliani, ethnological art like African and Japanese masks, old Japanese prints (Ukiyo-e) from artists like Utamaro and Sharaku and animal illustrators of the 19th century like John Gould.

see more on: `flickr.com/photos/gbachelier/` and `www.evogenio.com`

Artificial Ant Paintings

(computer images built through insect behavior simulation)

Nicolas Monmarché
nicolas.monmarche@univ-tours.fr



AP20060530Bb

This image is obtained by the simulation of red and black ants laying colored pheromones during their random moves on the canvas. Phreromones are used to attract ants and competition can occur when the canvas is fully covered by pheromones. An interactive evolutionary algorithm is used to find interesting color/behavior settings for the ants.

see more on: `nicolas.monmarche.free.fr`

Artificial Ant Paintings

(computer images built through insect behavior simulation)

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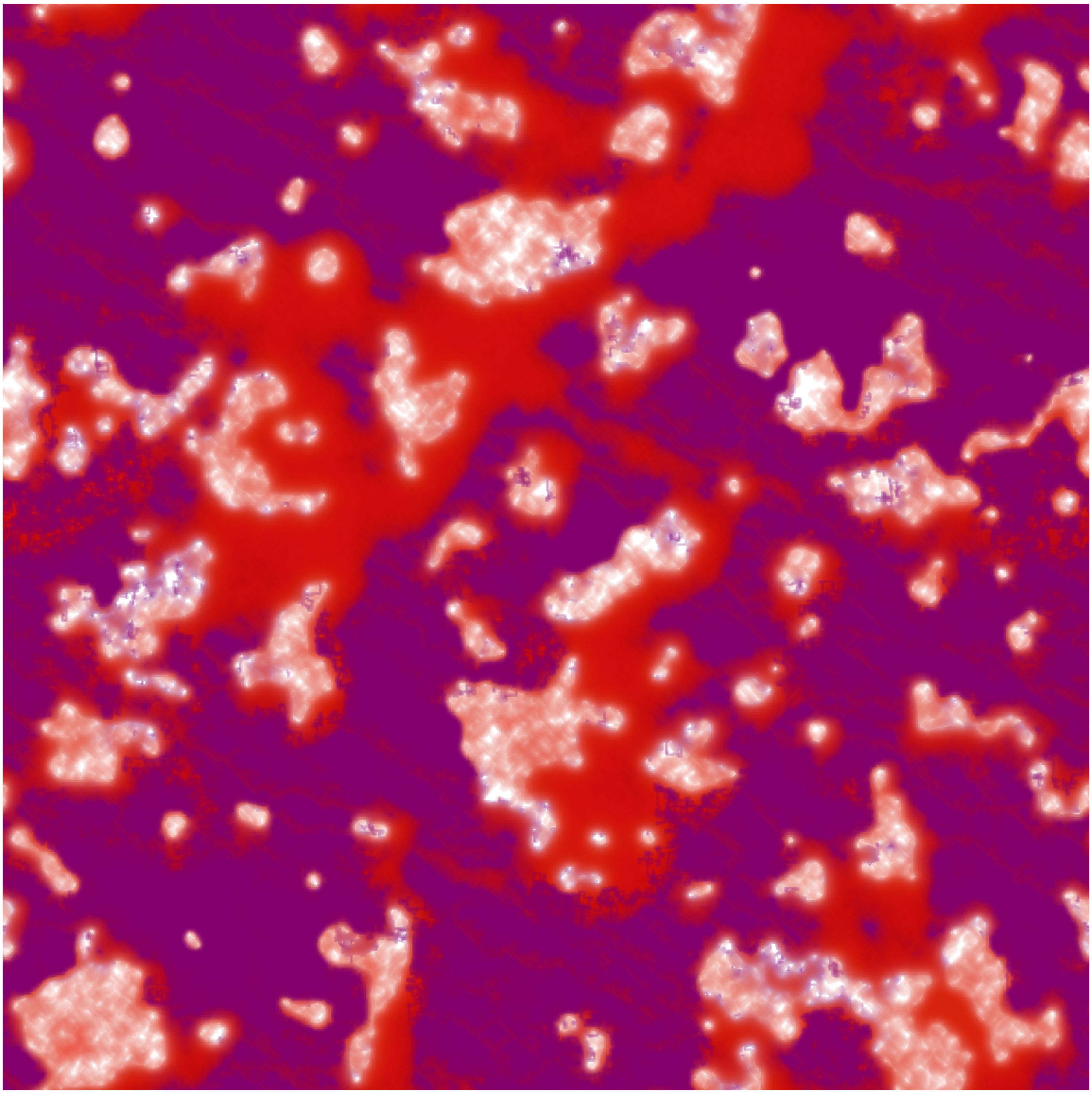

