Ekphrastic Poetry: Catalyst for Scientific Creativity

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"Somewhere, something incredible is waiting to be known." — Carl Sagan

Background

Poetry

Greek “poiein”
To create, to make

Ancient Greece (c. 700 BCE): “**Poiesis**” appears in Greek literature. **Homer’s works**.

Classical Greece (5th Century BCE): **Aristotle’s “Poetics”** - foundational analysis of new form of art.

Ancient Rome (1st Century BCE): Latin word “**poetica**”. Virgil and Ovid.

Middle Ages (5th to 15th Century CE) and Renaissance (14th to 17th Century): Word “**poetry**” emerges.

18th Century - Present: **Poetry evolves**. **Diverse purpose**, structure, form, and style.

Ekphrasis

Greek word “ekphrasis”
To describe in full

Detailed, **vivid description** of a work of art

Conveys **emotional, sensory and/or intellectual connection** with the art.

Since Antiquity

- Homer’s “Iliad”
- Achilles’ description of Hephaestus’ shield: Vivid Imagery of scenes of war and peace, evoking feelings, emotions

No rules - The crafting of a description or story based on author’s connection with the art

The Ekphrastic Poem

An ekphrastic poem is **inspired in a work of art**.

The expression of our **feelings and creative thinking** based on our appreciation of the art.

The poem goes beyond what is visible

- ➢ Explores **deeper meanings, connections**.
- ➢ Creates, invents, theorizes one of many possible **stories or *theories** represented in the art.

The town does not exist
except where one black-haired tree slips
up like a drowned woman into the hot sky.
The town is silent. The night boils with eleven stars.
Oh starry starry night! This is how
I want to die.

It moves. They are all alive.
Even the moon bulges in its orange irons
to push children, like a god, from its eye.
The old unseen serpent swallows up the stars.
Oh starry starry night! This is how
I want to die:

into that rushing beast of the night,
sucked up by that great dragon, to split
from my life with no flag,
no belly,
no cry.

The Starry Night
By Anne Sexton - Inspired on Vincent Van Gogh's *Starry Night*

Abstract, Surrealist & Scientific Art as Inspiration

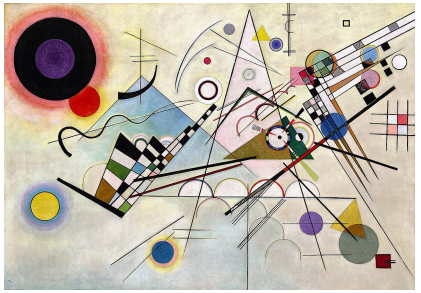
Abstract and surrealist art may stimulate scientific creativity through ekphrastic poetry.

- ➢ Alluding to concepts in math, physics, chemistry, and nature in general.

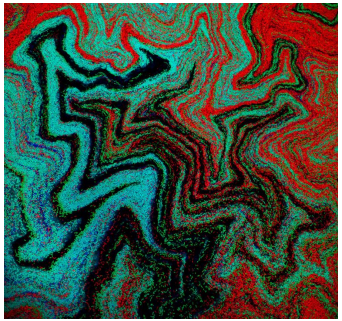
Science and art have intersected in the world of scientific imaging.

- ➢ Fluorescent Confocal Microscopy and Atomic Force Microscopy **Images of tissues, cells and organelles**
- ➢ The Hubble space telescope **images of galaxies**

Galatea of the Spheres by Salvador Dalí, 1952. Surrealism.



Composition 8 by Wassily Kandinsky, 1923. Abstract Art.



Bacterial Biofilm. By Fernan Federici & Jim Haseloff. Smithsonian.

Monkey Head Nebula. Hubble Telescope. NASA.

The Ekphrastic Poetry Exercise

An exercise of our **imagination**

Visualize components of the art and their interconnections.

Apply knowledge of science and philosophy to what you see.

Break free from boundaries of established science concepts.

Create new stories, scenarios. Play with the laws of physics, biology, chemistry. **New Insights**. **Divergence**.

Southern Ring Nebula

Image: NASA, ESA, CSA, STScI, Webb ERO Production Team

Listen to the Stars

Listen to the stars — far, flung apart — elsewhere,
nowhere, everywhere. An aural orchestra — distant
pan-flute crackles echoing anti-gravity static,
space-dust murmurations, galactic-sighs, crests-troughs.

What frequency or wavelength powers them?
No sine or cosine graph can map. No telescopic lens
nor Webb's mirrored ears — strong enough to decode
their algorithm, decipher their grammar, text, language.

What we see, we see / and changing is changing //
the light that shrivels a mountain / and leaves
a man alive // Heartbeat of the pulsar / heart sweating
through my body // The radio impulse / pouring

in Taurus // I am bombarded yet I stand ....
A philharmonic score — a nebula poem, a long poem,
an epic — its unceasing ocular cadence, haunting —
black hole's cosmic crescendo — an axiomatic trance.

Sandeep Sen

Sen, Sandeep. Galactic Portraits as Ekphrasis. *Science, The Wire*. July 16, 2022. https://science.thewire.in/culture/the-arts/galactic-portraits-as-ekphrasis/ Accessed 10 Oct. 2024.

Can Ekphrastic Poetry of Abstract, Surreal or Scientific Art be a Catalyst for Scientific Creativity and Discovery?

Historically, the Interdisciplinary Pursuit of Art and Science has Fostered Creativity.

Da Vinci and the Creative Process

Theorizing about the various paths for creativity and learning,

- “Man-made disciplinary boundaries cannot shackle his or her mind to one particular field.”

Experienced firsthand the formative role of the connection between art and science.

- “These are the principles for the development of a complete mind: Study the science of art. Study the art of science... Realize that everything connects to everything else.”

Ahmed, Waquas. “The Mind of Leonardo Da Vinci.” *Philosophy Now: A Magazine of Ideas*, 2019/issues/134. https://philosophynow.org/issues/134/The_Mind_of_Leonardo_da_Vinci. Accessed 10 Oct. 2024

Poetry and Science

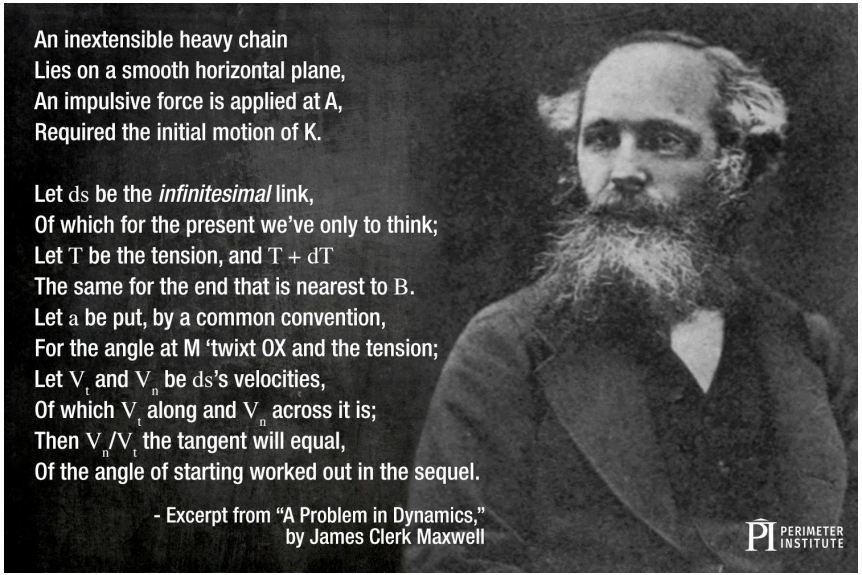
Presently considered separate career paths.

But great **synergisms in the past**.

- 1800s: Mathematician Ada Lovelace and physicist James Clerk Maxwell
- Prolific poets who wrote about science, math and even forecasted the arrival of computers.

New trend among scientists:

- Translating research into lyrics, haiku, and other poetic forms
- Alternative ways to inspire others with their findings.



Scientists Take on Poetry. September 22, 2020. *Physics* 13, 150
Hunter, Colin. "12 poignant poems (and one bizarre limerick) written by physicists about physics". Inside the Perimeter. October 17, 2018.

Poetry of Code

Ada Byron Lovelace (1815-1852)

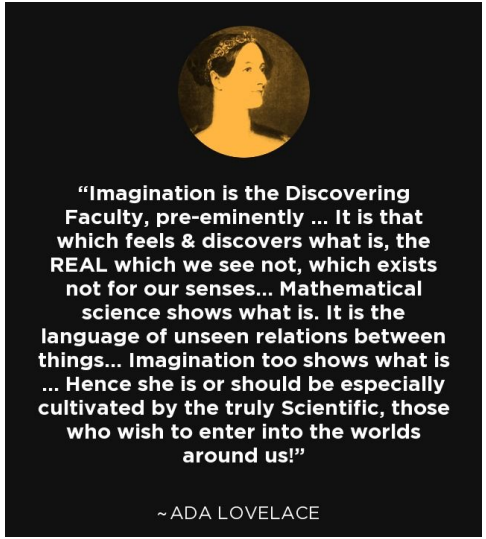
- Born to Annabella Milbanke and Lord Byron
- Mathematician & Writer

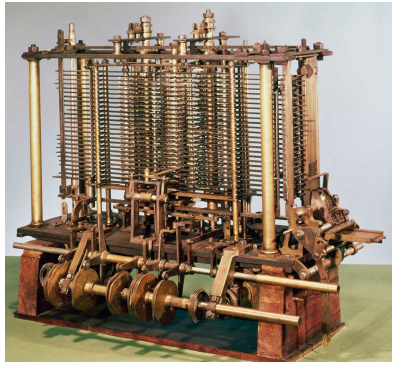
World's First True Computer Programmer

Expert in the '**Analytical Engine**' of Charles Babbage.

Discovered new functions for the engine.

- Believed it could read "weaved algebraic patterns" and perform specific calculations.
- Wrote algebraic codes. Algorithms. A new language.
- Created a program for punched cards to weave a long sequence of Bernoulli numbers.
- Hypothesized the engine would be able to perform symbolic logic, create art and compose music.





The Analytical Engine: Lovelace's poetry generator.

"If you can't give me poetry, can't you give me poetical science?"

Understood **creativity as the ability to find "points in common, between subjects having no very apparent connexion, & hence seldom or never brought into juxtaposition."**

Scientists Take on Poetry. September 22, 2020. *Physics* 13, 150
Hunter, Colin. "12 poignant poems (and one bizarre limerick) written by physicists about physics". Inside the Perimeter. October 17, 2018.

Einstein and the Creative Process

Noted his scientific insight did not come from logic or mathematical formulas, but from intuition and inspiration.

- “When I examine myself and my methods of thought, I come close to the conclusion that the gift of imagination has meant more to me than any talent for absorbing absolute knowledge."

About his scientific contributions:

- “Imagination is more important than knowledge. Knowledge is limited. Imagination encircles the world.”

