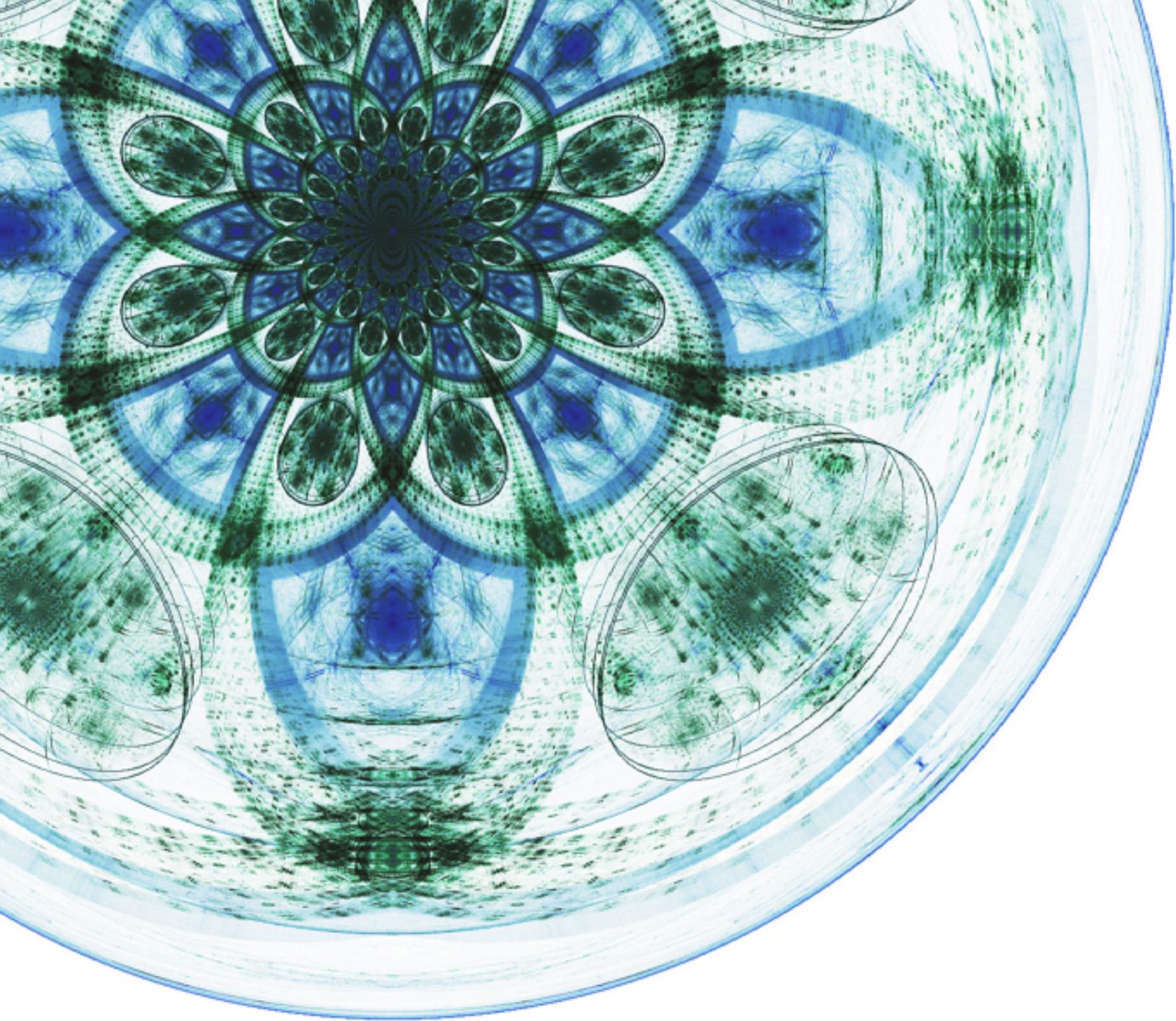




# *Recursia*

Life, Chaos, and the Geometry of Nature





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Life, Chaos, and the geometry of nature

*Zoe Allgaier*

*Recursia*  
*Life, Chaos, and the Geometry of Nature*  
*Designed & written by Zoe Allgaier*  
*Self-published 2026*

A stylized, handwritten signature in black ink, appearing to read 'Zoe'.

- i.* The Abyss
- ii.* The Tide
- iii.* The Coast
- iv.* The Geometry of Nature
- v.* Fractals
- vi.* Recursia

Recommended Reading



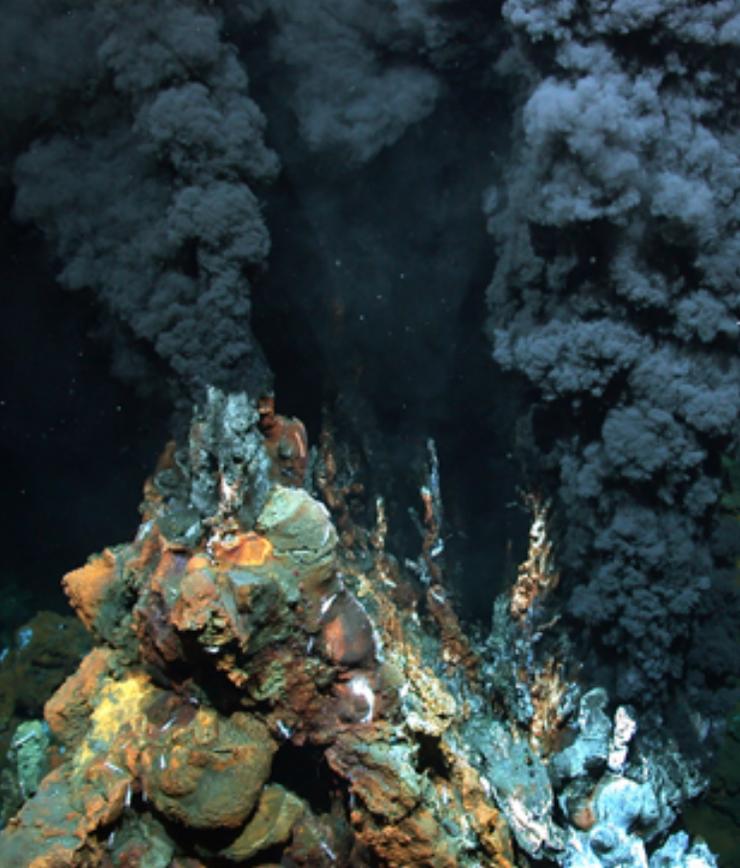
“The rolling of eddies, the unfurling of ferns, the creasing of mountain ranges, the hollowing of animal organs *all follow one path*. It has nothing to do with any particular medium, or any particular kind of difference. The inequalities could be slow and fast, warm and cold, dense and tenuous, salt and fresh, viscous and fluid, acid and alkaline. *At the boundary*, life blossoms.”

(Chaos: Making a New Science, Gleick, 1987)