AP20060923Ca

This picture is showing a painting built here with two ants which are laying colored pheromones during their random moves on the canvas. An interactive evolutionary algorithm is used to find interesting color/behavior settings for the ants. Here, the two ant are attracted by their own color and they both have a low probability to turn on their right at each step.

Artificial Ant Paintings

(computer images built through insect behavior simulation)

Nicolas Monmarché

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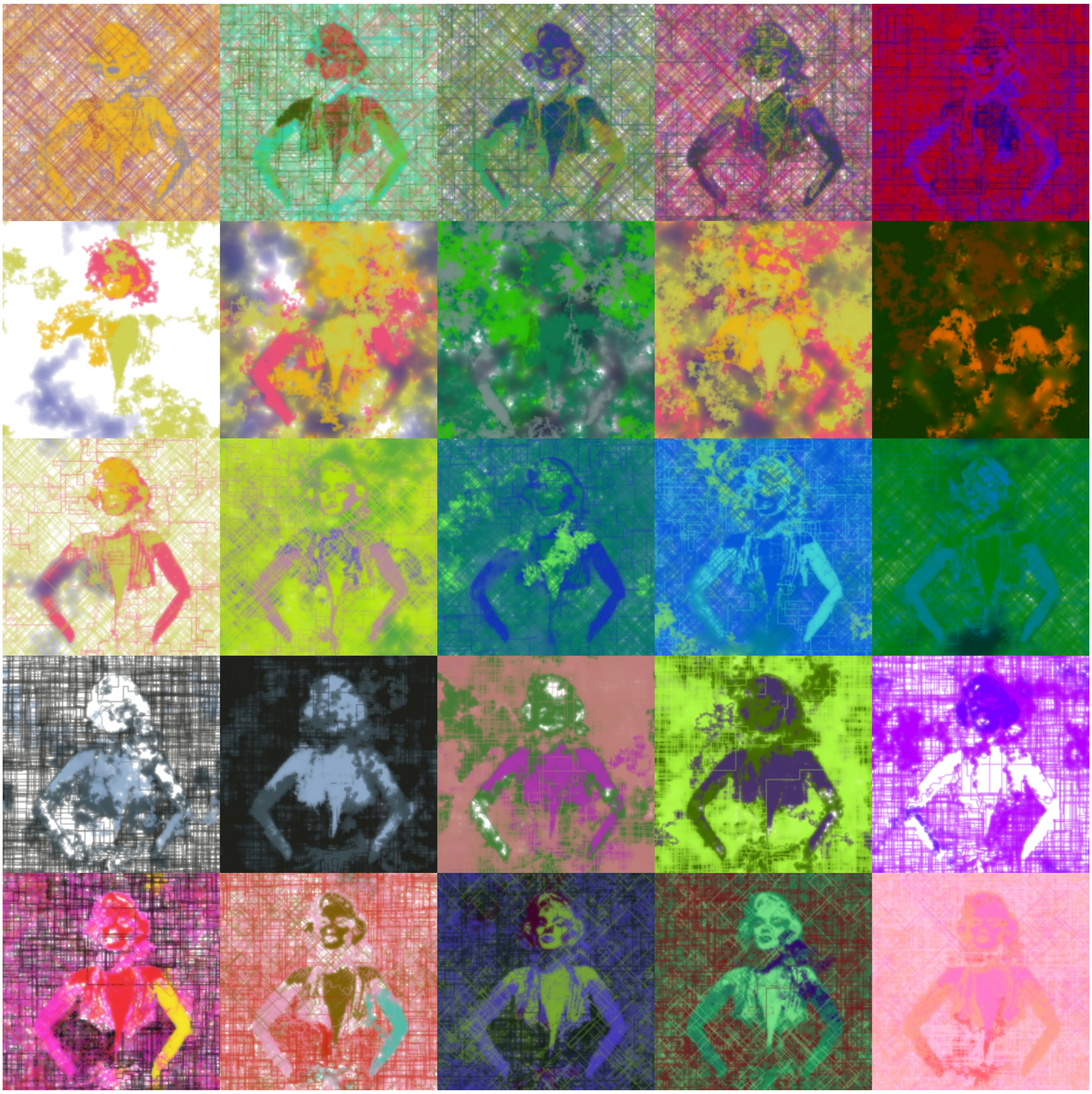