“Einstein’s scientific ideas were often firstly created in the shape of images and intuitions, and later converted into mathematics, logic and words. Music helped Einstein in this thought process and helped convert the images to logic.” *The Symphony of Science.* NobelPrize.org Accessed Sep 30, 2024

Einstein, Albert, and Alice Calaprice. *The Expanded Quotable Einstein*. Princeton University Press, 2000

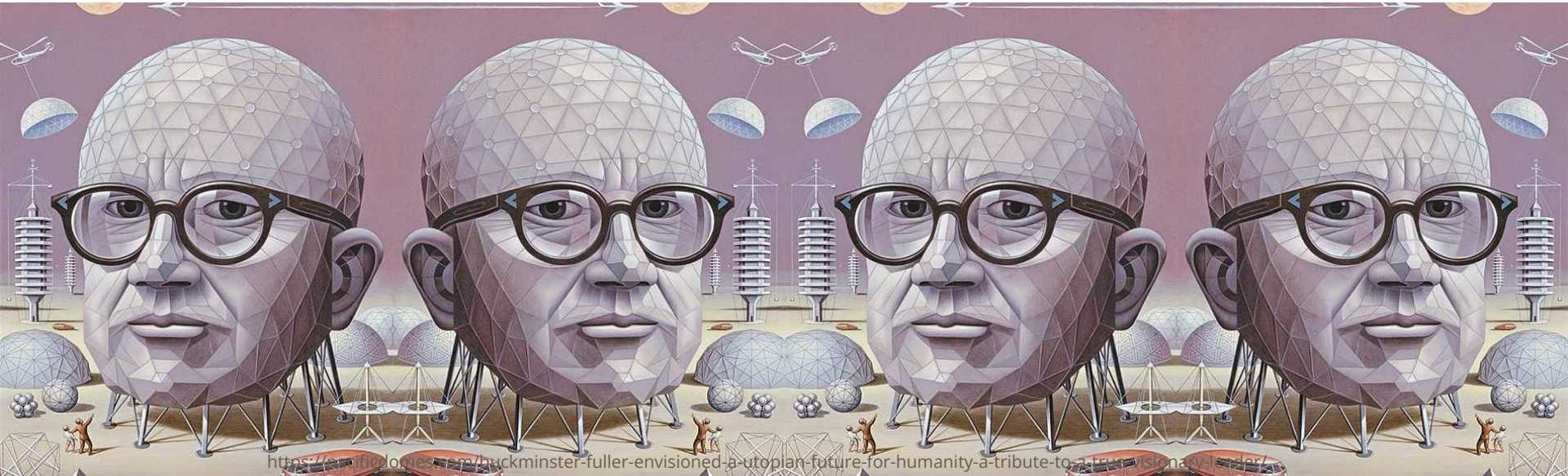
R. Buckminster Fuller - Architect, Scientist, Poet

American **architect**, **scientist**, **inventor**, **philosopher**, **researcher**, **poet**. (1895-1983)

Interdisciplinary Visionary who takes inspiration in nature.

- Geodesic dome (extremely stable), Dymaxion House/Car, 2,000+ patents
- *The world must work for 100% of humanity.*

The structures of many **viruses are geodesic** and very stable. New scientific discoveries have revealed a type of carbon molecule that has been called **fullerene given its geodesic spherical shape**. They are also **incredibly stable**. It hold great promise due to its **superconductivity**.



https://scientificlogos.com/buckminster-fuller-envisioned-a-utopian-future-for-humanity-a-tribute-to-a-true-visionary-leader/

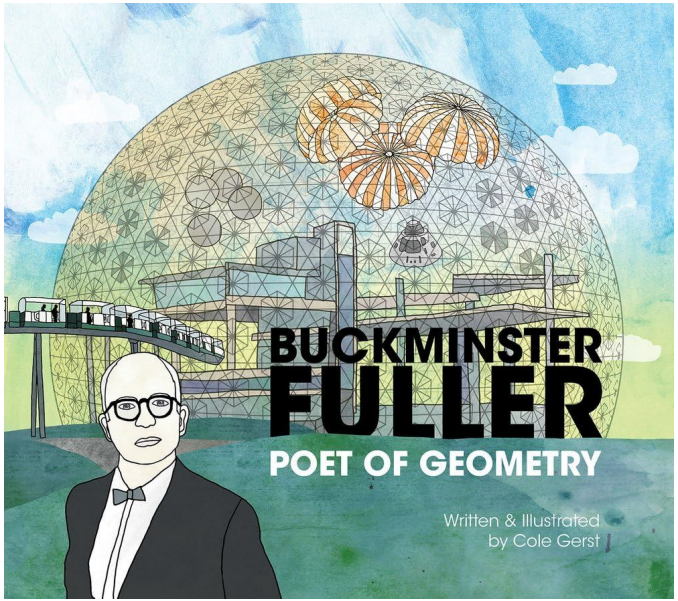
R. Buckminster Fuller - *Poet of Geometry*

"Only the free-wheeling artist-explorer, non-academic, scientist-philosopher, mechanic, economist-poet who has never waited for patron-starting and accrediting of his co-ordinate capabilities holds the prime initiative today."

R. Buckminster Fuller (2009). "Ideas and Integrities: A Spontaneous Autobiographical Disclosure", p.164, Estate of R. Buckminster Fuller

His text, *Critical Path* (1981), features Fuller's "singular blend of philosophical fringe-think, love of science, and cosmic poetics." - Maria Popova

https://www.poetryfoundation.org/poets/r-buckminster-fuller



His groundbreaking invention of the geodesic dome, his untiring pursuit of sustainable progress and of doing more with less, **Fuller's** creations continue to influence architects, scientists, and artists today.

https://www.ipgbook.com/buckminster-fuller-products-9780615873442.php

The connection between art and science has long been established throughout the human creative process; however, specific tools such as ekphrastic poetry have not been studied as possible catalysts for scientific creativity.

We seek to evaluate the role of ekphrastic poetry as a catalyst for scientific creativity.

We are purposeful in our research by choosing selected forms of art as inspiration for ekphrasis:
Abstract Art, Surrealist Art, Galactic Images & Fluorescent Confocal Microscopy

What is Creativity?

The ability to provide solutions or generate original ideas by combining:

- Established knowledge
- **Imagination**
- Analytical thinking

Csikszentmihalyi, Mihaly. Creativity: Flow and the psychology of discovery and invention. Harper Perennial, 1996.

Scientific Creativity

The ability to generate new ideas in scientific contexts to solve complex problems

Requires integrating:

- Established knowledge and
- **Innovative thinking**

Friedman, J. and Sutherland, W.J. 'The Nature of Scientific Creativity.' Journal of Creative Behavior, vol. 38, no. 4, 2004, pp. 223-236.

How can Ekphrastic Poetry be a Catalyst for Scientific Creativity?

By Stimulating

Imagination

+

Innovative Thinking

Within a foundation of

Established Knowledge

Assessing Creativity

The **Torrance Test of Creative Thinking** (TTCT)

- Psychometric assessment involving cognitive-affective skills.
  - Includes criterion-referenced measures of creativity:
    - richness of imagery, colorfulness of imagery, fantasy, articulateness of storytelling, emotional expressiveness, and unusual visualization.

Specialized TTCT:

- **'Verbal Tasks Using Non-Verbal Stimuli'**
  - Subtype: **Ask and Guess Task**
    - Asks person questions about a picture, which cannot be answered by simply looking at the picture.
    - Requires analysis and creative thinking.

Plucker, Jonathan, and Mathew Mackel. "The Cambridge Handbook of Creativity." *Cambridge University Press*, 2010

Assessing Creativity using Specialized TTCT

Ask and Guess Task

1. Asks person to **generate a hypothesis** about the causes leading to the events of the picture. (Kim 2002)
2. Asks the person to **guess the possible consequences** of the event depicted. (Kim 2002)
3. In addition to this TTCT, we will ask one question to explore whether the imaginary incursions during the ekphrastic poetry exercise revealed an **'Aha' moment** for the students, also known as **Eureka moment**.
    - ➢ Many psychologists and neuroscientists consider these 'insights' the most dramatic form of creativity.
    - ➢ They are sudden realizations of which people become aware, and often lead to discoveries, inventions, poetry and new scientific theories. (Pearce et al., 2022)
4. Pictures/Images chosen as free flowing vehicles to creativity
    - ➢ Abstract, Surreal, Scientific Art
    - ➢ Given nature of images: non-specific geometric figures, shapes, colors (abstract), the blurring of reality and imagination with dream-like imagery (surreal), and artistically captured scientific concepts or events (scientific art)

Kim, Kyung Hee. "The torrance tests of creative thinking - figural or verbal: Which one should we use?" *Creativity. Theories – Research - Applications*, vol. 4, no. 2, 2017, pp. 302–321
Pearce, BinBin J., et al. "Going beyond the AHA! moment: Insight discovery for transdisciplinary research and learning." *Humanities and Social Sciences Communications*, vol. 9, no. 1, 2022

Can Ekphrastic Poetry of Abstract, Surreal or Scientific Art be a Catalyst for Scientific Creativity and Discovery?

A Pilot Study to Evaluate the Role of Ekphrastic Poetry on Scientific Creativity

Methods

Methods

26 students, ages 15 - 19

- 21 high school, 5 college students

All students were provided with electronically submitted instructions and questionnaire in a Google Form.

Eight pieces of art, two in each of these categories:

- abstract art, surreal art, galactic images (Hubble), fluorescent confocal microscopy of cells

Questionnaire included 5 questions based on the Specialized Torrance Test of Creative Thinking (TTCT).

- **Numerical**
  - Single choice: numerically 0-3 or Yes/No/Maybe
  - Mark as many as applicable: number of scientific concepts, theories, etc, that came to mind)
- **Open answer**
  - Describe insights or ‘Aha’ Moment

Assessment

Graph Results

- Clear, visual representation of proportions, allowing quick and easy understanding of different groups and responses

Analysis and interpretation

- **Analysis**
  - Descriptive. Based on frequencies and percentages of specific responses for each type of art.
    - Analysis can be improved in future studies with a more linear scale (0-10) for some questions.
  - Will consider stratification of art into four categories (abstract, surreal, galactic and electron microscopy - last two categories fall within scientific art)
    - May help narrow specificity with regards to ekphrasis and insights in relation to a given work of art.
- **Interpretation**
  - Valuable to learn possible catalyst effect of ekphrastic poetry on scientific creativity

Ekphrastic Poetry Exercise

Instructions in Google Form

An ekphrastic poem is inspired in a work of art. We express our feelings and creative thinking based on our appreciation of that art. The poem goes beyond what is visible, exploring deeper meanings and creating one of many possible underlying stories or *theories.

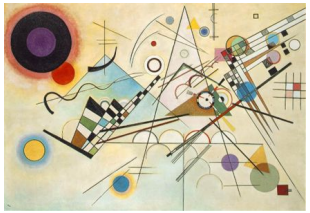
Abstract and surrealist art are creative catalysts for ekphrastic poetry, often referencing concepts in science and nature. More recently, science and art have intersected in the world of imaging, such as with electron microscopy, the Hubble space telescope, and even MRIs, providing great inspiration for creative ekphrastic poetry.

This activity is an exercise of our imagination. In the words of Albert Einstein, “Imagination is more important than knowledge. Knowledge is limited. Imagination encircles the world.” Coming out of the Dark Ages, the Renaissance brought much progress to humanity with the evolution of art and its interplay with science. Of this, Leonardo Da Vinci noted, "To develop a complete mind: study the science of art; study the art of science. Learn how to see. Realize that everything connects to everything else."

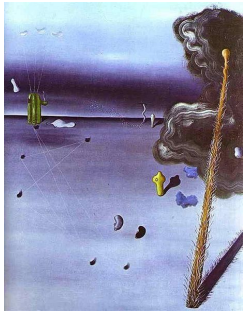
*Poems can be as short as eight lines (1 to 2 strophes) or a full length poem, with no maximum length limit. Works will be published online, if the author agrees. Additional forms of recognition are being explored with various art foundations.

Eight Works of Art as Inspiration for Ekphrasis

Abstract

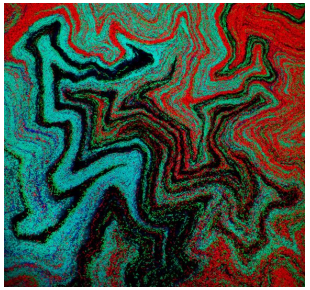


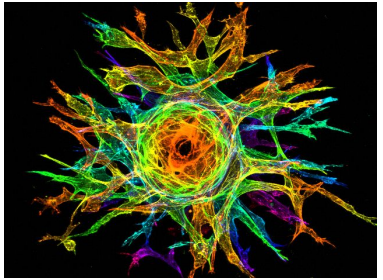
Surreal



Galactic

Cell Imaging





Questionnaire

Enter the *TITLE and *BODY of your ekphrastic poem here, based on your chosen work of art.