*i*

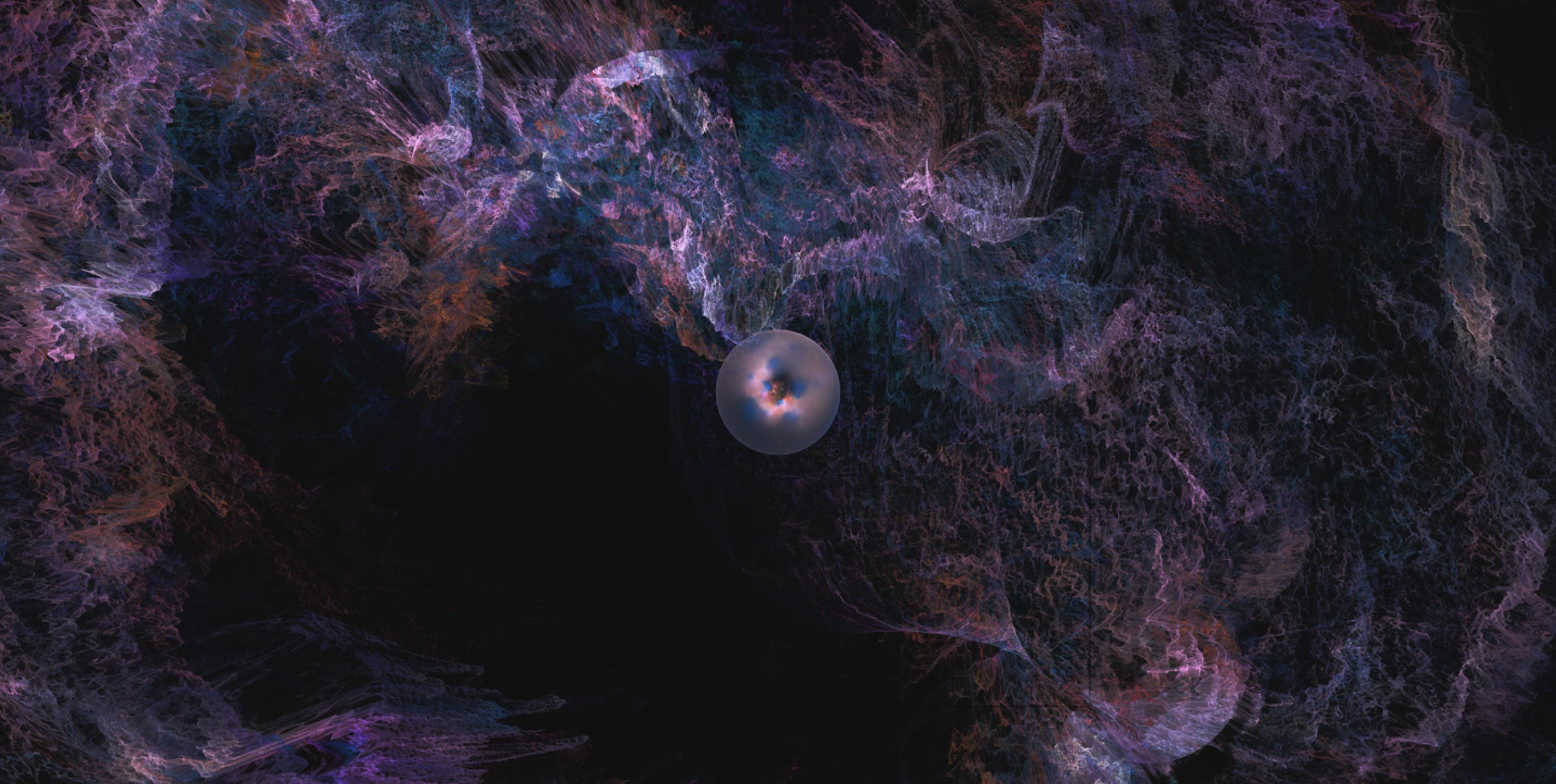
# THE ABYSS



You are engulfed by a suffocating darkness. The blackness of abyss. *Desolate. Dark. Cold.* Above you, the weight of the sea, tens of thousands of pounds of pressure, compresses you in all directions. Below you, the Earth roars and tears itself apart, her magma innards spilling into the abyss—the only source of warmth or light. Fighting the pressure, you cleave toward the archean rupture.

Plumes of black smoke violently *whorl* upwards. The water scalds *and* freezes around you. As you get closer to the fissure, there's movement. The boundary where magma penetrates the ocean is *thick with Life*. Communities huddling against one another, feeding off of the mineral-richness created at the radiant edge of Chaos.

These extremophiles are *Archaea*—the abiogenesis; our first experience on Earth. 4.2 billion years ago, the sundering and colliding of Earth's plates beneath the dominion of the ocean created hydrothermal vents. Here, the unfurling and fusing of molecules, new and old, birthed our microbial ancestors. In this smoking Chaos, we learned to live and die *with one another*.



*ii*

# THE TIDE

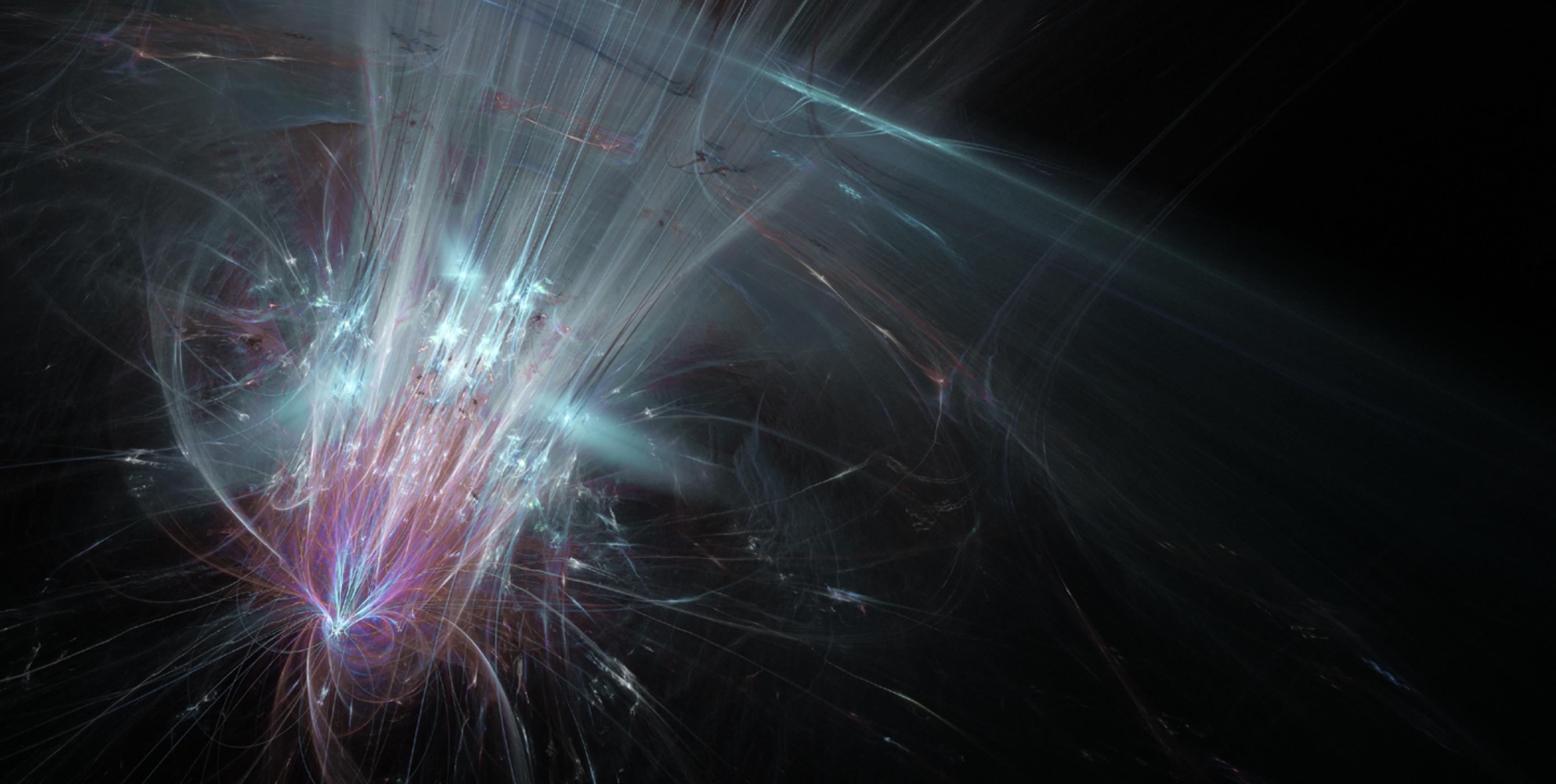


The full Moon bathes you in iridescence and beckons the tide closer to her. A coastal zephyr, salt-tinged and pleasantly humid, flutters across your skin. All that can be heard is the *swell*, *crash* and *drift* of the waves. The inhale and exhale of the shore, a melody played by the Moon, Earth and Sea.

Water rushes over your feet and retreats, rushes again; you feel the sand *pull* beneath you, inviting you to join the dance between Luna and Thalassa. Reverently, you abide, wading into the sacred pool.

Below the surface lies a labyrinthine cathedral. A garden of multicolored, veiny bifurcations sprawling out in every direction, reaching to grasp anything near. These reticulated formations are Cnidaria. Their infinite curls allow a multitude of species—*Porifera*, *Molluscs*, *Crustacea*, *Chordata*, *Cephalopoda*, and *Zooxanthellae*—to blossom.

The Coral are many and one; a collective individual, born at the intersection of the sea and the sky. They are a harmonious “living surface, which attempts to come into as intimate and complete contact as possible with the surrounding medium;” extending and unwrapping iteratively and infinitely, at every scale. *Controlled Chaos*. Order.