25 ant painted marilyns

These pictures are built with several ants which are laying colored pheromones during their random moves on the canvas. Pheromones are used to attract ants and, in these paintings, a picture of Marilyn has been used as a permanent pheromone field for the ants. Each painting corresponds to various parameters of color and moving behavior for the ants.

see more on: `nicolas.monmarche.free.fr`

Virtual plants

(3D interactive evolutionary design)

Stefan Bornhofen

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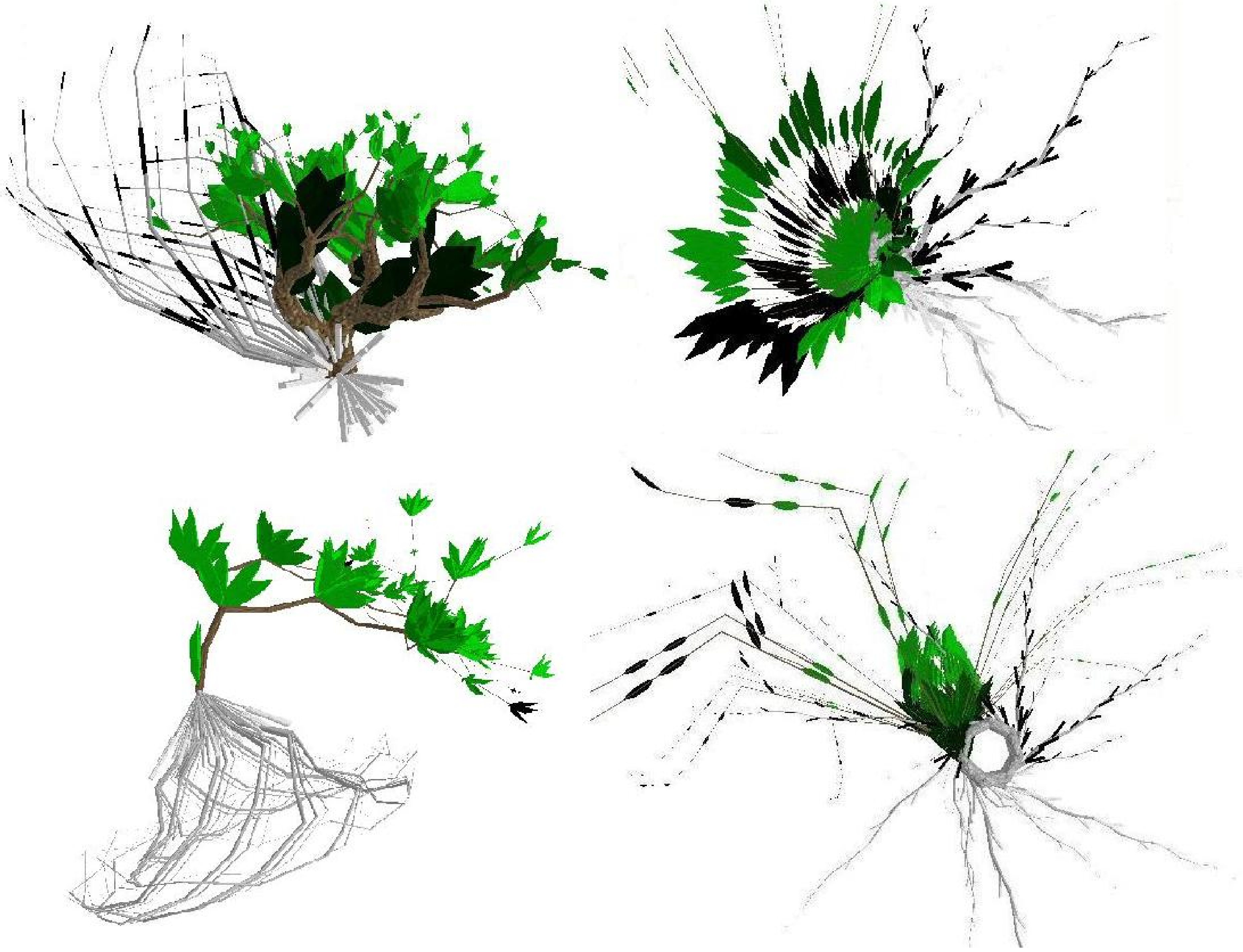