Add *YOUR NAME and the Name of the *WORK OF ART at the end of your poem.

***There are no specific rules for the structure (meter, rhyme, stanza) of your poem. If you prefer poetic prose or prose with some poetic elements, you can submit that instead. Let your creativity and imagination flow in the form of writing that comes naturally to you.

1. Did you find a connection between your chosen work of art and any of these fields? Check all that apply.

➢ Math, Physics, Chemistry, Biology, Technology, Psychology, Philosophy, Other (List)

2. How many science concepts or theories, mathematical formulas or theorems came to mind when you analyzed and then wrote about this work of art?

➢ 1, 2, 3, 4, 5 or more.

Questionnaire

3. a) Did you experience an ‘Aha moment’ as part of this activity? In other words, did you feel a sense of discovery or simply a new *insight about a concept of science or math while analyzing and writing about this work of art?

- ➢ Yes, No, Not Sure

3. b) If yes, to what extent was this realization or discovery, regardless of scope, significant to you?

- ➢ Minimal, Moderate, Significant

3. c) Can you mention briefly what specific ideas or insight you realized?

- ➢ List as many ideas and connections as apply. Important for understanding the impact of your poem.

4. After examining the art and writing your poem, what was your level of emotional or mental connectivity with it?

- ➢ None, Mild, Moderate, Strong

5. Did this activity enhance your appreciation of art?

- ➢ Yes, No, Not Sure

Results

*PLEASE - MUST CHOOSE ONE work of art from BELOW as inspiration for your ekphrastic poem, or poetic prose. *CLICK on your chosen work of art.

24 responses

Two participants did not mark their choices, *Bacterial Biofilm* and *Monkey Head Nebula*. One participant erroneously marked *Mama, Papa is wounded!*, but wrote about *Galatea of the Spheres*.

Ekphrastic Poems

Big Bang

light
color
form
explosions of shape and
existence, completely new

a vast universe
born from nothing
containing everything

every shape, every sound,
every speck of dust
all from one explosion
one moment
one bang

frantic
fleeting
ever-growing

a symphony of life
the music of the universe
born from darkness

impossible,
beautiful,
miraculous.

Lael Sanders, RE ‘26

Based on *Composition 8* by Wassily Kandinsky

Ekphrastic Poems

Solar Eclipse

The sun draws me in, solar
eclipse glasses resting on my
forehead—
I look up, egotistical,
Believing that those glasses
are surely a scam,
A bright crash over my retinas:
The sun is purple,
Casting the once orderly world
into chaos

My dog, three paces in front of
me
Is an impressionist painting,
Lines creating neon textures
The first sketch of a building
Scribbles only an architect
could decipher

The light, from my purple sun
Red-rimmed—
Paradoxical shapes
Or perhaps geometric
Sputter out in every direction,

I put my solar eclipse glasses
back on—
Everything becomes orderly,
There is no chaos,

What happens,
When I lose these glasses?
My dog barks.

Kayra Serpenguzel, RE ‘25, FSU ‘29

Based on *Composition 8* by Wassily Kandinsky

Ekphrastic Poems

Zboară

Says the space
To the bird without a face,
“Fly”
Repeats the sky
To the feather in the dirt
And as though plucked by a cosmic hand
As though to make a final stand
As though it needn’t life to lift
The bird that was not a bird took to space.

Chloe Alfonso, RE ‘24, Yale ‘28

Based on Bird in Space by Constantin Brancusi, 1932-40. Abstract Art, Modernism.

Ekphrastic Poems

Revenge of Self-Negligence

Divine femininity,
What is it worth? Years of self negligence
transforming into spheres of appreciation that come at a certain age.
Or merely a certain woman telling you the importance
of divine femininity.
A last laugh, that revenge
the divine femininity finally coming into play.
Being seen via colorful planets
telling you that it does not matter what you look like
who you emulate
what you love
you are a divine feminine.
A planet,
a gravitational force to be reckoned with.

Emily Lawrence, Wake Forest ‘27
Based on *Galatea of the Spheres*,
by Salvador Dalí

Ekphrastic Poems

Spheres of Beauty

In spheres of light, Galatea reappears,
Atoms dance as science shifts its gears.
Each orb a whisper of geometry's grace,
Symmetry's tender embrace in this fragmented space.

Atomic whispers paint her timeless face,
Optic dreams through Dali's hand retrace.
Where math and art in harmony combine,
Galatea shines, where science and beauty align.

Ciara Díaz, New World School of the Arts '27

Based on *Galatea of the Spheres*,
by Salvador Dalí

Ekphrastic Poems

Ephemeral Reaction

In our first glance
All movements ceased.
The nucleons, static,
Your beauty etched.

When from afar
The mighty force returned,
Though deconstructed
Your grace still reigned.

Noble and calm,
Anxiously stable,
Your pensive nature,
All reactions quenched.

Further away
From this inner world,
A macrocosm
Made them reflect.

You are the Goddess,
A Nereid, they said.
She who in the Universe
Forged dance ensembles of
Smalls, femtos, gigas,
amongst
Trillions of spheres of
Matter, Gas, Ice.

All the while Chronos
Searching a majestic formula,
Heard Graphene's whisper
To conceive of you:
Galatea, the Creator
Of Love, Life and all that is
Unknown.

Nelson Martín Manstein, RE '26

Based on *Galatea of the Spheres*,
by Salvador Dalí

Ekphrastic Poems

Labyrinth of Dreams

In my labyrinth of dreams, Galatea spins spheres—
Worlds born from the tender caress of nothing.
Each speck, a universe manifesting its own narrative,
With echoes of creation in soft whispers.

Vlad Ponomarenko, RE ‘25, Cornell ‘29

Based on *Galatea of the Spheres*,
by Salvador Dalí

Ekphrastic Poems

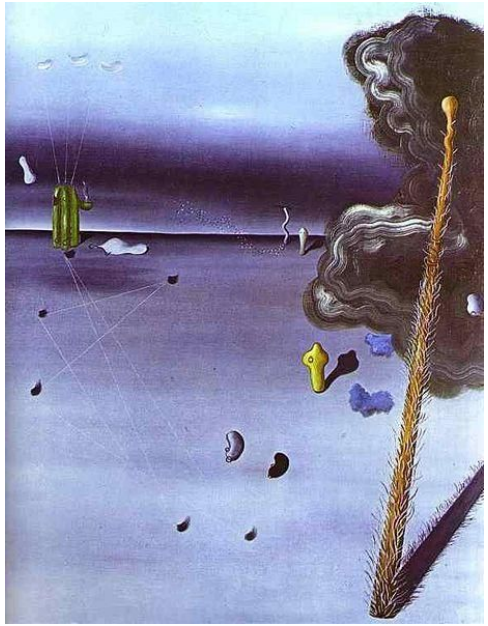
Ethereal

In orbs of light, her form takes flight,
Galatea's grace in spheres so bright.
A goddess born of cosmic dreams,
In Dali's world, surreal she gleams.

Christopher Tsialas, RE '26

Based on *Galatea of the Spheres*,
by Salvador Dalí

Ekphrastic Poems



Cactus at Play

My needle-like hairs touch the cloud of smoke above us
My children play in the sand
and I am a mother of four
"Mama, Papa is wounded!" exclaims one daughter
but Papa was not wounded; he was a cactus
playing with our other children
holding onto them like balloons in the sky.

Lionel I. Diaz, U. Miami ‘27

Based on *Mama, Papa is wounded!*
By Yves Tanguy, 1927.

Ekphrastic Poems

Gaze of the Nebula

In the velvet cloak of night, a visage stirs,
A monkey's face formed in cosmic blurs.
Gas clouds whisper secrets, ethereal and bright,
Stars twinkle like laughter, igniting the night.

Crimson and azure dance in a swirling embrace,
A celestial tapestry, time's gentle trace.
What stories are hidden in this vibrant hue?
Of ancient worlds dreaming, of life breaking through.

Eyes that watch from a nebula vast,
Reflecting the echoes of the universe's past.
Imagination soars where knowledge falls short,
In the heart of the cosmos, a wondrous report.

In this cosmic canvas, we search for our place,
Finding connections in the stars' silent grace.
The Monkey Head whispers, "Look up and see,
In the expanse of the heavens, you're part of the mystery."

Stephanie Wallen, RE '24, Caltech '28.

Based on Monkey Head Nebula. Hubble Telescope. NASA.

Ekphrastic Poems

Worthy

Under the dark midnight skies,
a beautiful, complex galaxy lies,
made of a mix of light, gas, and dust,
pointing to the One who we can trust

Nebulas bloom and planets spin.
All of it worshiping and glorifying Him.
Coming together to form a choir
and sing praises that never tire.

He creates life from a mere touch.
To this majesty, I will forever clutch.
If the galaxies shout of His power,
so will I lift my voice, even louder

Glorifying God in the heavens forever,
it is my life endeavor.
For the rest of my days I will try.
Still, the sum of our reverence would fall shy.

Kathryn Serra, RE ‘23, Harvard ‘27.
Based on Monkey Head Nebula. Hubble Telescope. NASA.

Ekphrastic Poems

Contrast

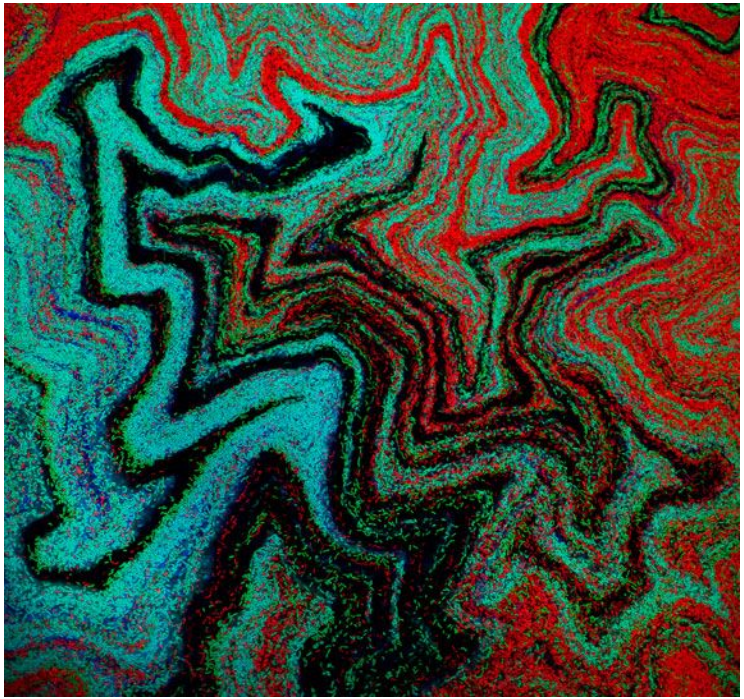
Illuminating the outer darkness of the Milky Way
both more than 5 times the size of the sun
exhibiting their searing energy and ultraviolet radiation
an energetic and colossal blue star stands big
another one red and bright
facing each other in the eye
representing the galaxy we live in as well as an undersea world
contrasting each other like water and fire.

Manav Saigal, RE ‘26

Based on *Cosmic Reef. Hubble Telescope. NASA*

.