*iii*

# THE COAST



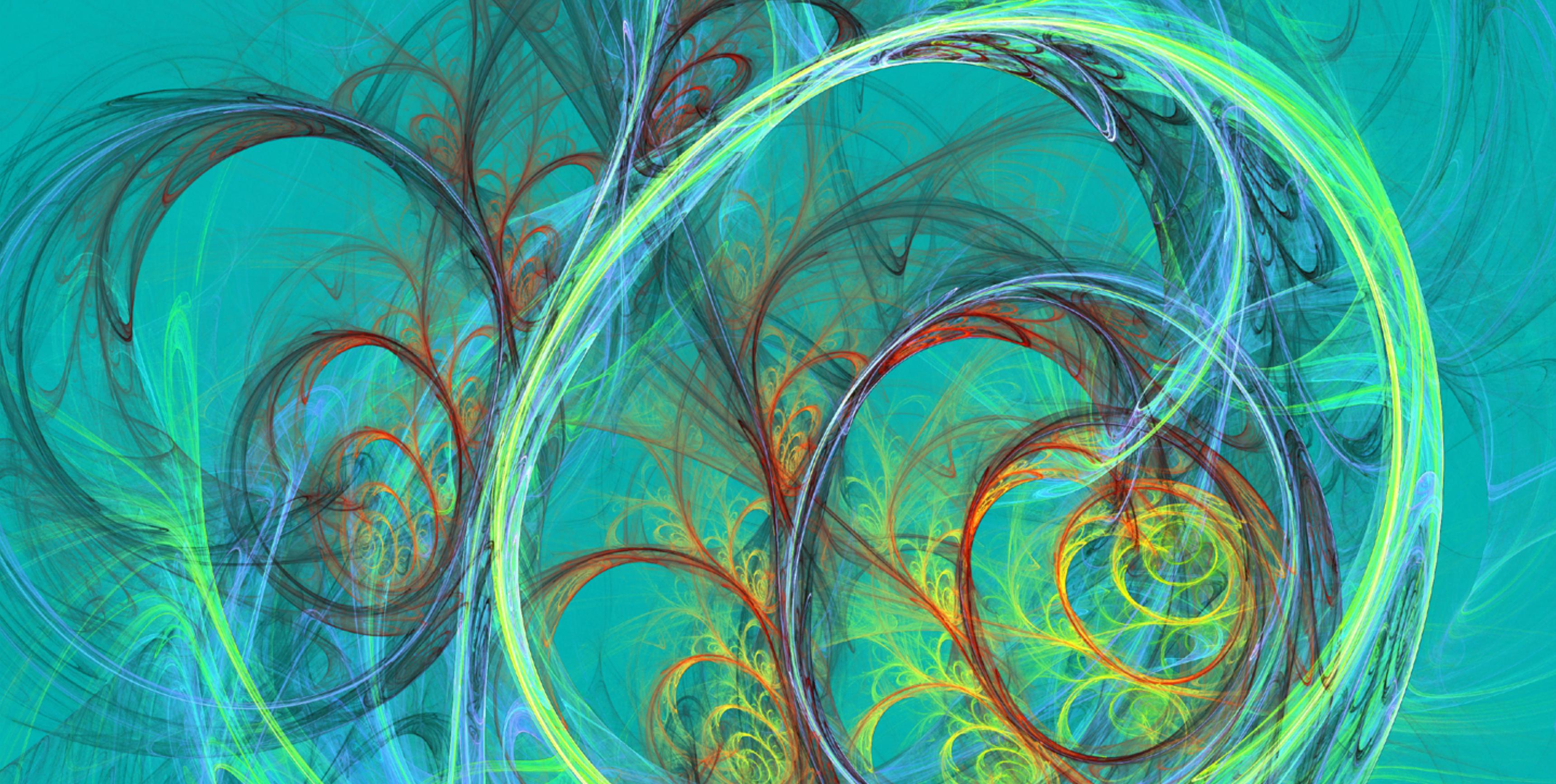
The Sun irradiates the white powder beneath you. Caressed in its warmth, you hear the breath of the surf and the resulting winds in the grass and trees behind you. Sinuous ripples of cloud swirl into one another high above you. Ahead, the same smooth laminae ripple through the sand.

You spread your fingers into the warm grit. Below the heat, the sand is damp. Cold sediment etches your skin and gathers into the creases of your fingers. In the grains you feel the shape of your skin. Creases of creases, folds of folds, rhyming the undulations surrounding you. The structures beneath your skin recurse the coral beneath the tide. *All expressions of the abyss.*

The serpentine cusp of the ocean spirals and froths against the shore. Its curves “so involved in their detail that their lengths are often infinite or, rather, indefinable. Each portion, a reduced-scale image of the whole.”

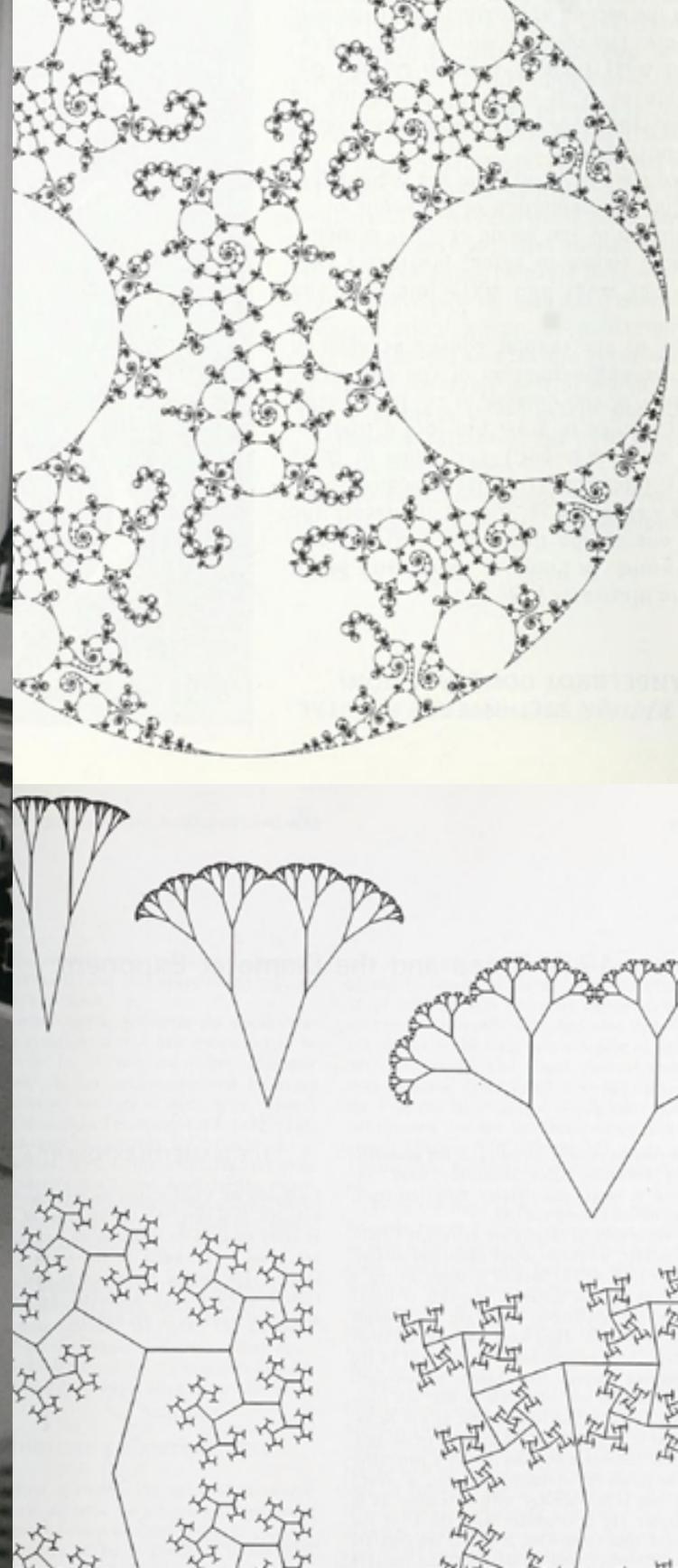
Sand between his fingers, Benoit Mandelbrot looked deeply into the ripples and whorls in the shifting creases where sand and sea collided. He sat for a while, listening to the tranquil complexity.

What lies *between* the tide and the sand?



*iv*

THE GEOMETRY  
OF NATURE



Your thoughts go quiet in the hum of the *IBM 7090*. The cold, precise machine cocoons you *in mente sua*. Thousands of pounds of precious metal, diodes, tapes, and tubes *spin, click* and *whirr* at random intervals. The cerebral room you sit in is *thinking*.