evolved forms

The picture shows artificial plants that have been grown in a 3D virtual garden. Each plant constitutes the phenotype resulting from developmental processes, based on the information in their genotype and interactions with the environment (light and soil nutrients).

During interactive evolutionary sessions, the user can manually navigate in the 3D environment, assess each plant from arbitrary points of view and select one or several shapes for reproduction and mutation. Interesting morphologies emerge after only few generations. The presented individuals have been especially designed for appealing structure, by selecting crooked shapes and non-functional aerial roots.

see more on: `http://www.???`

Laying Down a Path

Tim Barrass
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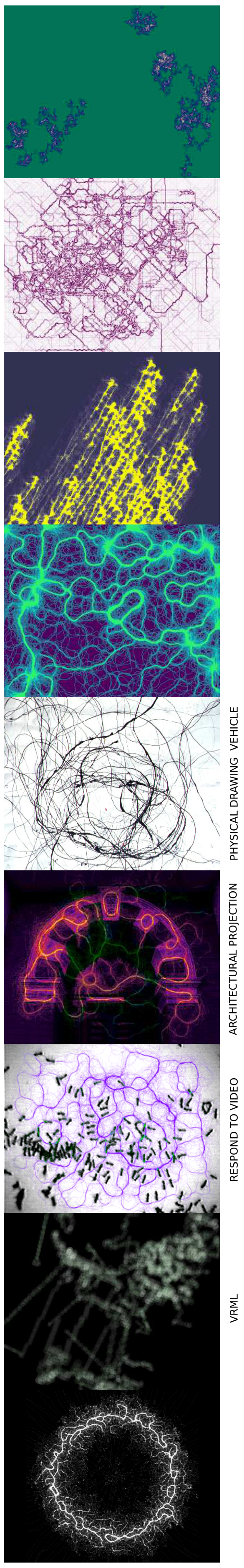