Ekphrastic Poems

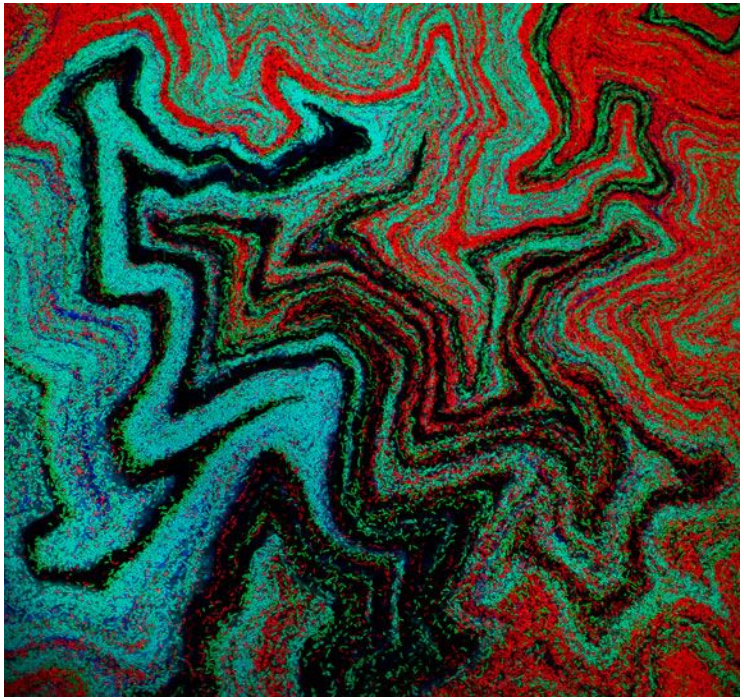


Sight

Do you see me?
Not unless you're looking
Looking hard
And Long
Using all of your precious sight
How would you be different
If it was I that had your sight
If only I had eyes
To see
Or ears
To hear
Or skin
To feel even the slightest bit of touch
How much more could we be
To you
If we had just one of your gifts
Maybe then
You would see us
All of us.

Sophie Kosiba, Brandeis '27
Based on *Bacterial Biofilm* - Each dot is an individual bacterium, called Bacillus subtilis. By Fernan Federici & Jim Haseloff. Smithsonian.

Ekphrastic Poems

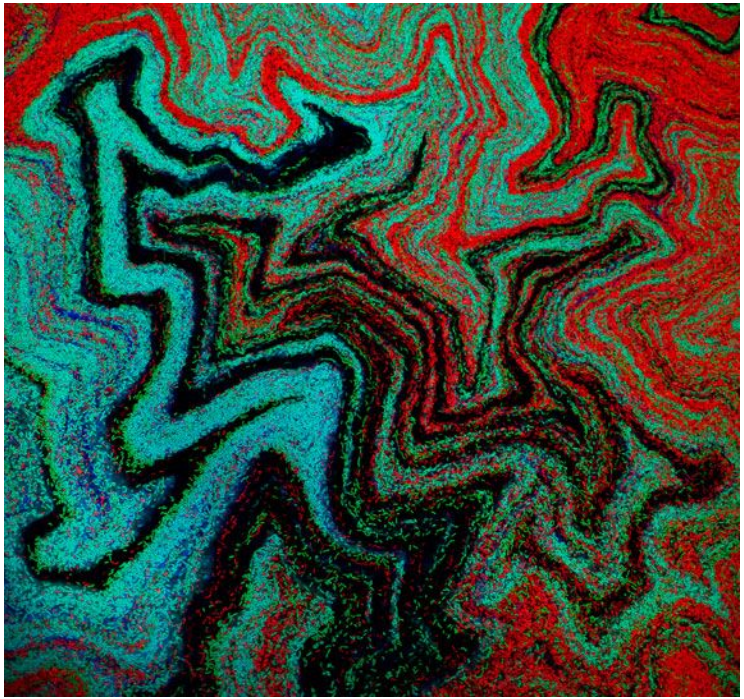


The Contributors

A matrix of bacteria—
Each bacterium a dot in the system.
Banding together
With curves and layers,
No one bacterium stands out,
Yet each gives itself to the whole,
Vibrant and connected.
Sinuous yet sharp,
The lines in the matrix
Come from microscopic,
But not insignificant,
Contributors.

Mia Campbell, RE ‘25, MIT ‘29
Based on *Bacterial Biofilm* -
Each dot is an individual
bacterium, called Bacillus subtilis.
By Fernan Federici & Jim Haseloff. Smithsonian.

Ekphrastic Poems



Strangers in a Biofilm

Amidst the spectrum of light
That only the extremes saw,
I found you reaching for me
With *subtle* moves of pure awe.

Orange and green, red and blue,
Finding one another to
Complement our moods,
Each dot witness to our truth.

Like happiness and nostalgia,
Subject to our own devices:
Quorum sensing, ion channels,
Charges fleeting Cupid's Bow,
Even more so to the fates
Of our universes fused.

Fertile lair of creation,
Inoculates and refrains,
At the sight of the blue light,
Or the touch of the halides.

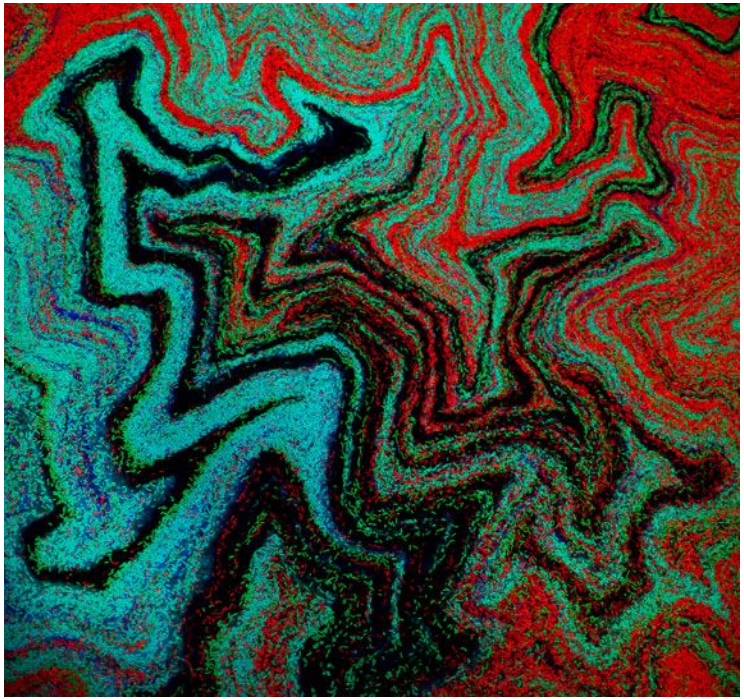
As tiny cells we converge
In one being, The Biofilm.
The Community of All,
Atoms, Molecules, Bacteria.

And from these,
All the ones
And the stars
Will connect,
In a distant dance
Of endless interplay.

Nelson Martín Manstein, RE '26

Based on *Bacterial Biofilm* - Each dot is an individual bacterium, called Bacillus subtilis. By Fernan Federici & Jim Haseloff. Smithsonian.

Ekphrastic Poems

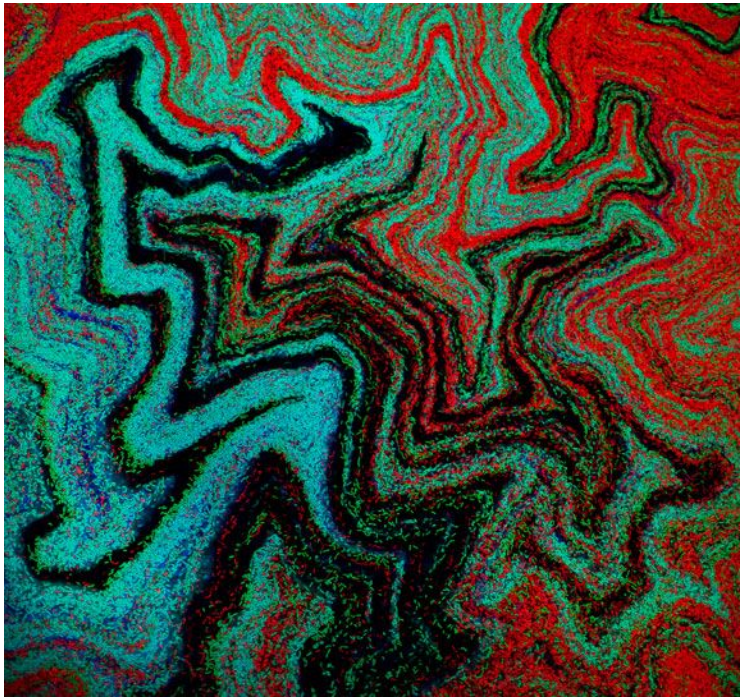


Big Picture

Hundreds, thousands, millions of dots,
Each separate, in its own world,
And yet, together, they are something more.
Green flashes, streaks of fire,
An intricate masterpiece
Unwittingly created,
But no less significant.

Andrew Gedde, RE ‘25, MIT ‘29.
Based on *Bacterial Biofilm* - Each dot is an individual bacterium, called Bacillus subtilis. By Fernan Federici & Jim Haseloff. Smithsonian.

Ekphrastic Poems



Microcosmic Symphony

Under the lens, life unfolds,
a universe within a drop.
Each dot teeming with
tiny architects of a grand design.

Veins of red, blue, green, black.
a symphony of the unseen,
Yet, now seen.
Each bacterium
subtilis.
Yet, not subtle,
playing its part in the sea of the living.

Patterns echoing nature's hand,
they cluster and spread,
Like winding rivers of water and blood.
Silent, complex, alive.

Patience reveals a hidden world,
A canvas of single cells,
Each dot a life with
a purpose.

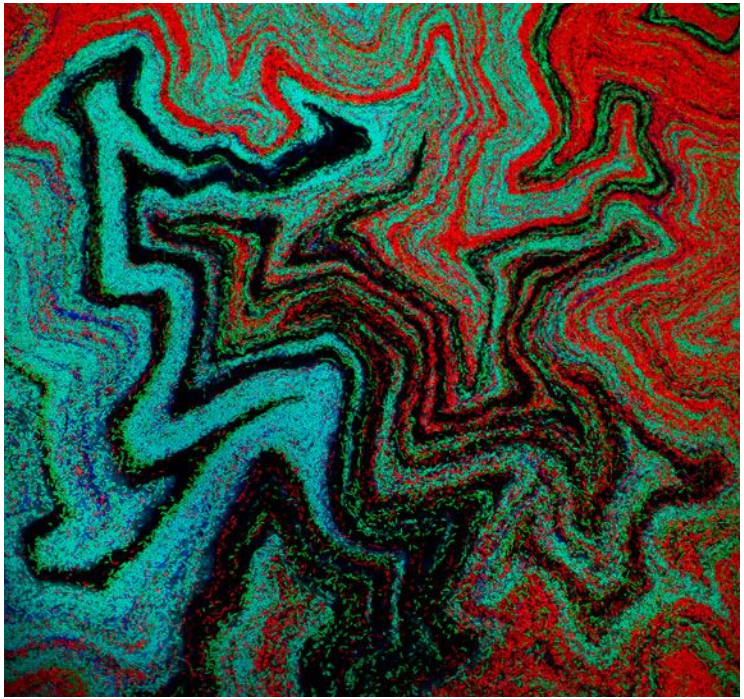
Beauty in a microcosm,
Art in the invisible,
Yet, now visible.
A being in each tiny speck.

Miniscule creatures,
Magnificent microorganisms,
form vast, intricate tapestries.
Nature’s marvel.
The twisting dance of life–
Never-ending.
Eternal.

Constantino Pena, RE ‘26

Based on *Bacterial Biofilm* - Each dot is an individual bacterium, called Bacillus subtilis. By Fernan Federici & Jim Haseloff. Smithsonian.

Ekphrastic Poems



Arcade Carpet of the Gods

The bacteria weave together a pattern beyond our understanding, its natural state appears to us as intentionally vague; like the splattered canvas of the boundary-pushing artist, it is created to be obtuse.

