The Golden Ratio

Fibonacci Sequence, Golden Rectangle, Golden Spiral, Phi

The Golden Ratio

The golden ratio, also known as the golden number, golden proportion, or the divine proportion, is **a ratio between two numbers that equals approximately 1.618**. Usually written as the Greek letter phi, it is strongly associated with the Fibonacci sequence, a series of numbers wherein each number is added to the last.

It is the ratio of a line segment cut into two pieces of different lengths such that the ratio of the whole segment to that of the longer segment is equal to the ratio of the longer segment to the shorter segment.

https://www.youtube.com/watch?v=wTlw7fNcO-0

https://www.youtube.com/watch?v=4TF6mMUe3FY

https://www.youtube.com/watch?v=dREpRHgkjsg

Fibonacci Sequence

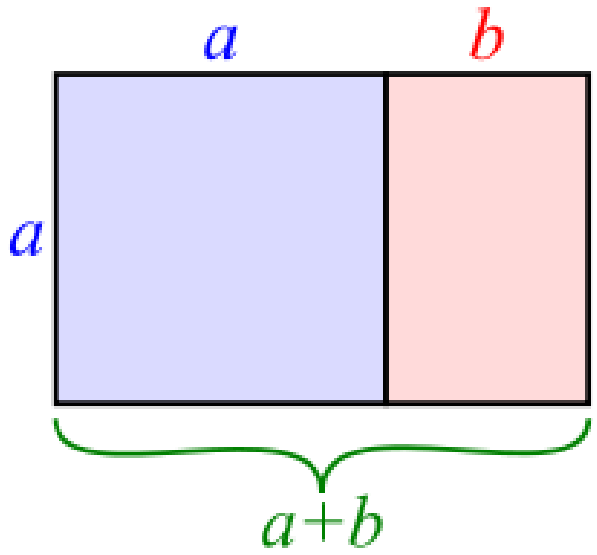
The Fibonacci Sequence is the series of numbers:
0, 1, 1, 2, 3, 5, 8, 13, 21, 34, ...
The next number is found by adding up the two numbers before it:

- the 2 is found by adding the two numbers before it (1+1),
- the 3 is found by adding the two numbers before it (1+2),
- the 5 is (2+3),

and so on!
Example: the next number in the sequence above is 21+34 = **55**
https://www.youtube.com/watch?v=wTlw7fNcO-0
https://www.youtube.com/watch?v=2tv6Ej6JVho