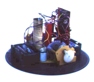

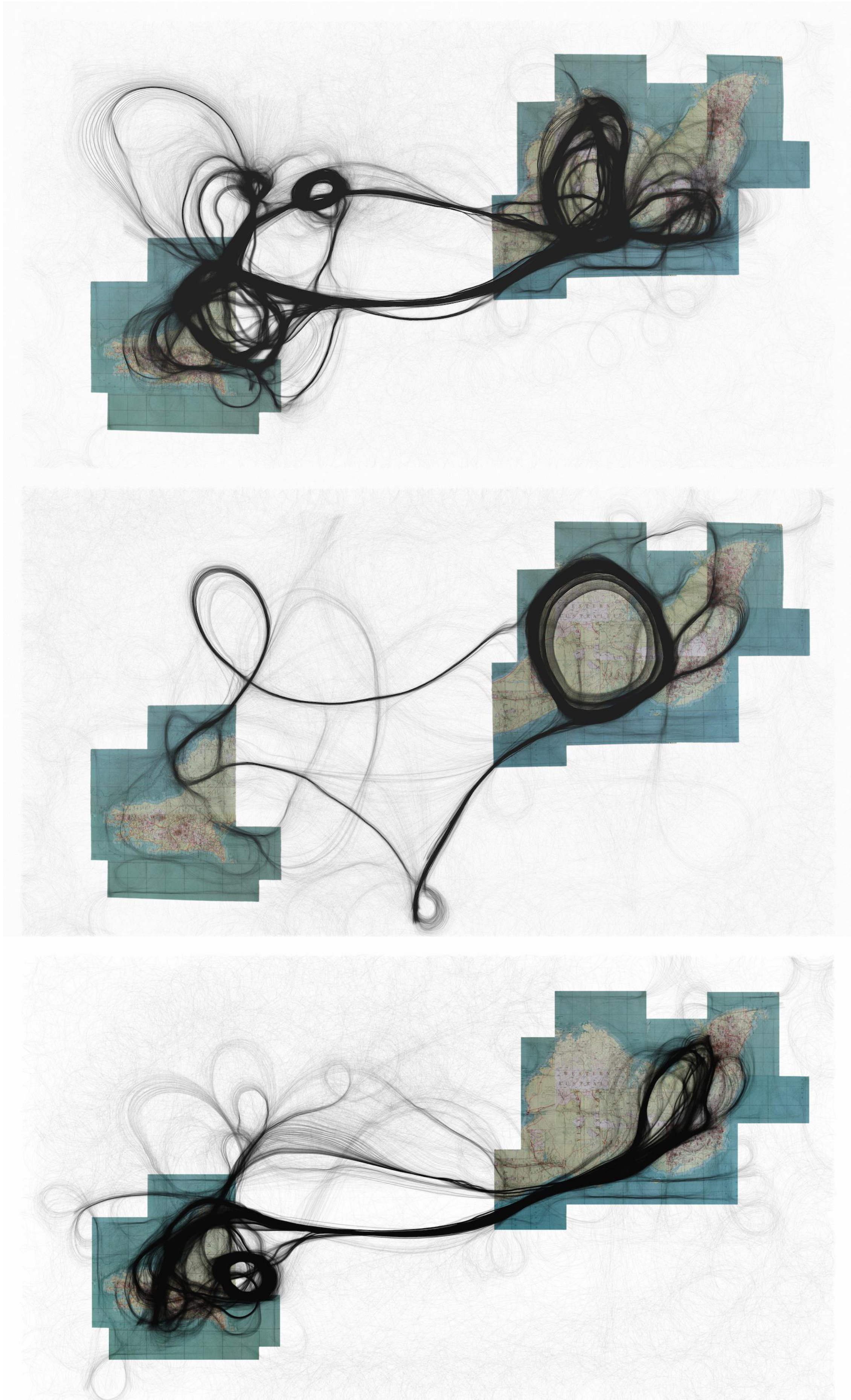

These images show various stages of investigation of a basic ant-inspired algorithm where the ants are implemented as a form of Braitenberg vehicle, with their movements shaped by the geometry of their sensors and turning circle.
The algorithm was tuned via developmental programming over a decade 1991-2000, and revisited in 2009 for a collaboration with Lee Honey where we began to explore ways of combining physical artefacts with the ant interaction, as a way to exhibit the work.
The next step in this project is to explore physical sensor-based drawing machines, progressing from the one which produced the middle image in the left column, in relation to gallery space, including potential human interaction.