“It’s about what you get from it,” the artist says, pretentiousness dripping from their tongues, like the purple prose we clamor to compare it to –not describe, not explain…We can never explain it. We cannot explain its truth in plain language, but as we inch forever closer, fingers smudging and breath fogging up the glass, we try to the best of our abilities to contain multitudes within bounds.

Insignificant. Smaller than a grain of dust lost in the wind. Dragged along by forces beyond comprehension. The small human cannot comprehend the vastness of the universe. It is also difficult to conceptualize the minutia of bacteria. As the universe is to us, we are to the bacteria, and vice-versa.

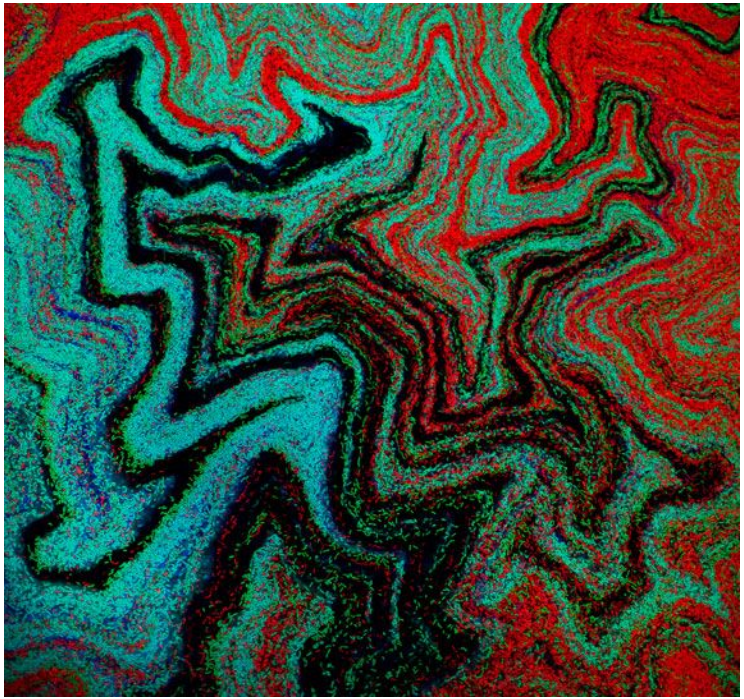
I do not understand the Bacteria Biofilm; I cannot predict it mathematically as the scientists have done. So, I compare it.

To me, it looks like an Arcade Carpet.

Garishly colorful, almost seizure-inducing. It looks like it should be the unidentifiably sticky companion to a Pac-Man machine. Forever stained and made artificial sweet. The chemical recreations of vague fruit approximations waft up at you. “This is our attempt at raspberry. It is blue.”

Cont/

Ekphrastic Poems



Arcade Carpet of the Gods / Cont.

It looks like its thin strands will shock you at repeated intervals, static built up and discharged at the nearest thing. Static: Like the noise of random radio waves picked up by your TV, extraneous byproduct of a busy universe.

Electric! It's Electric!

Fizzing and crackling like a live wire, sparks licking up a hand, a kind tingle on the tongue and the tang of cold metal, almost sweet in its lack of abandon. It does not care for you, it is a glorious static God, and it understands you as well as you do it. Ant meets Boot. Ant meets Heel. Ant is left as smear on pavement.

"The researchers mixed all of the colors together, at first, but, as the bacteria grew, they reconfigured themselves into mathematically predictable patterns."* Bacteria mixed to Oblivion; Shaken bottle, Shattered glass, Snowflake fractals ad infinitum. Quod Erat Demonstrandum.

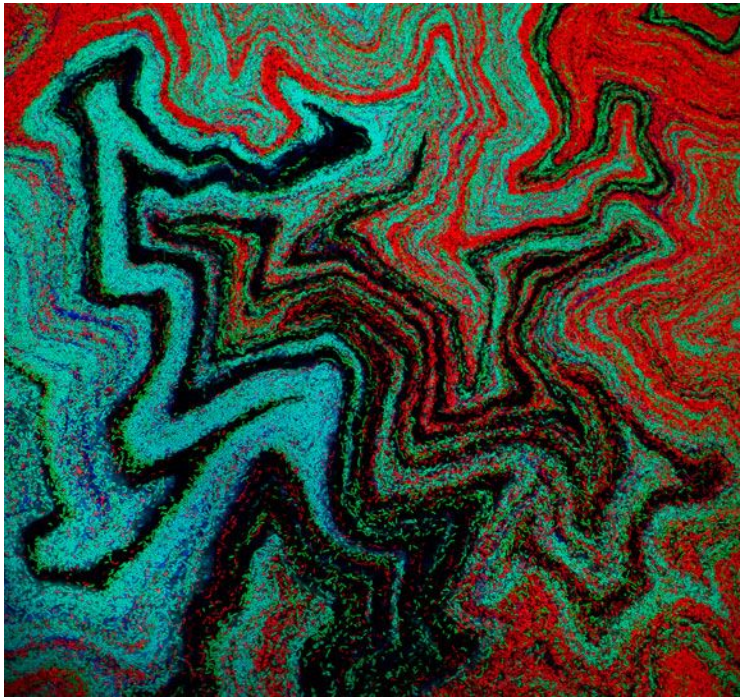
Chaos is simply Order we don't yet understand. But we inch ever closer, we reach out to grasp the fuzzy, stained, sticky, Arcade Carpet of the Gods.

Paloma Lopes, RE '25, JHU '29

Based on "*Bacterial Biofilm* - Each dot is an individual bacterium, called Bacillus subtilis. By Fernan Federici & Jim Haseloff. Smithsonian."

*Quotation taken from https://www.smithsonianmag.com/science-nature/science-images-that-border-on-art-50661407/

Ekphrastic Poems



Our Future in a Biofilm

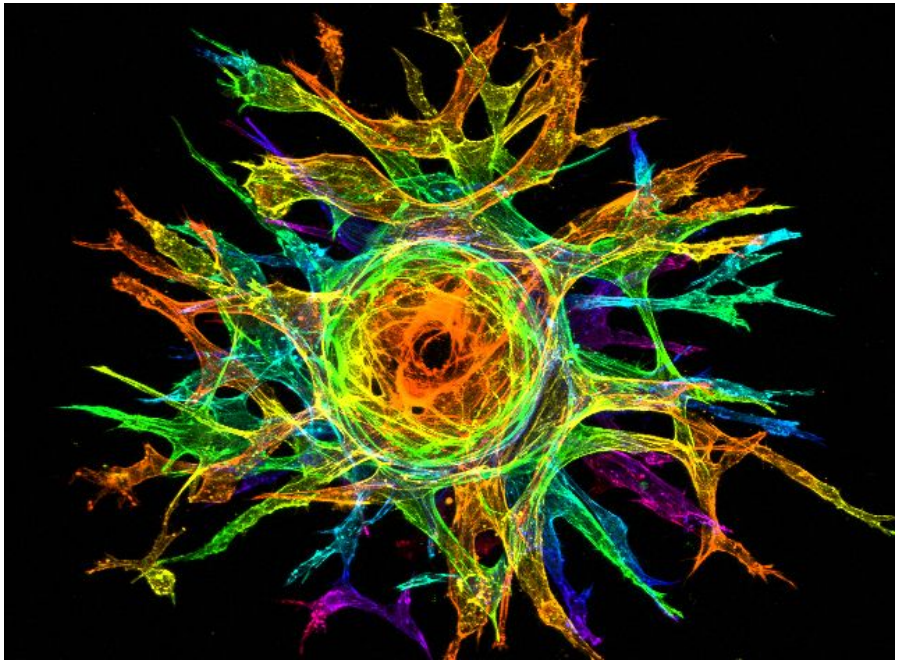
An unforgiving world surrounds my friends and me
We will group together in order just to be
Find solace, warmth, and protection only amongst ourselves
In time we will create libraries, knowledge filled shelves
As we progress through time and space
All we can is stay together in this big race.

Connor Alfonso, RE ‘26

Based on *Bacterial Biofilm* - Each dot is an individual bacterium, called Bacillus subtilis. By Fernan Federici & Jim Haseloff. Smithsonian.

Ekphrastic Poems

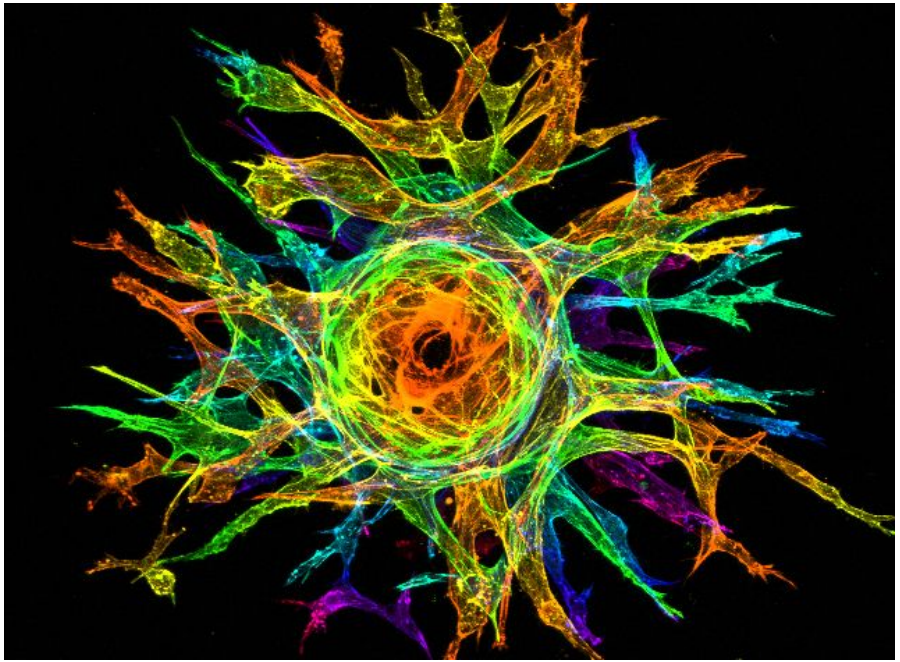
The Essential



God, the bright yellow center.
The foundation and root of our existence.
Without the brilliant nucleus, we lack purpose and everything is a matter of opinion.
Without it, our lives would crumble and gravity would cease to exist.
Each appendage is a testament to our creator, who forms us with unique characteristics.
When we lose focus on its splendor, divisiveness swallows our world and those differences amongst us result in catastrophe.
The yellow center, a reminder of where we come from and how we are connected.

David Serra, RE ‘24, Boston College ‘28
Based on *Sprouting Endothelial Cell*.
By Karina Kinghorn. UNC Chapel Hill.

Ekphrastic Poems



What Makes Us Human?

"What is that?" you ask.

A spider web?
A fractal?
A neural net?

No, a cell.
Invisible to the human eye,
too detailed for the human
mind,
too intricate for the digits.