The Golden Rectangle

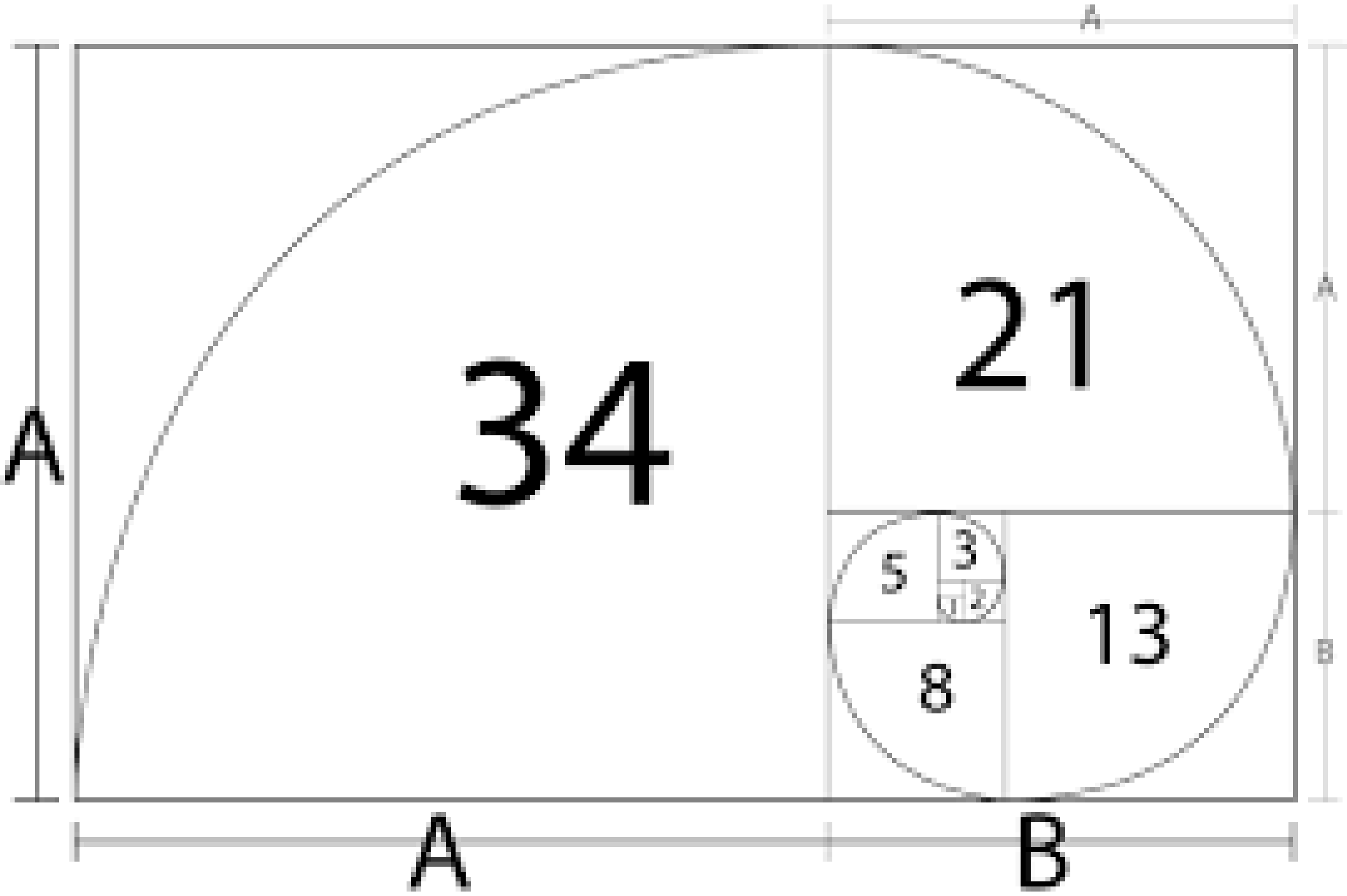
In geometry, a golden rectangle is a rectangle whose side lengths are in the golden ratio, 1:{\tfrac {1+{\sqrt {5}}}{2}}, which is 1:\varphi, where \varphi is approximately 1.618.



The Golden Spiral

In geometry, a golden spiral is a logarithmic spiral whose growth factor is ϕ, the golden ratio. That is, a golden spiral gets wider by a factor of ϕ for every quarter turn it makes.