Self-Organising Map Ants (SOMA)

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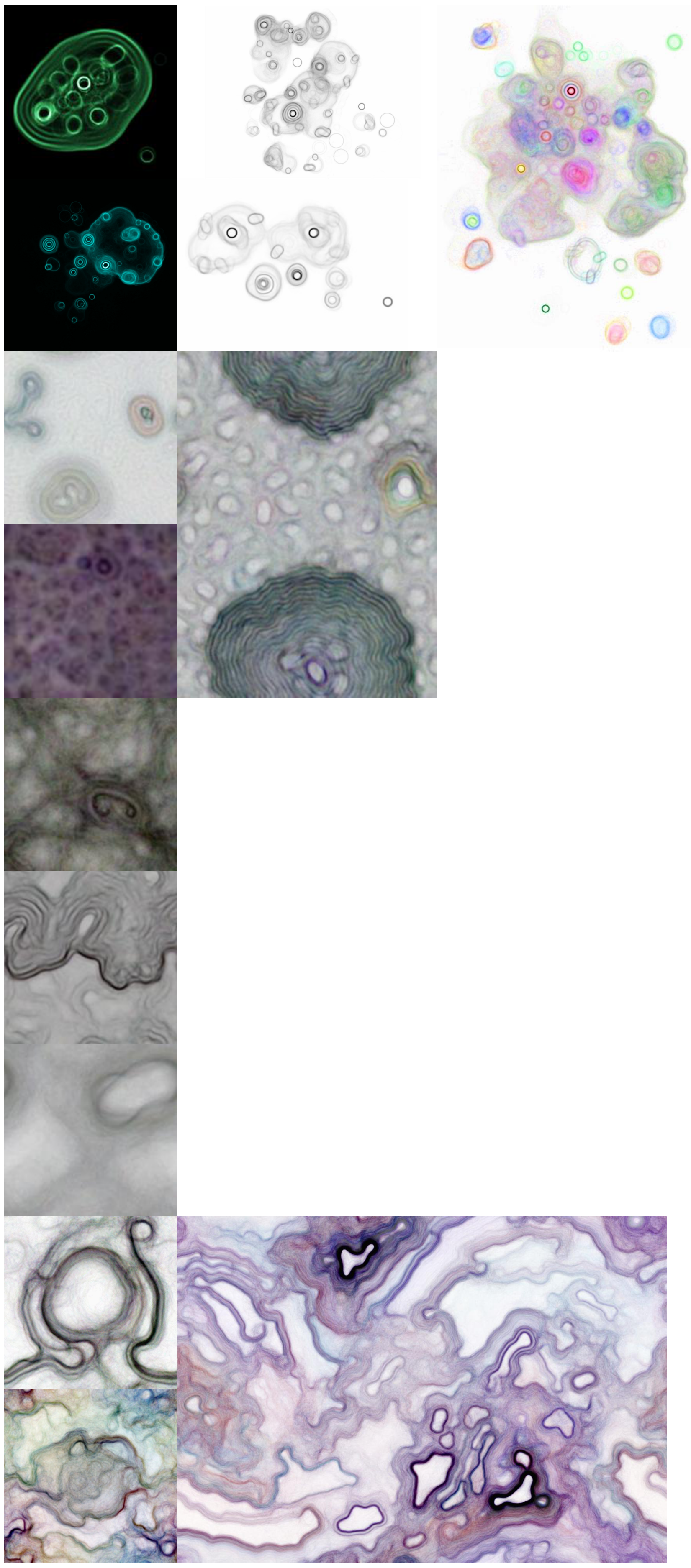