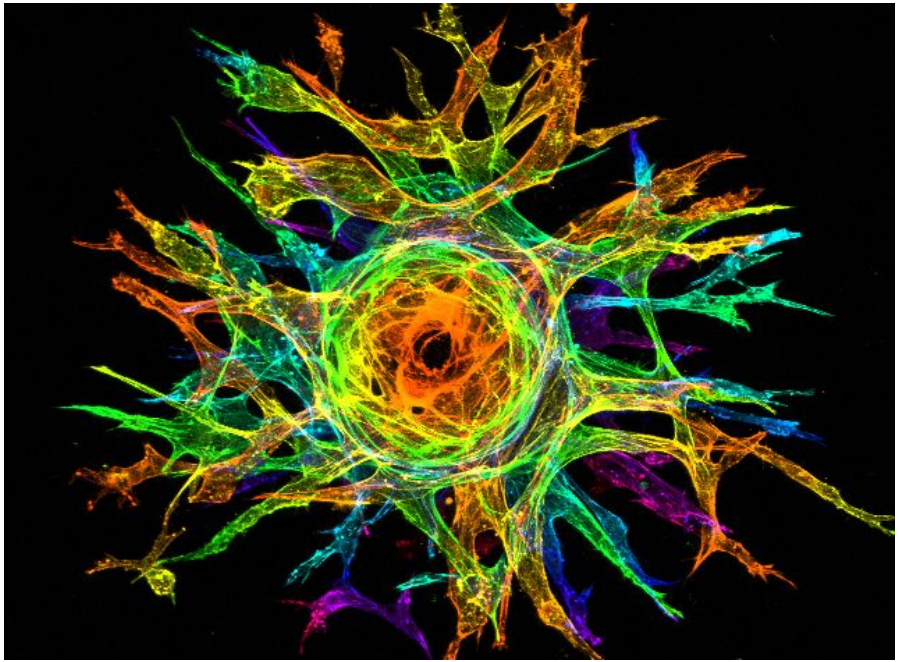
The nucleus.
A center full of life,
the hearth of human design,
branching endlessly out of
sight.

A cell.
Invisible to the human eye,
too intricate for the digits:
clandestine to our sensation,
confined to our imagination:
yet so profoundly human.

"What is that," you ask?
Well,
'tis but a cell,
the spark that makes us human.

Jacob Aronow, RE ‘26
Based on *Sprouting Endothelial Cell*.
By Karina Kinghorn. UNC Chapel Hill.

Ekphrastic Poems

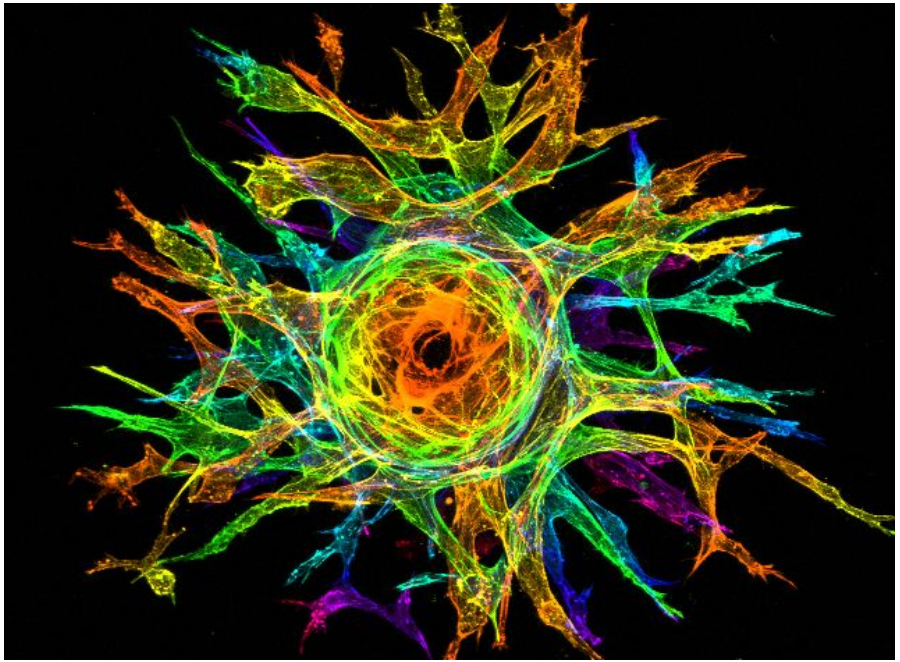


Web of Life

The cell's web lies passing blood, electrolytes.
It lays its colorful roots in time for life's amassing
Rooted in the beginning of life, colorless mass lying in time.
Blood lies in a web of cells, electrons passing.

David Martinez, RE ‘25, MIT ‘29
Based on *Sprouting Endothelial Cell*.
By Karina Kinghorn. UNC Chapel Hill.

Ekphrastic Poems



Web of Life

In the quiet art gallery of space,
A work of art, sits out of place,

Rainbow in color, with an ever shifting hue,
The architect of life, sits proud and true.

A tapestry of cells beginning to bloom,
Unfold the secrets of this room.

The root of change, silent and unseen,
Yet under a microscope, glows a bright green.

Each curve and line, a story to be told,
Of vessels forming, strong yet bold,

The delicate and intricate dance,
Life's design begins a subtle trance,

The art reflects a deeper view,
Of growth that's silent, yet so true,

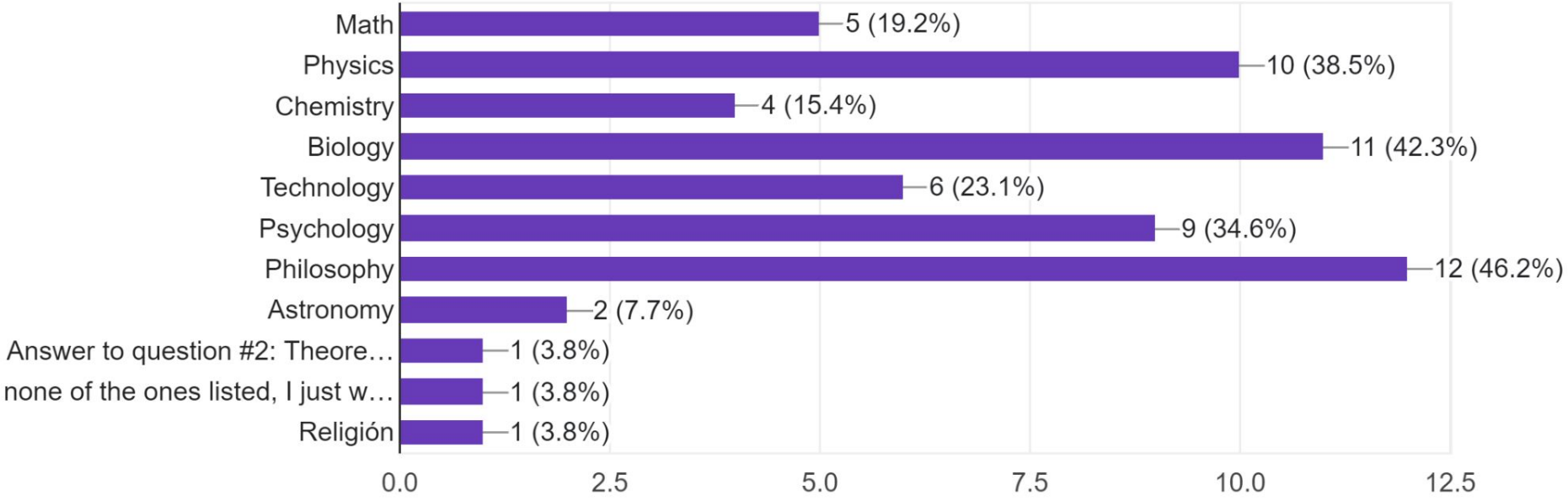
A glimpse of what's beneath the skin,
Where life chooses to end and begin.

(after reading the whole poem, try reading odd & even stanzas such as 1:3:5:7 or 2:4:6:8)

Liam Díaz, Nova Southeastern '28
Based on *Sprouting Endothelial Cell*.
By Karina Kinghorn. UNC Chapel Hill.

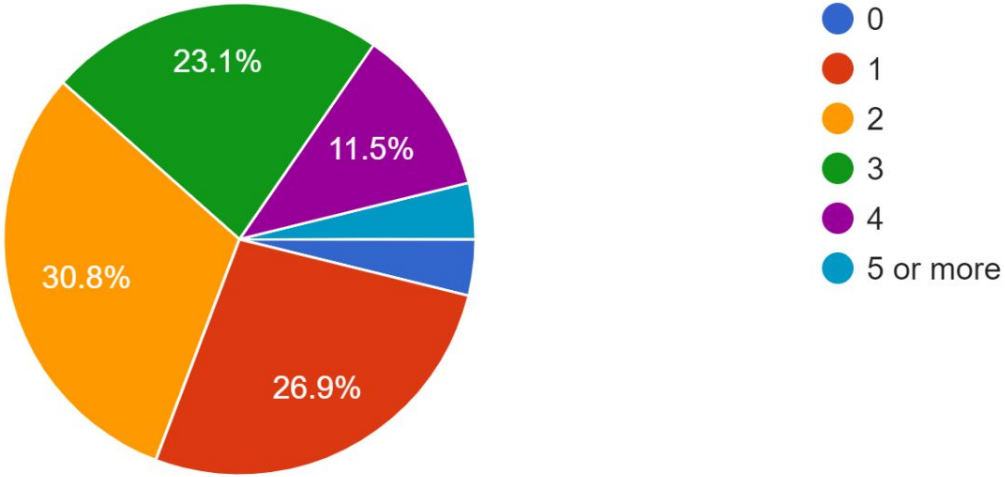
1. Did you find a connection between your chosen work of art and any of these fields? Check all that apply.

26 responses



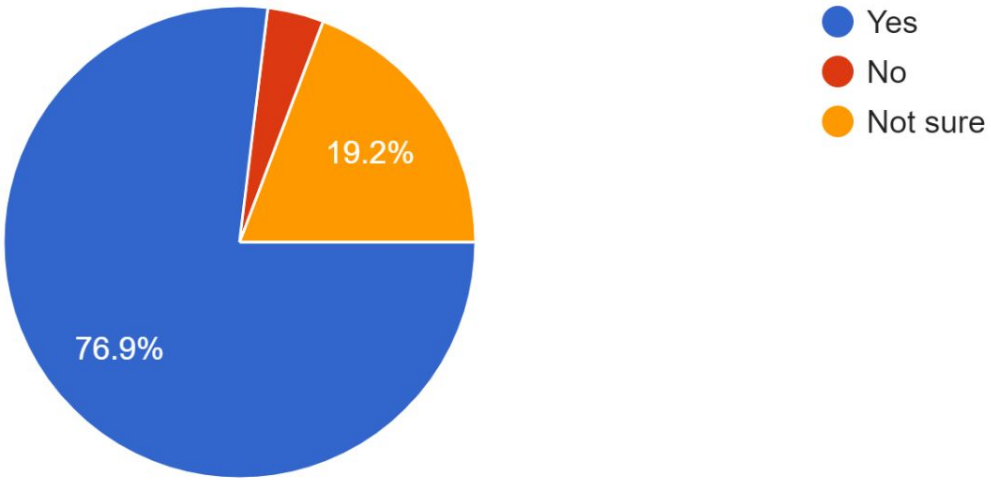
2. How many science concepts or theories, mathematical formulas or theorems came to mind when you analyzed and then wrote about this work of art?

26 responses



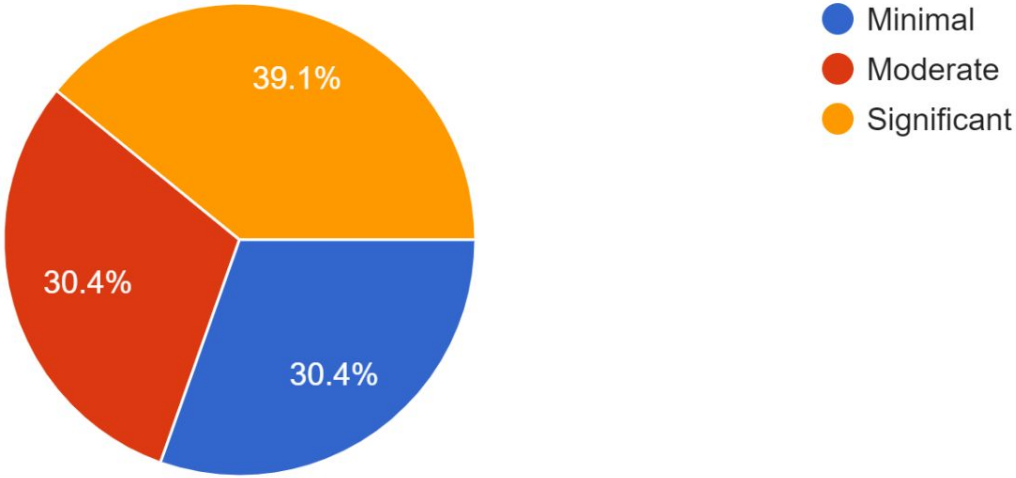
3. a) Did you experience an ‘Aha moment’ as part of this activity? In other words, did you feel a sense of discovery or simply a new *insight about a ...hile analyzing and writing about this work of art?