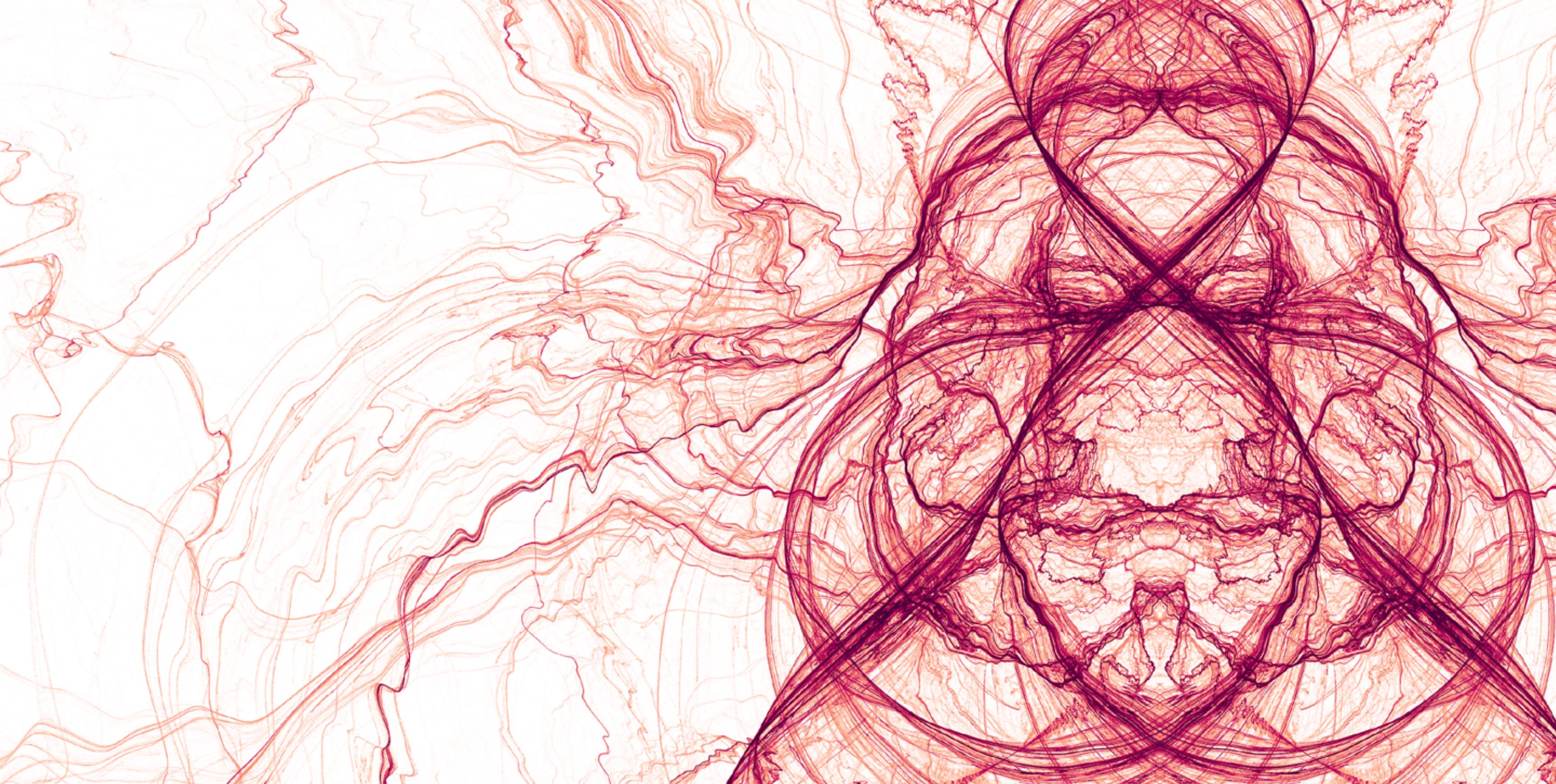
The aftermath of World War II wrought the *Age of Information*; an intersection of the “logical mind” and the machine. The computing that broke Nazi codes now allowed Science, Technology, Engineering and Math to expand into every niche. Modern medicine *saved* countless lives while the atom bomb *vaporized* entire communities. Chaos and Order, exacted.

*Not so*. Despite the devastation and miracles born of flesh and binary, attempts to model environments, species, planets, and machines resulted in complete disarray. Carefully plotted data points morphed into regular-yet-irregular patterns; Order begot Chaos. *How?*

A new sound, as the computer prints the paradox it’s been fed:

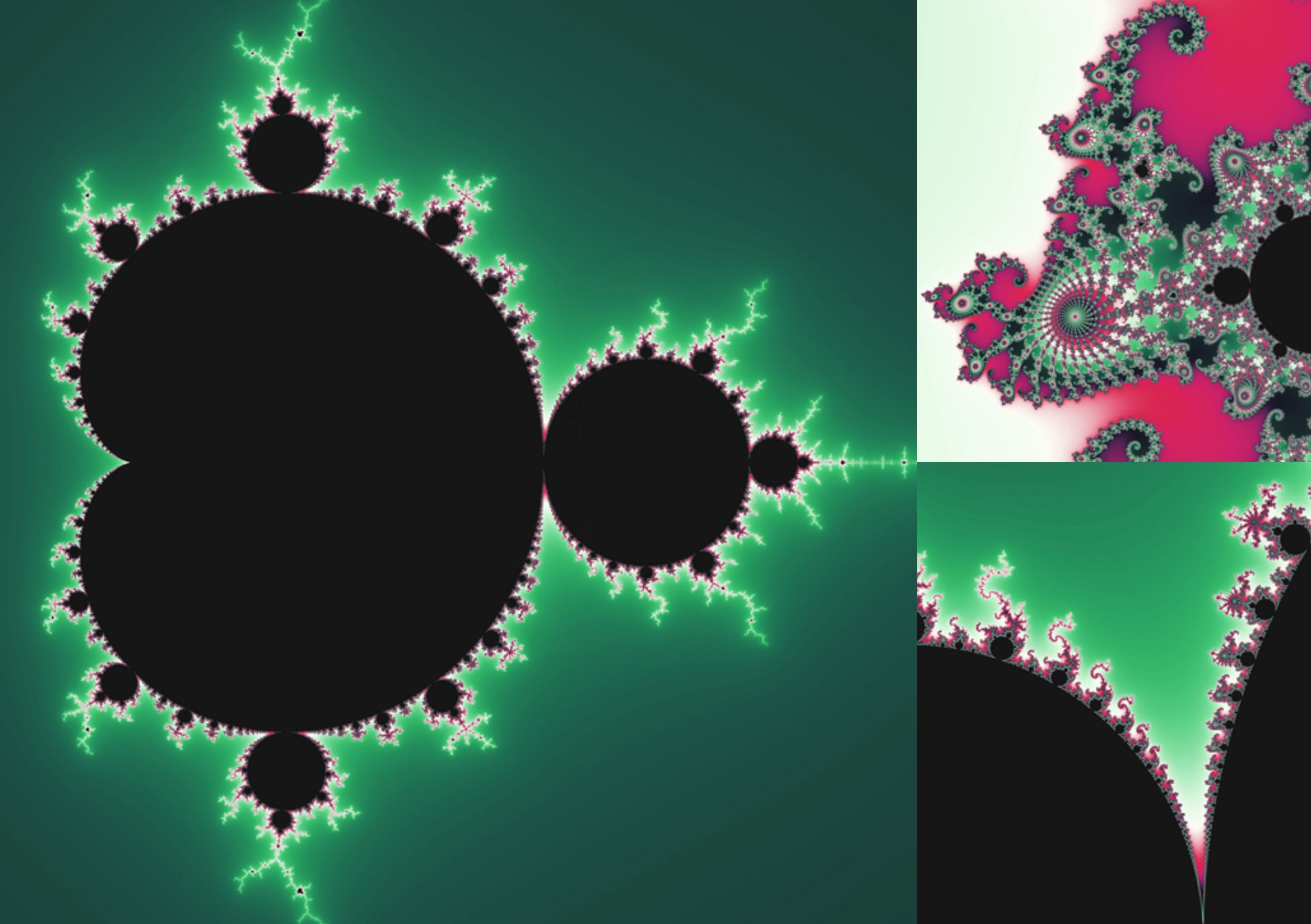
$$f_c(z) = z^2 + c$$

The *7090* ran hundreds of iterations of this equation sequentially, until an image emerged; *that which lies between sand and tide*. Infinity between spirals, vortices and crevices at the edge of Chaos. *A fractal*.