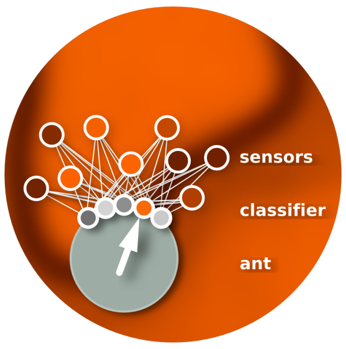

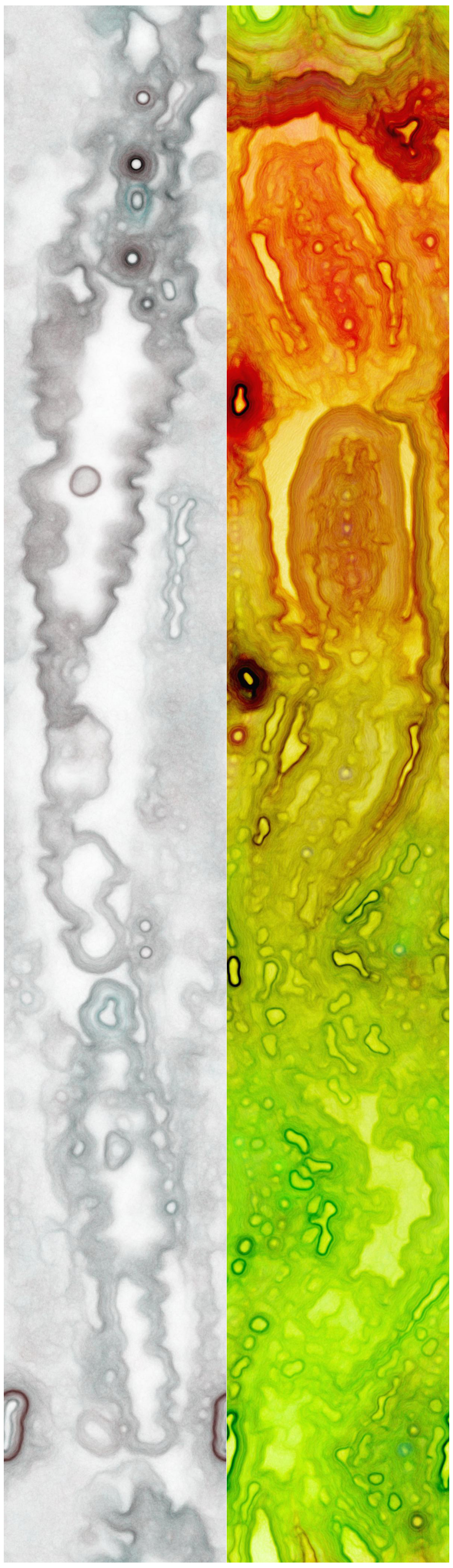

This work from 2003-2005 shows stages in the development of an ant model where the ants learn as they go, each continually updating its own internal Kohonen self-organising map to learn associations between the marks it detects and the angle of turn it will take with its next step.

SOMA Reloaded

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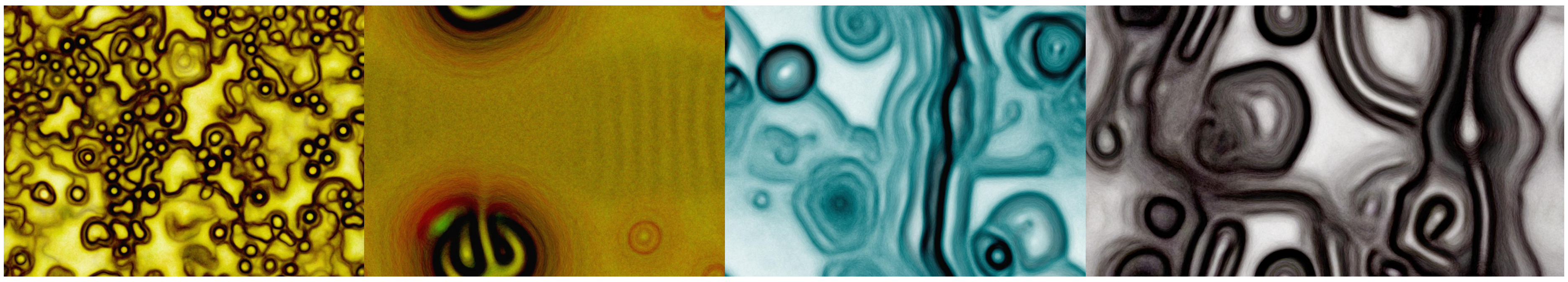