26 responses



3. b) If yes, to what extent was this realization or discovery, regardless of scope, significant to you?

23 responses



3. c) Specific ideas or Insights Realized

“The painting reminded me of nature, how easily we categorize and define what is "order" and "chaos". It was hard for me therefore to relate it to technology once I established this connection to nature initially.” Author, ***Solar Eclipse***

“The interplay of chaos and order in Kandinsky’s work mirrors mathematical concepts of chaos theory and fractals.

The use of geometric shapes and symmetry relates to principles in physics, particularly in the study of wave patterns and quantum mechanics.

The abstraction in the art connects to philosophical ideas about perception and reality, challenging how we interpret visual stimuli and meaning.” Author, ***Chaos and Harmony***

“While analyzing the work of art, and crafting my poem, I realized how everything in the universe is just like the figures in the work of art; irregular, random forms that burst from nothing, yet make up our entire lives. This changed how I view the importance of the world, and the beauty of our short time on it. It reminded me that everything is an important, amazing reflection of this vastness of the universe, and should be treasured.” Author, ***Big Bang***

Composition 8 by Wassily Kandinsky, 1923.
Abstract Art, Expressionism.

3. c) Specific ideas or Insights Realized

“That our conception of life can sometimes minimize our conception of the natural world that is not life. For example (at least for me) when we think of flight we likely think of a bird flying but rarely consider a single feather soaring through the air.”

Author, ***Zboara***

Bird in Space by Constantin Brancusi, 1932-40. Abstract Art, Modernism.

3. c) Specific ideas or Insights Realized

“The macrocosm may indeed be a larger scale representation of what happens in a microcosm at the atomic level. Depending on the element, for example Uranium vs. Helium, the nature and magnitude of the movement and reactions that take place in the nucleus, may be completely different, mirroring the various behaviors of planets in billions of galaxies within our Universe.

Another thought provoked by the painting was its similitude with Graphene, one of the strongest and most versatile materials available, and an electroconductivity gem. Galatea resembles Graphene’s shape: a 2-D lattice made of continuously repeating, sigle-layer hexagones of carbon atoms.”

Author, ***Ephemeral Reaction***

Galatea of the Spheres by Salvador Dali, 1952. Surrealism.

3. c) Specific ideas or Insights Realized

“#1: Beauty is not recognized as infinite for most women in today's society. In other words, there are certain standards to live up to as promoted by social media, for example, that are created by other people. Therefore, connecting a woman to the infinite galaxy can be a reminder that beauty, as well, can be infinite and found in every aspect of a woman. Thus, proposing this idea of all women being "divine" in their own unique ways.

#2: The tough exterior of planets, that tend to degrade over time, such as rocks on the moon becoming sand or climate changes in Saturn (or even Earth via global warming - to reference a more common example) can be connected to the degradation people in general (my poem is more specified towards women, but I think all people can relate to this) feel in the challenges of life.

#3: Human behavior is easy to manipulate when there are prevalent sources that keep promoting the same ideas. That degradation is stemmed from ideas that are tossed to promote certain ideals that may not fit what life today is all about. For example, beauty standards today are not the same as they were in the 1700s, when women commonly suffered from childbirth due to lack of medical advancements and were, therefore, encouraged to remain a certain physique. ”

Author, **Revenge of Self-Negligence**

Galatea of the Spheres by Salvador Dalí, 1952. Surrealism.

3. c) Specific ideas or Insights Realized

“The poem captures Galatea's ethereal form emerging from orbs of light, reflecting Dali's surreal and celestial vision. It emphasizes her grace, beauty, and timelessness, portraying her as a divine figure in a dream-like, dynamic space.” Author, ***Orbs of Light***

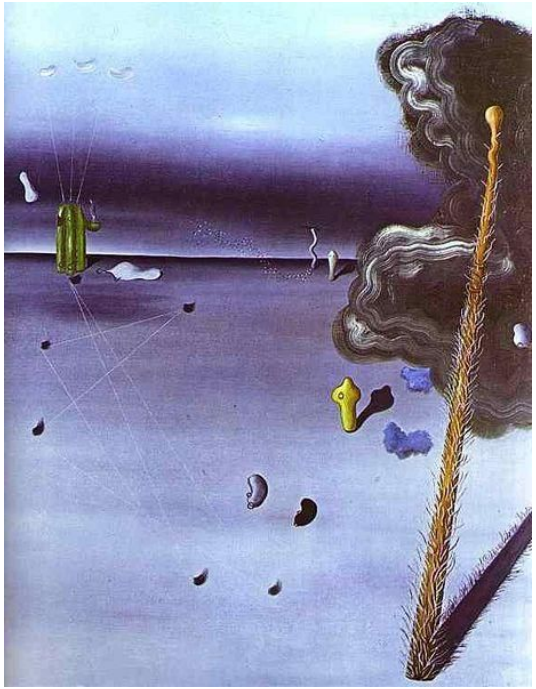
“I realized the sheer expansiveness of the universe, our tiny existence, and the interconnectedness of all matter in our universe.” Author, ***Labyrinth of Dreams***

Galatea of the Spheres by Salvador Dalí, 1952. Surrealism.

3. c) Specific ideas or Insights Realized

“I realized that many of the shapes looked like seeds, plants, and parts of nature. I also realized the title could probably be applied to a few of the shapes if one thought for long enough, so I did, and applied the title to a few specific shapes. The green shape looks like a cactus. The red one with the white lines on it looks like a strange alien plant. I made that one the mother because it looked like it was watching over all the other shapes. I made the cactus the father because the other shapes were surrounding it.”

Author, ***Cactus at Play***



Mama, Papa is wounded!
By Yves Tanguy, 1927. Surrealism.

3. c) Specific ideas or Insights Realized

“The transcendence of God” Author, ***Worthy***

“I realized how creative writing about science can be.” Author, ***Gaze of the Nebula***

Monkey Head Nebula. Hubble Telescope. NASA.

3. c) Specific ideas or Insights Realized

“Tweaking the poem's pace shifted its vibe from serene to chaotic, emphasizing how style affects mood. It also highlighted how art, like viewing the cosmos through the Hubble Telescope, can adapt and evolve based on our perceptions and technological interactions.” Author, ***Cosmic Grace***

“The stars shown in the image helped put a clearer picture in my mind of the trillions of stars that are out there unnoticed. It also allowed me to further understand and acknowledge the true size and impact some stars have in the Milky Way such as the two shown in ‘Cosmic Reef’." Author, ***Contrast***

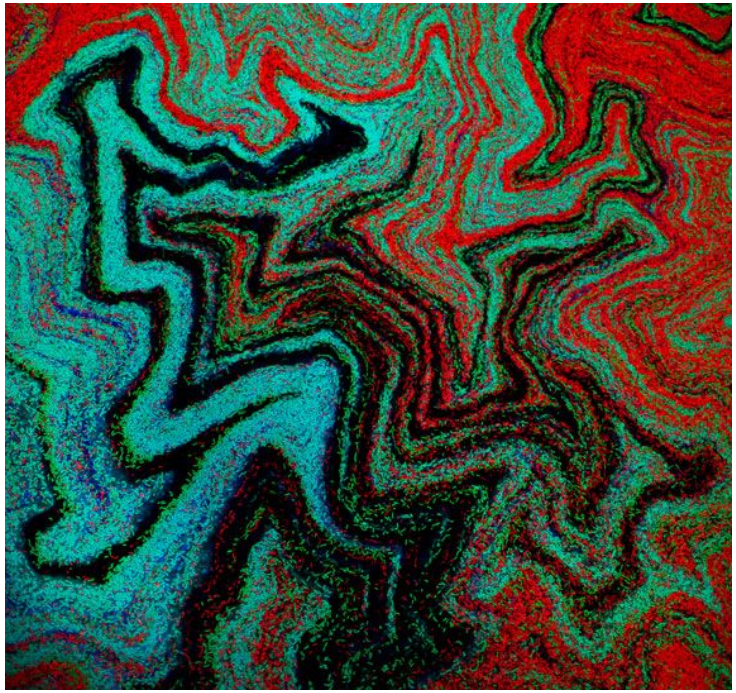
Hubble's Cosmic Reef. NASA

3. c) Specific ideas or Insights Realized

“Scientists will look at biofilms and bacteria with regularity. Although biofilms might be a mundane concept, they represent perhaps the first instance of the evolutionary prerogative of the simple need to gather for protection by single-celled organisms. From these simple gatherings complex social structures will evolve. And in this way, our happiness, future and safety will come to form.” Author, ***Our Future in a Biofilm***

“I didn't realize anything in this poem that I didn't know before, but this exercise did allow me to package a recurring thought about the complexity of the universe.” Author, ***Arcade Carpet of the Gods***

“I realized that people/ideas/objects that may seem unrelated can actually be combined to created something much greater than any one of the components. This concept can be applied in many ways, from acquiring knowledge to promoting teamwork.” Author, ***Big Picture***



Bacterial Biofilm - Each dot is an individual bacterium, called Bacillus subtilis. By Fernan Federici & Jim Haseloff. Smithsonian.

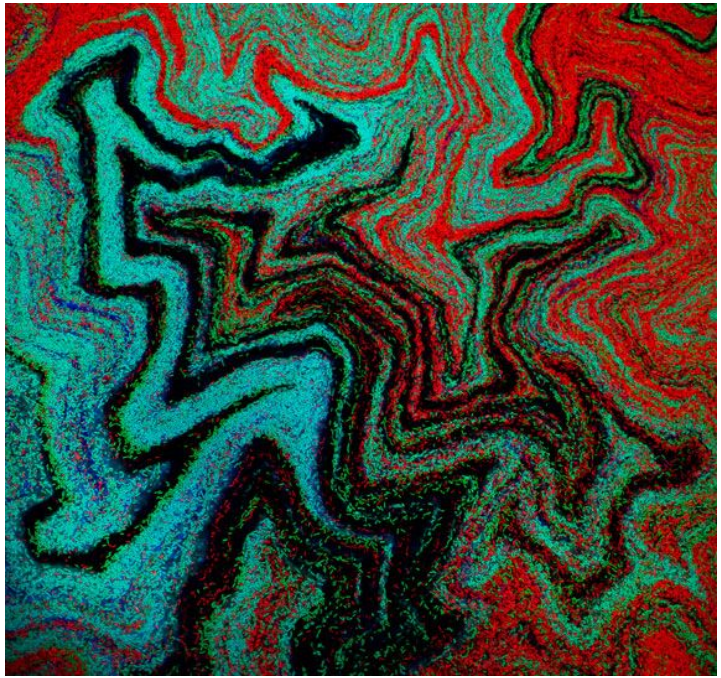
3. c) Specific ideas or Insights Realized

“I realized that unnatural looking things may be natural in nature.” Author, ***The Hidden Galaxy***

“I realized how microorganisms can come together to form art. Each dot in this biofilm represents life and it's amazing how they all merge together to form a work of art. The different colors were interesting as well because I needed to think about why certain bacteria were red, while others were blue, green or black. Was it due to certain elements of each bacteria?” Author, ***Microscomic Symphony***