*v*

# FRACTALS



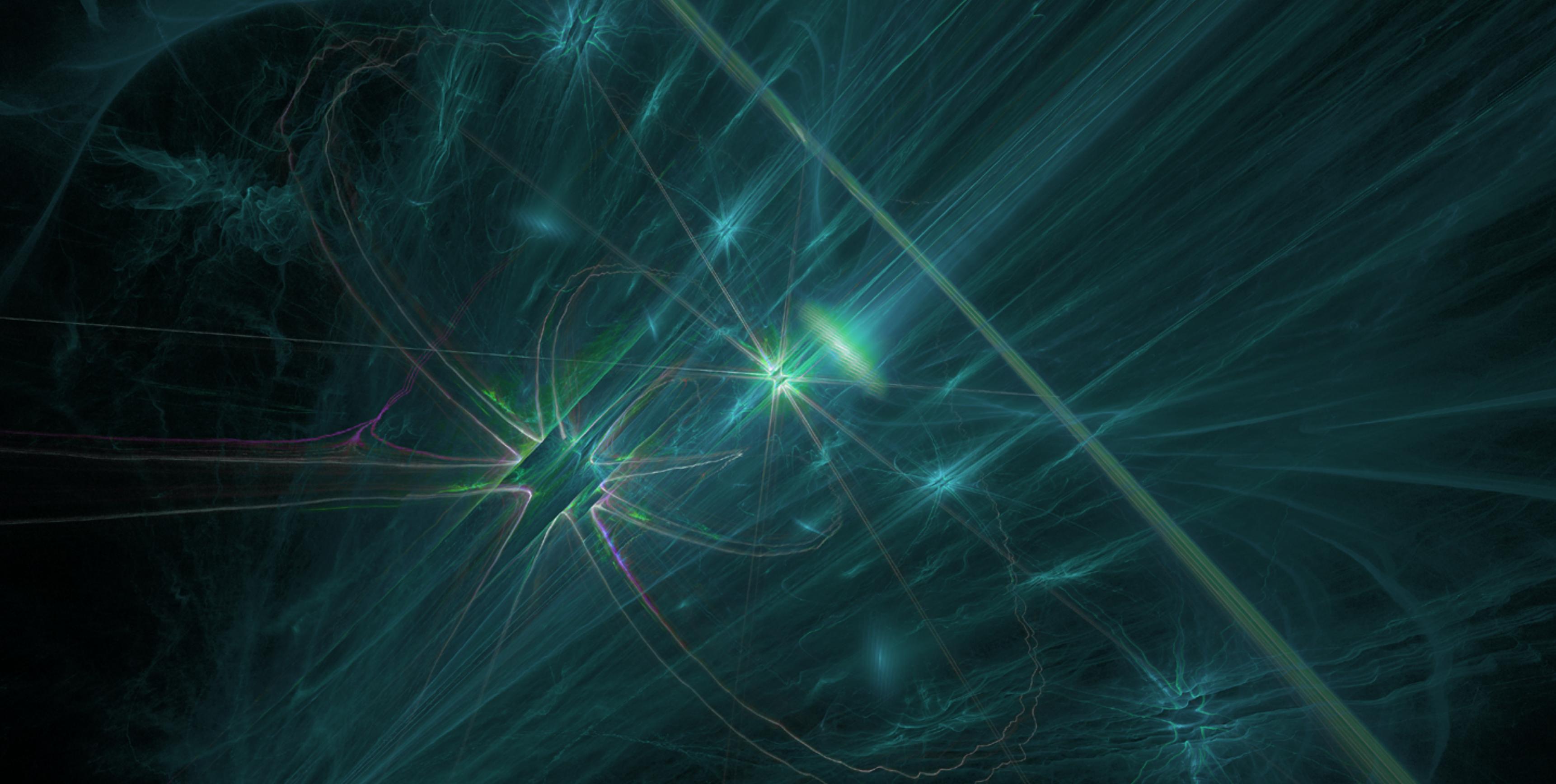
The hum of the *IBM 7090* filled his ears as Mandelbrot surveyed the image. After a lifetime of study and 22 years working at IBM, he had “conceived and developed a new geometry of nature.”

Mandelbrot called the family of shapes *fractals*; of the Latin *fractus*, “to break:” to create irregular fragments.

Iterations of iterations; *fractals* are everywhere. They are “Infinitely complex patterns that are self-similar across different scales—pictures of Chaos.” It is *fractal* geometry that defines the branches of trees, the flow of galaxies, and the folds of our DNA.

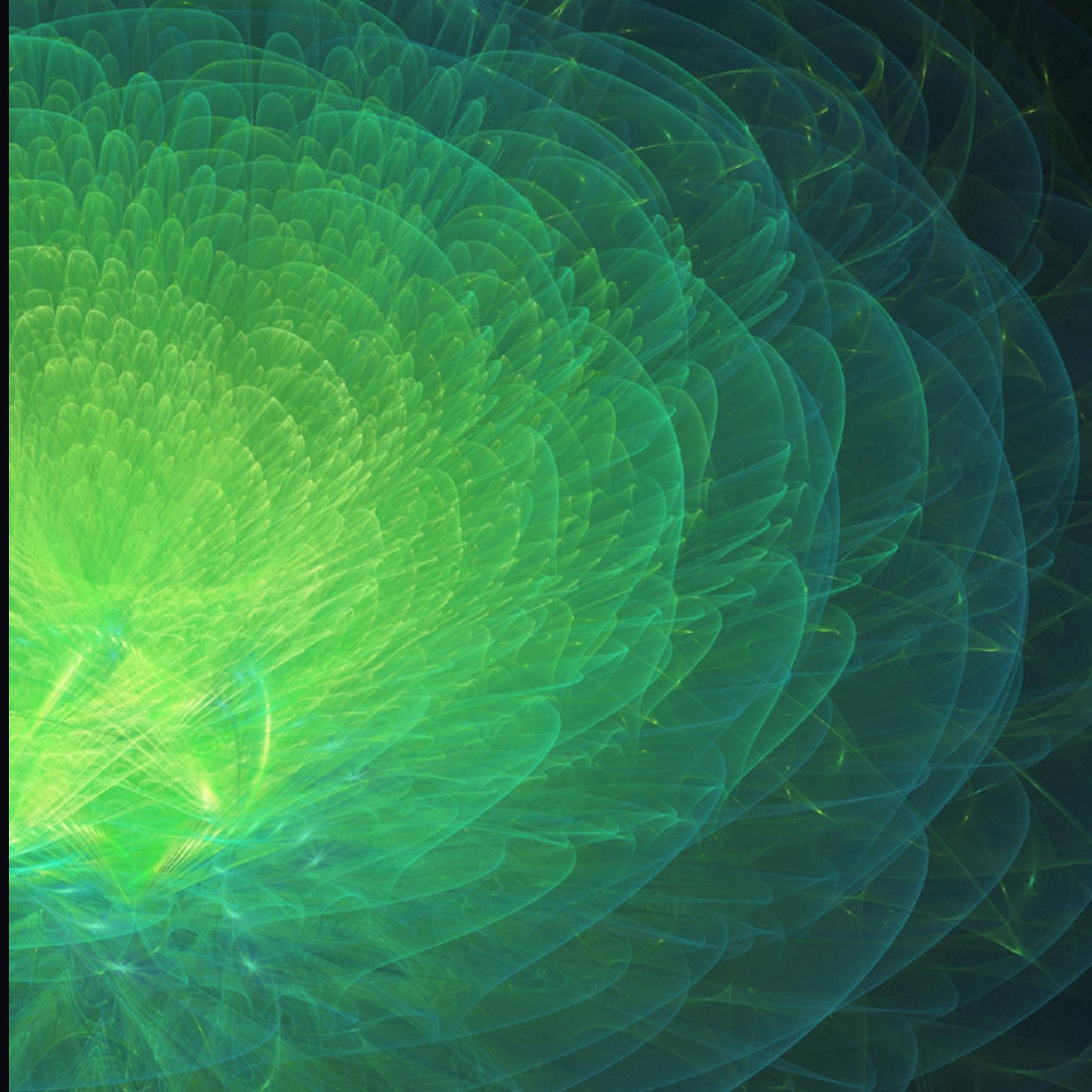
The old sciences: *geometry, physics, meteorology, hydrology, anatomy, linguistics, computer graphics, economics, geology, medicine, physical cosmology, engineering, acoustics, thermodynamics, astronomy, cryptography*, and the *social sciences* would forever be changed. New sciences were born or reinforced: *ecology, sociology, cardiology, neuroscience, nonlinear dynamics, Chaos theory*.