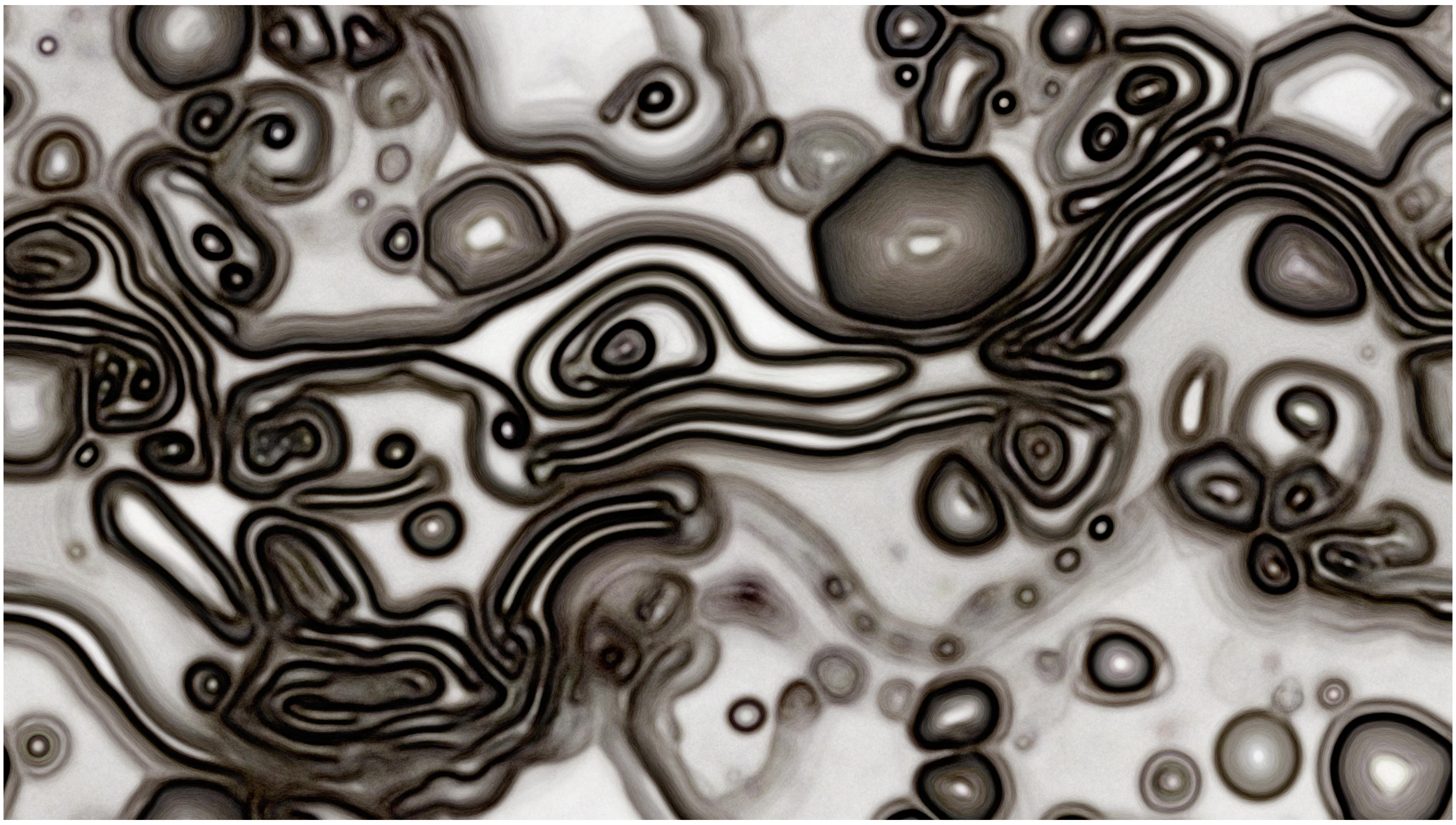

This shows recent progress in 2013, scaling up the processing to experiment with higher resolution ant sensor models, larger fields of sensor input, different ways of sensing colour as well as different ways to assign and draw colours, larger populations, larger canvases, and different starting conditions.