“I realized that each contributor does not have to play a significant role in the effect of the whole.” Author, ***The Contributor***

“Realized that bacteria that could have sensational input would be far more dangerous and capable than now.” Author, ***Sight***



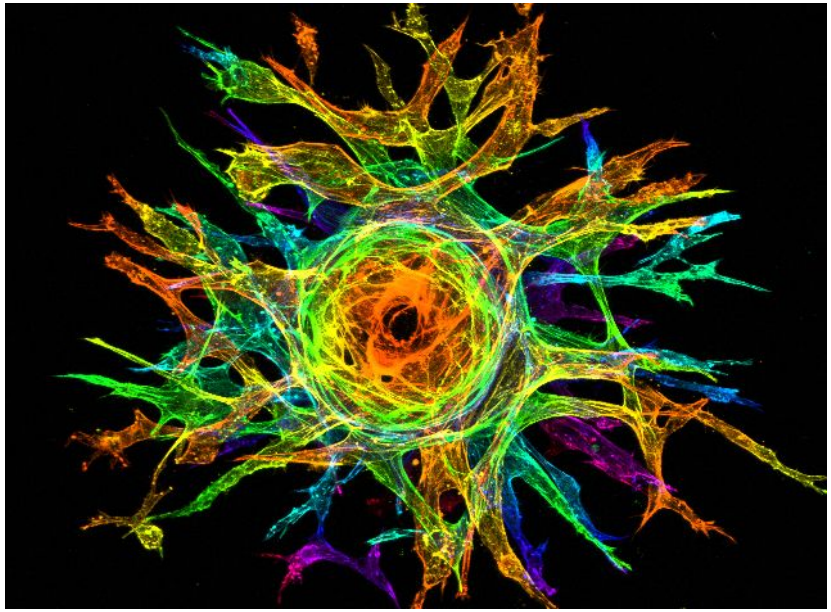
Bacterial Biofilm - Each dot is an individual bacterium, called Bacillus subtilis. By Fernan Federici & Jim Haseloff. Smithsonian.

3. c) Specific ideas or Insights Realized

“The structure of a cell is nothing unique. Take a look at a neural net or a fractal and it will be hard to miss the similarities between them and the sprouting cell. However, what a neural net and others do not have in common with the cell is humanity. The cell is eminently human, profoundly intricate, and plainly fascinating. While the other things I mentioned are concepts invented by humans to explain certain truths of the universe, they will never be as human as a cell. The precision of nature beats the clumsy attempts of human invention every time. In other words, whatever humans do, no matter how close they may come, they will never synthesize something as truly human as a cell.

This realization is particularly relevant in today's technological age, where the line between human and artificiality is being rapidly blurred. But I hope my poem serves as a reminder that this line, no matter how fuzzy it may become, will never fully disappear.”

Author, ***What Makes Us Human?***



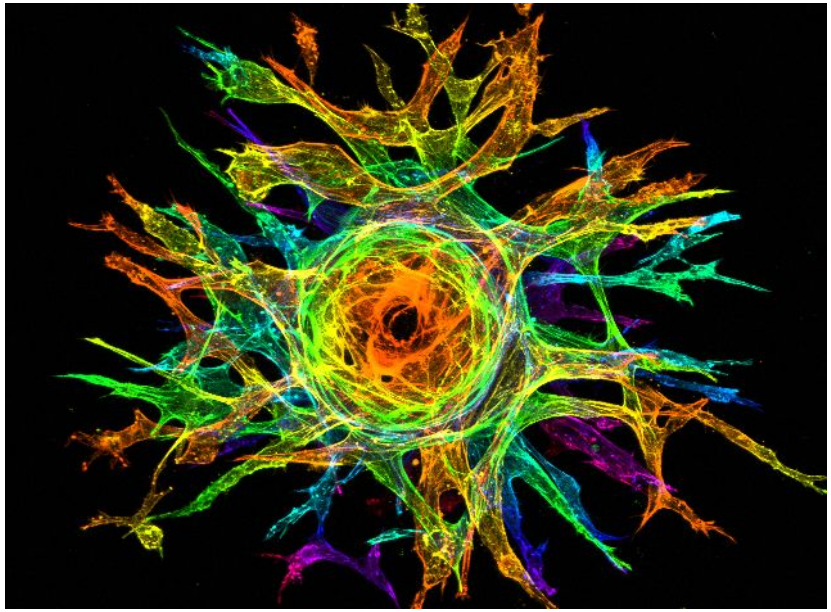
Sprouting Endothelial Cell. By Karina Kinghorn. UNC Chapel Hill.

3. c) Specific ideas or Insights Realized

“The similarity between a nucleus and the rest of the cell and our Creator and the rest of humanity.” Author, ***The Essential***

“electron microscopes, cell staining, cell division, origin of life, evolution, solutes/solvents” Author, ***Web of Life***

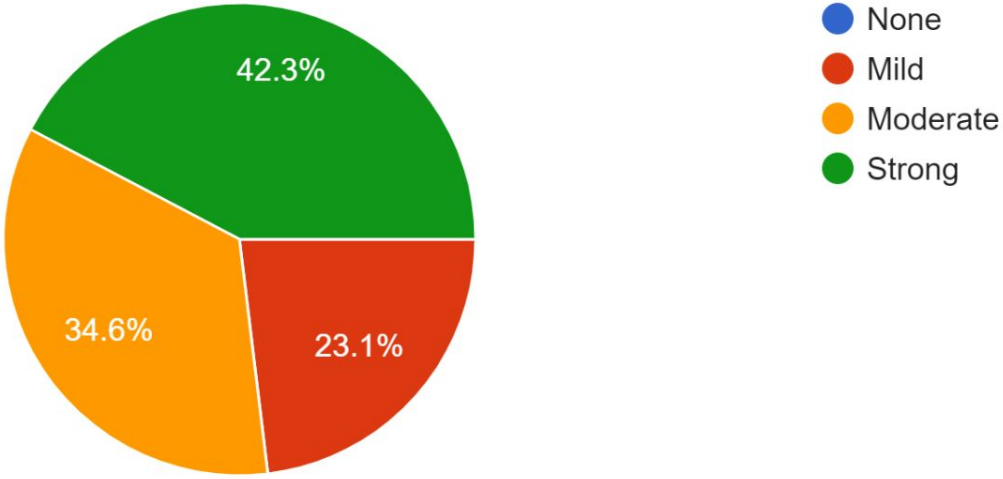
“Mainly a realization of the beauty of which science allows us to view which we would not otherwise be able to. The beauty of life unseen, among many other things.” Author, ***The Colors Untold: Silent and Unseen***



Sprouting Endothelial Cell. By Karina Kinghorn. UNC Chapel Hill.

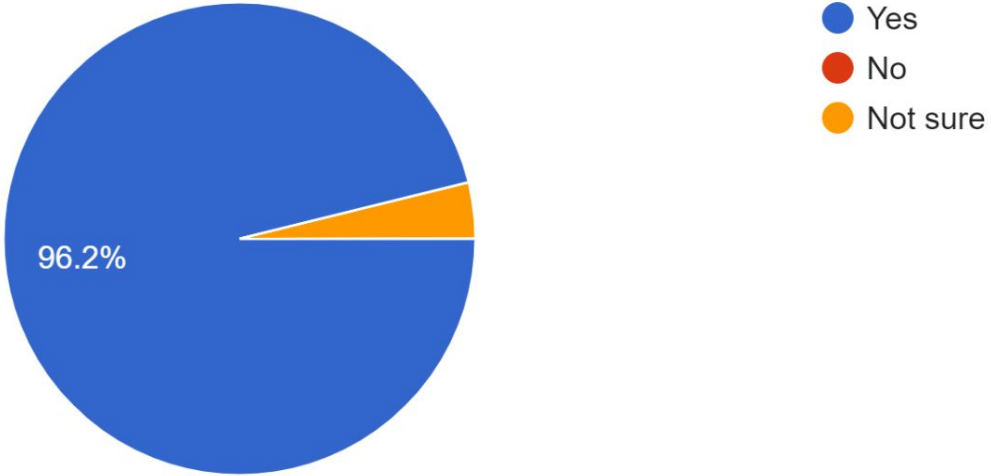
4. After examining the art and writing your poem, what was your level of emotional or mental connectivity with it?

26 responses



5. Did this activity enhance your appreciation of art?

26 responses



Discussion

Philosophy, Biology, Physics and Psychology were the fields most commonly connected with the chosen work of art across all categories, from surreal, to abstract and scientific art.

- In many poems, multiple scientific fields were linked to the ekphrasis process and some writers added fields like theology and religion.

In classical science, emotions do not have a place for discovery, and pure analytical thinking is required.

- However, **the nature of human beings is to think both logically and emotionally**.
- Ekphrastic poetry allows the emotions to play a role in gaining new creative appreciation and intellectual curiosity inspired in the colors, symbols and metaphors represented in art, resonating with complex scientific concepts and unsolved challenges.

The creative process is different from the scientific method.

- First, a new concept is conceived, inspired in the observation of nature and, in this case, of art.
- This concept may diverge and make connections between seemingly unrelated processes, leading to innovation.
- Then, analytical science may be applied to prove or disprove the new idea.

Discussion

The majority of participants experienced an 'Aha moment' or felt a sense of discovery and new insights (76.9%), while 19.2% were not sure if they had this experience.

- Of those who experienced an insight, **39% referred to it as significant**, while 30% considered it moderate and an equal percentage considered it mild.

Through ekphrastic poetry, the writer is free to play with ideas that come to mind via the interplay of images that resemble the players of the basic sciences of life, the microcosm of a biofilm, the human organism, society, and the creation of the Universe.

Ekphrastic poetry has the potential to facilitate discovery and to acquire new knowledge.

- Transcends intellectual realization.
- Leads to transformative moments of understanding that could change how we see the world.

Discussion

All participants experienced **emotional connectivity to the art** work.

- 77% considered the connection moderate to strong.

96% of participants felt the ekphrastic poetry activity **enhanced their appreciation of art**.

Additional benefits of ekphrastic poetry may include:

- Enhanced emotional intelligence
- Mental therapy: May serve as a healing outlet and to reduce stress
- Career exploration: A multidisciplinary education in science and art
- Art appreciation and personal growth

Conclusions

- Ekphrastic poetry inspired by surreal, abstract or scientific art can be a catalyst for creativity, spanning from scientific, philosophical to spiritual insights.
    - Could potentially be used as a tool to stimulate transcendental insights into the organization of nature and the universe.
- Across all categories of art, one common theme revealed among writers was the gained insight into the organizing principles in the Universe, over a wide range of scale, from subatomic particles to planetary systems.
    - The balance of order and disordered states (chaos) are an intrinsic component of structural systems and give rise to unique scientific processes, individual beings, societies and planetary systems in the Universe.
- These insights can be a catalyst to new discoveries and to the advancement of science.

Future Directions

Our study is not a comprehensive analysis of the relationship between visual art and scientific creativity, as expressed through ekphrastic poetry.

- ➢ It aims to foster interest and to start a vital conversation about ekphrastic poetry as a tool to foster creativity and innovation among students and new generations of scientists.

The ekphrastic poem could be a valuable tool for scientists and educators alike.

Both science and humanities classes could benefit from including ekphrastic poetry exercises to stimulate free thinking and creativity and, as a result, generate genuine, long-lasting passion and curiosity in the pursuit of these fields.

- ➢ Ekphrastic poetry introduces a different way to observe nature and history.

When humanity adopts this interdisciplinary practice, it must also be prepared for the next generation of dreamers, inventors and creators.

- ➢ One million AI algorithms may never surpass the power and limitless possibilities of the human scientific mind, fueled, in part, by ekphrastic poetry.

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