Order and Chaos *together*; as one. That is the beautiful and terrifying apotheosis of *fractals*. Creation and destruction are *one harmonious act*.



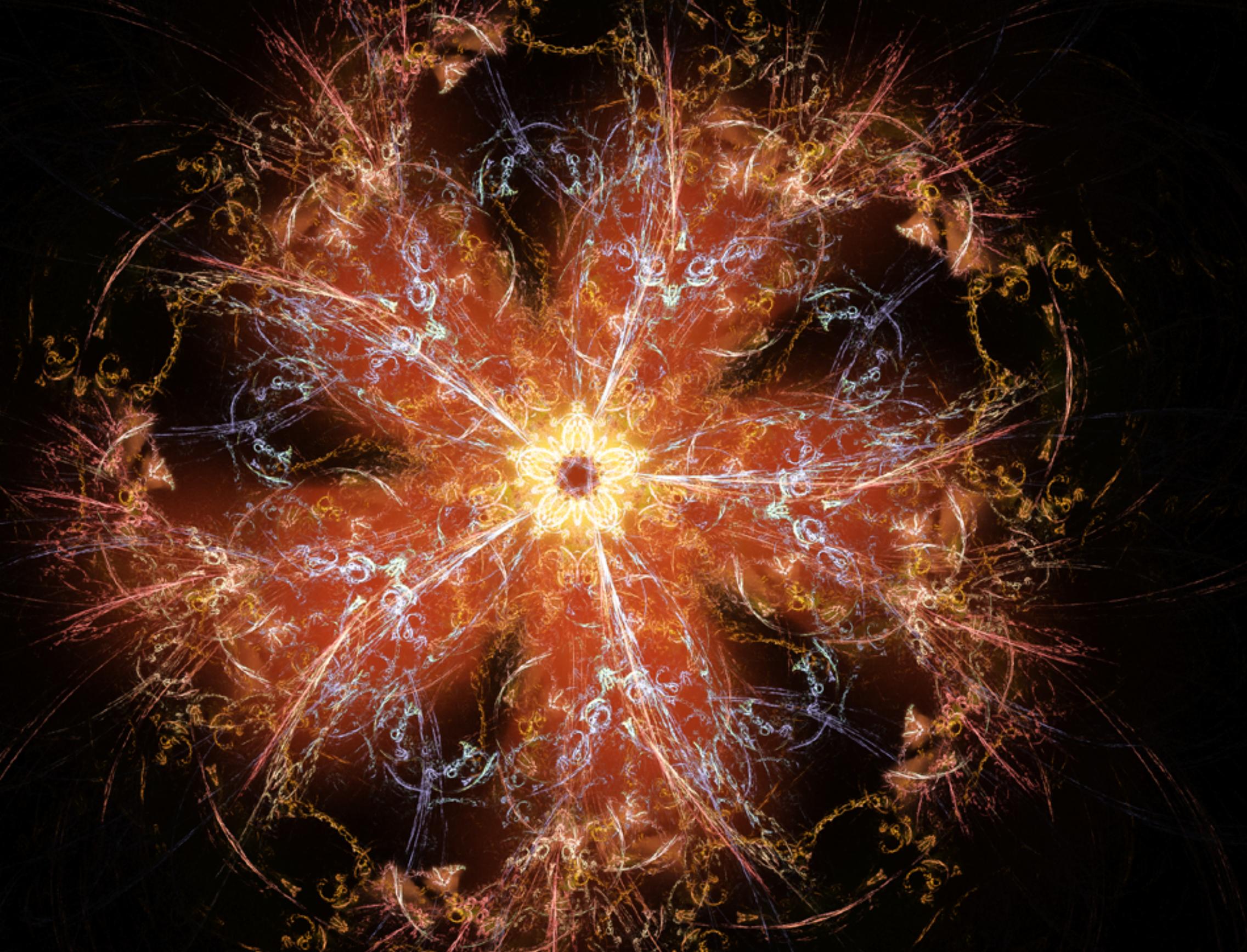
*vi*

# RECURSIA









The coastline cannot be measured; nor the polyps and branches of Coral.

*Between all things lies eternity.*

In Chaos we emerge, in Order we expand, in Harmony we find ourselves. All in boundary conditions, conflict zones, and edges. I ache to understand the inherent design of existence, to know the powerful space between the tide and the sand, the sun and the Moon, *you and I*.

Meditating on the intersections of art, math, beauty and science, I've experienced moments in which language and symbolism evaporates. The cool zephyr and the gritty sand collapsing *any semblance* of my individuality. All that remains is connection, love, understanding. Empathy for the whole of life and its diverse forms. A complete dissolution of difference between the internal and external.

Within the apparent randomness of chaotic complex systems, there are underlying patterns, interconnection, and what Donna Haraway might call *sympoiesis*, or a "making-with." The 19th century Reductionists disregarded the raw Chaos of nature when it confronted them. In the 20th century, the Chaoticians saw that Chaos *was also* Order.

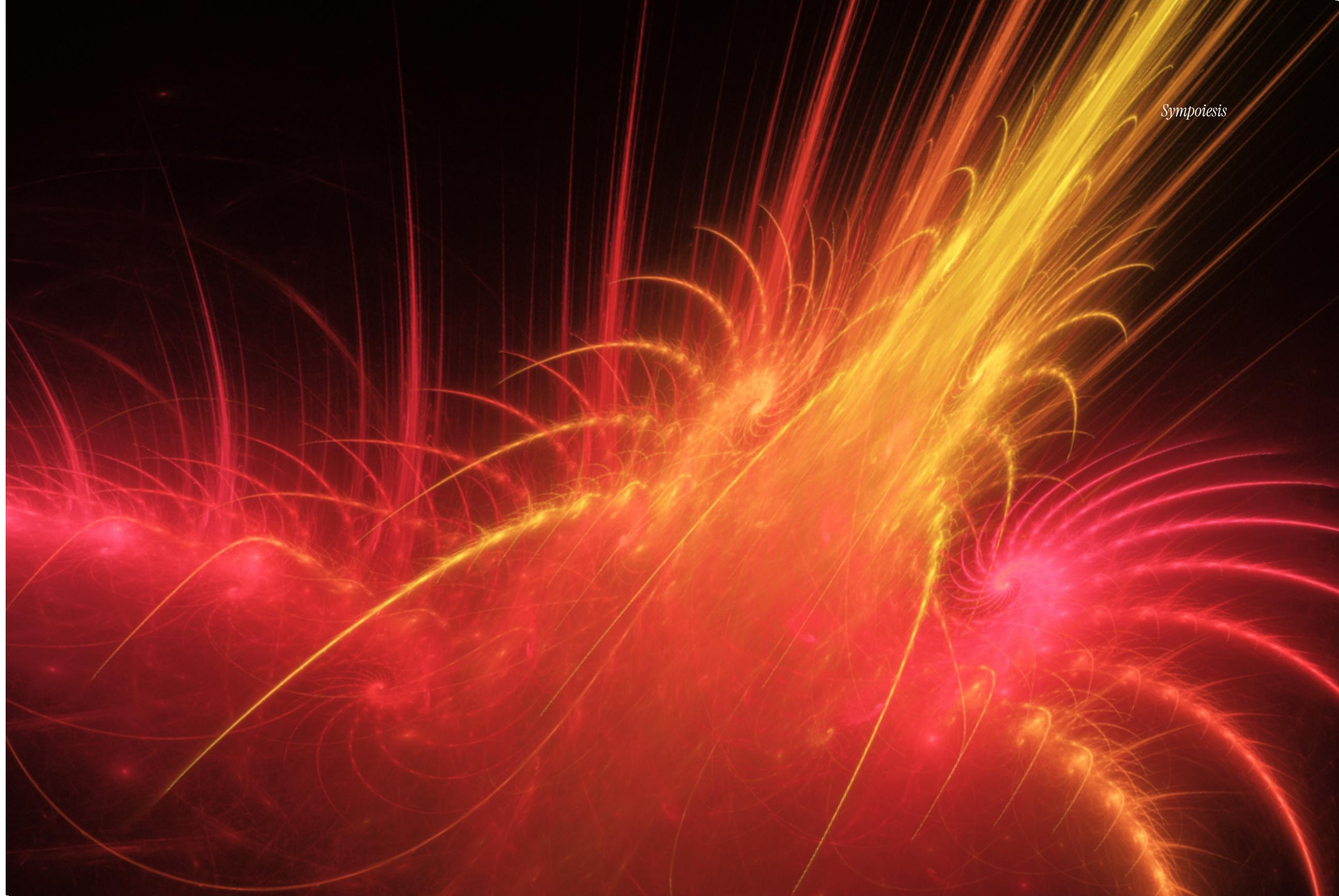
We exist in the tide of the planet's dynamic cycles. The Chaos of the archaic, ancient Earth still pulses beneath our feet; a violent, expansive dance of creation, exploration, destruction. We are born of the boundary between *Earth, magma and ocean*; a beautiful, generative conflict that continues to create new beings, ideas, systems, and movements across infinite scales.

When I see the trees bursting forth from the Earth, arms resembling our own nervous systems, stretching up to touch the sun—*I know we are the same*. The currents in the sky, mirroring the ocean's moisture, rippling and whorling in the same shape as my feelings. We are all fluid recursions of one infinite form.

This, is *Recursia*.

“Sympoiesis is a simple word; it means ‘making-with.’ Nothing makes itself; nothing is really autopoietic or self-organizing. That is the radical implication of sympoiesis. Sympoiesis is a word proper to complex, dynamic, responsive, situated, historical systems. It is a word for worlding-*with*, in company. Sympoiesis enfolds autopoiesis and generatively unfurls and extends it.”

– Donna Haraway



*Sympoiesis*

*Anima Mea*



*My Soul resides within this image.* A flower's blooming petals—reminding me how much I've blossomed as a person. The face of a snake—the Chinese zodiac of the year I was born. Inherit symmetry—akin to my own anatomical symmetry.

Her form is incomprehensible. A multitude of eyes, great and terrible wings; *“Be not afraid,”* she affirms. Her body aflame, burning in celestial omnipotence.

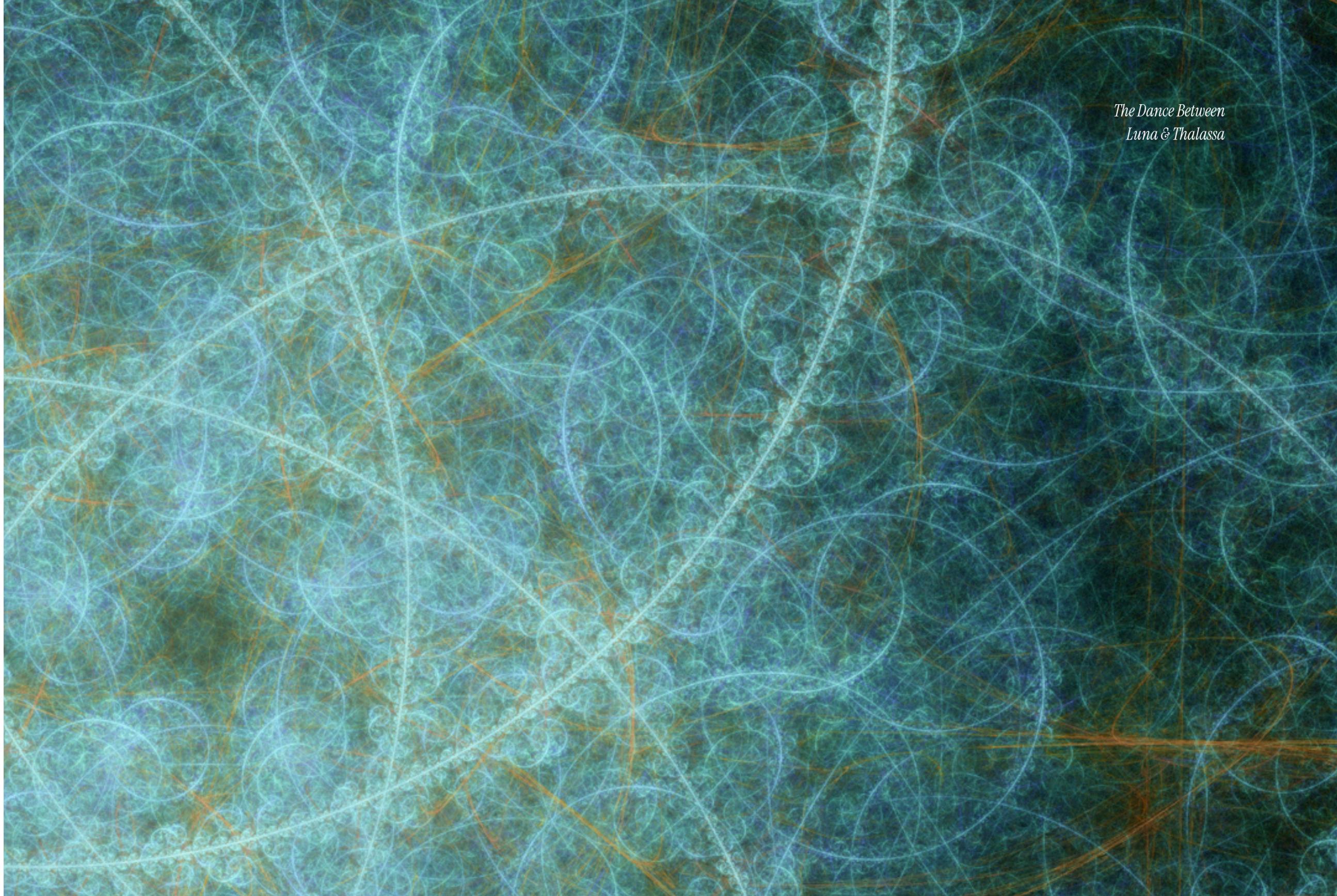
The *Seraphim* tenderly pronounces her sinuous message; in mathematic song she extends, *“from Earth you came and to Earth you shall return; from your dead flesh, flowers shall bloom; this is eternity.”*

*Seraphim*



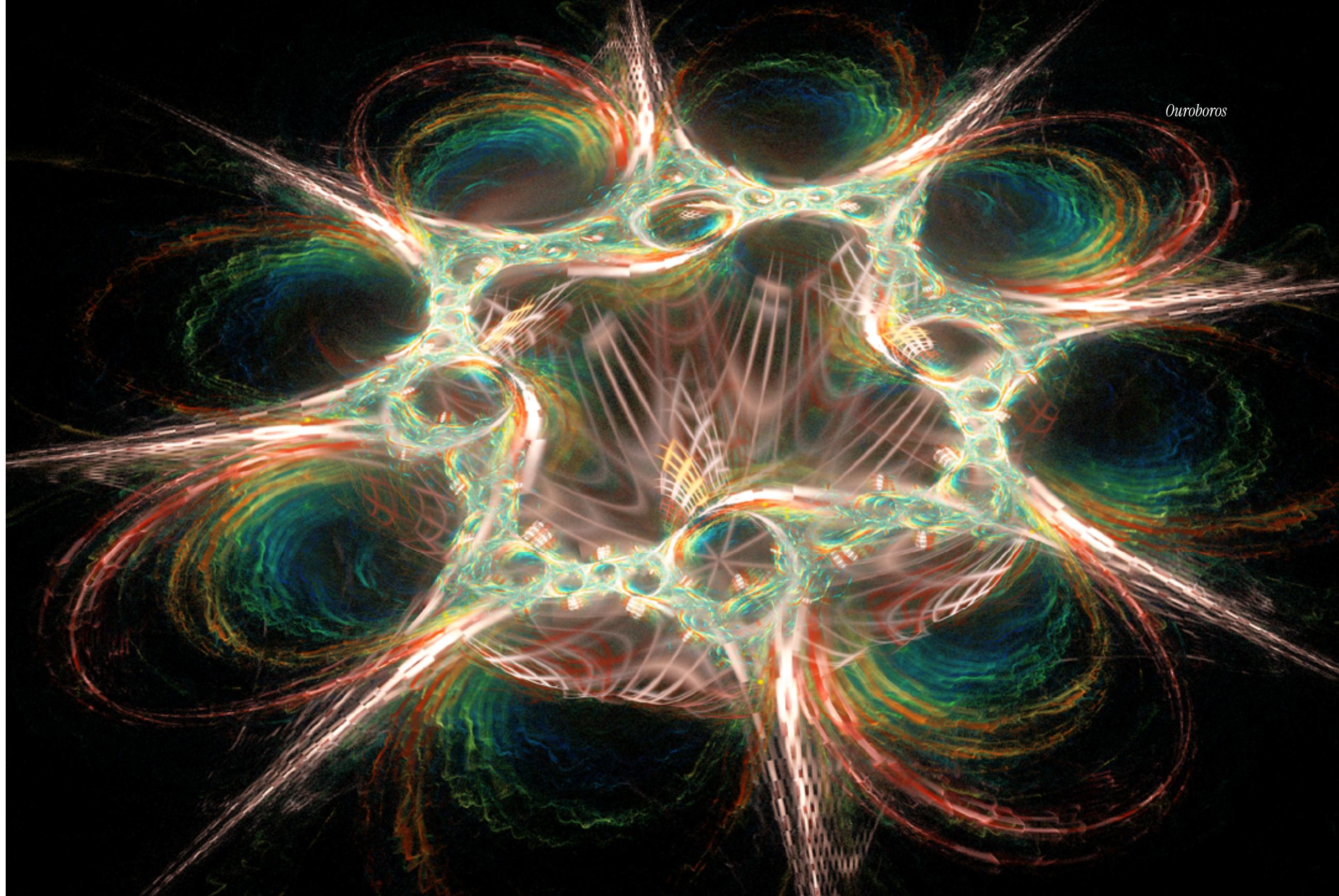
In the tide Thalassa gently holds you; your entire figure caressed.  
Luna guides you, her movement a celestial grace across Gaia.  
The *swell*, *crash* and *drift* of Thalassa's respiration echoes  
the subtle cues of Luna's motion. In the dance between Luna  
and Thalassa, *we become the same*.

*The Dance Between  
Luna & Thalassa*



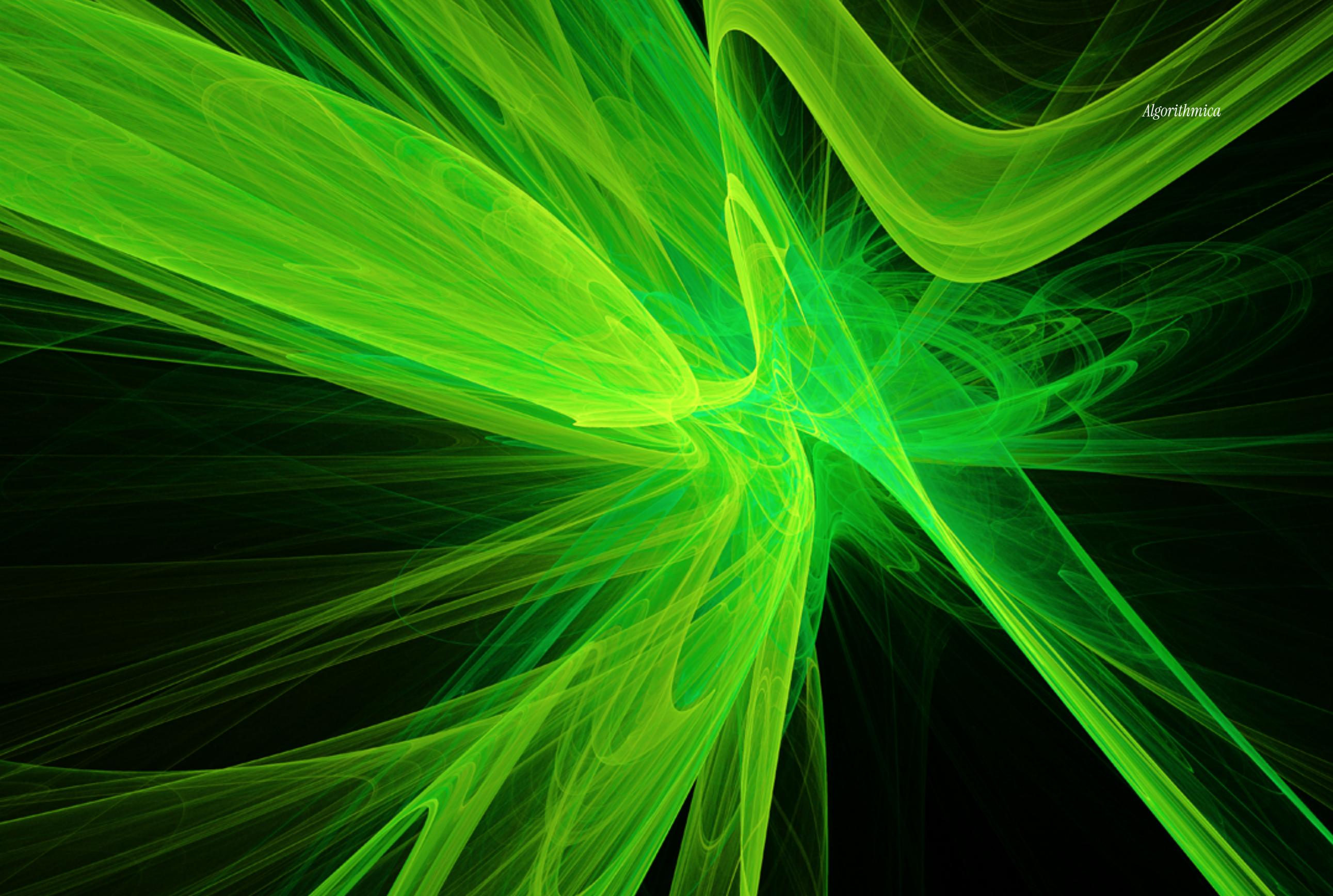
Life is a great unfurling; a generative Ouroboros.

To *be* is to *iterate*. Align yourself with the Chaos and  
blackness from which Nature itself spills forth.



*Ouroboros*

The digital ether that has freed our minds has also ensnared us. We view ourselves and one another in this recursive network, guised within the language of “technology” and “innovation.” Will we allow it to connect us all? Or will it transform us into something unrecognizable?



“I who have dwelt in a form unmatched with my desire, I whose flesh has become an assemblage of incongruous anatomical parts, I who achieve the similitude of a natural body only through an unnatural process, I offer you this warning: the Nature you bedevil me with is a lie. Do not trust it to protect you from what I represent, for it is a fabrication that cloaks the groundlessness of the privilege you seek to maintain for yourself at my expense. You are as constructed as me; the same anarchic Womb has birthed us both. I call upon you to investigate your nature as I have been compelled to confront mine. I challenge you to risk abjection and flourish as well as have I. Heed my words, and you may well discover the seams and sutures in yourself.”

– Susan Stryker



*Chimera*

I etch my face upon my wicked flesh, for I am my own devastating deity. Creation is mutilation to the unenlightened.

They tell me I am a freak of Nature, someone who destroys. They don't see my hard-working hands, they don't see who I am, the Life I breathe into otherwise dead landscapes. I am an artist, and my greatest creation is my *Self*. No one tells you the bravery will feel like fear.

*Gynandromorph*

The background of the page is a complex, abstract digital artwork. It features a dense network of glowing, ethereal lines in shades of bright blue, cyan, and magenta. These lines swirl, loop, and intersect, creating a sense of dynamic movement and depth. The lines vary in thickness and opacity, with some appearing as sharp, bright streaks and others as softer, more diffuse halos. The overall effect is reminiscent of a digital nebula or a complex data visualization. The lines are set against a solid black background, which makes the vibrant colors stand out prominently.

I am a star. A dying star. A dead star.

The final collapse before the sun sputters into nothing. I am nothing and you are nothing and the great devourer will make a real feast of us. It's all meat. It's all bone. It's all blood.

I am a star. A dying star. A hungry star.  
I have teeth. I must eat.

You can see my light begin to implode.  
I'm hungry. I'm hungry. I'm starving.  
Blood. Mouth. Rot. Teeth.

You will die. And so will the sun. And so will the Moon. So it's all for nothing. It's all for nothing and your corpses will be stirred into time and paint splatter, bizarre and intricate and I love you the way everything loves everything and the mushrooms will decay you and it's all for something and the sun will watch you and I will watch you and it's all for —

I am a star. A dying star. *I am you.*

*A dying star*



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*Listen to it.*



## ABOUT THE AUTHOR

*Zoe Allgaier* is a graphic designer, writer and artist from Utah. Drawing from a multitude of perspectives—*computerscience, biology, spirituality,* and *more*—Zoe weaves rich syntax with stunning scenery that explores the nuance and music of Life. She has a lifetime of experience as an artist, and 8 years of professional experience as a Designer & Brand Strategist.

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*Recursia* is a story about boundaries, conflict zones, edges. Hydrothermal vents where Earth and abyss collide, the unfurling of Coral into the sea. What lies between the tide and the sand? Between chaos and order?

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