- https://www.youtube.com/watch?v=ahXIMUkSXX0 (crazy fun)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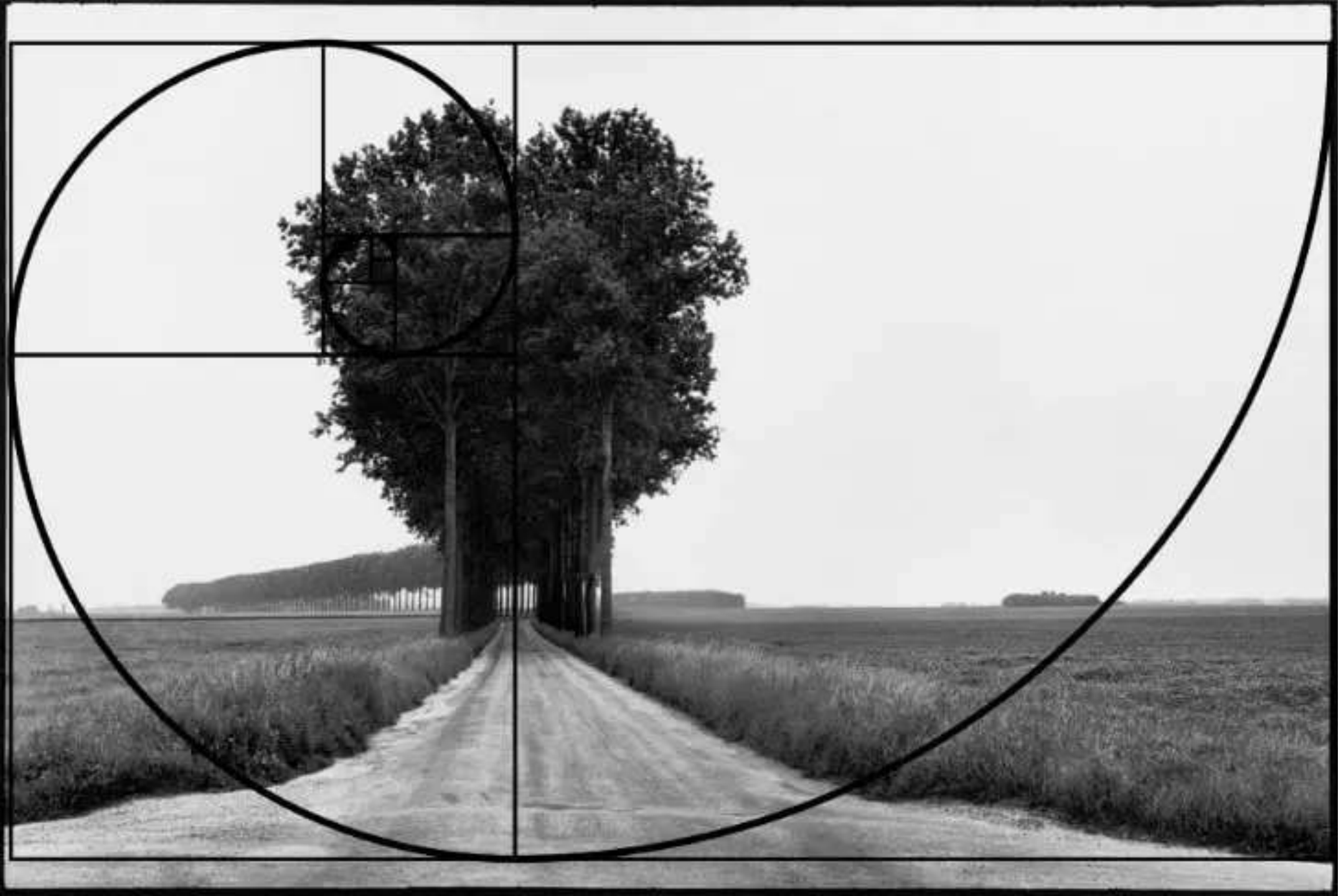
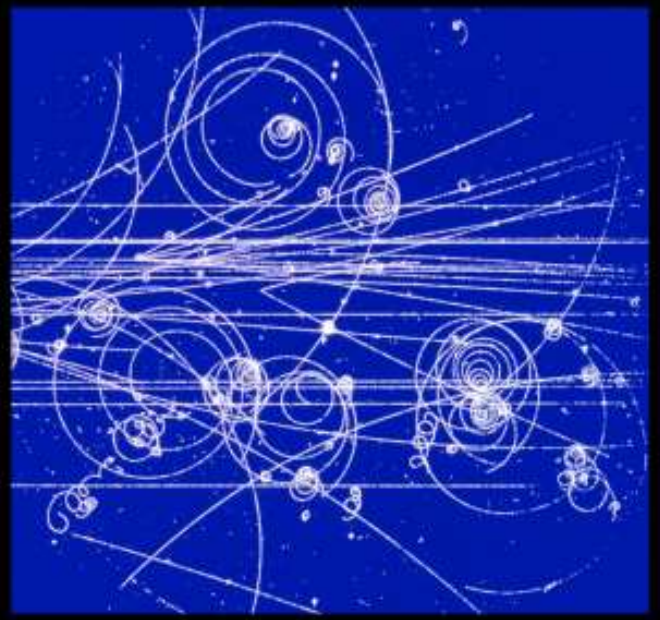
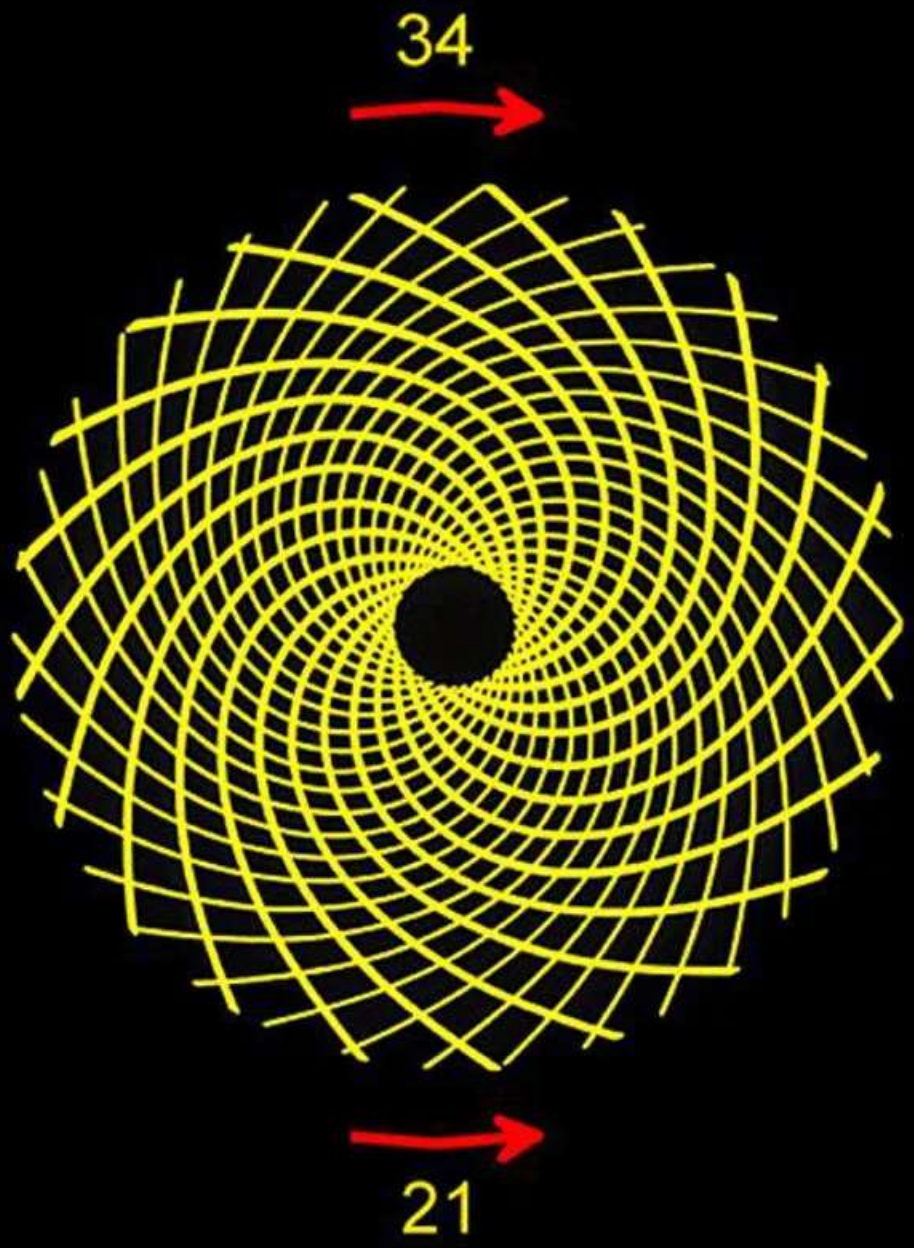
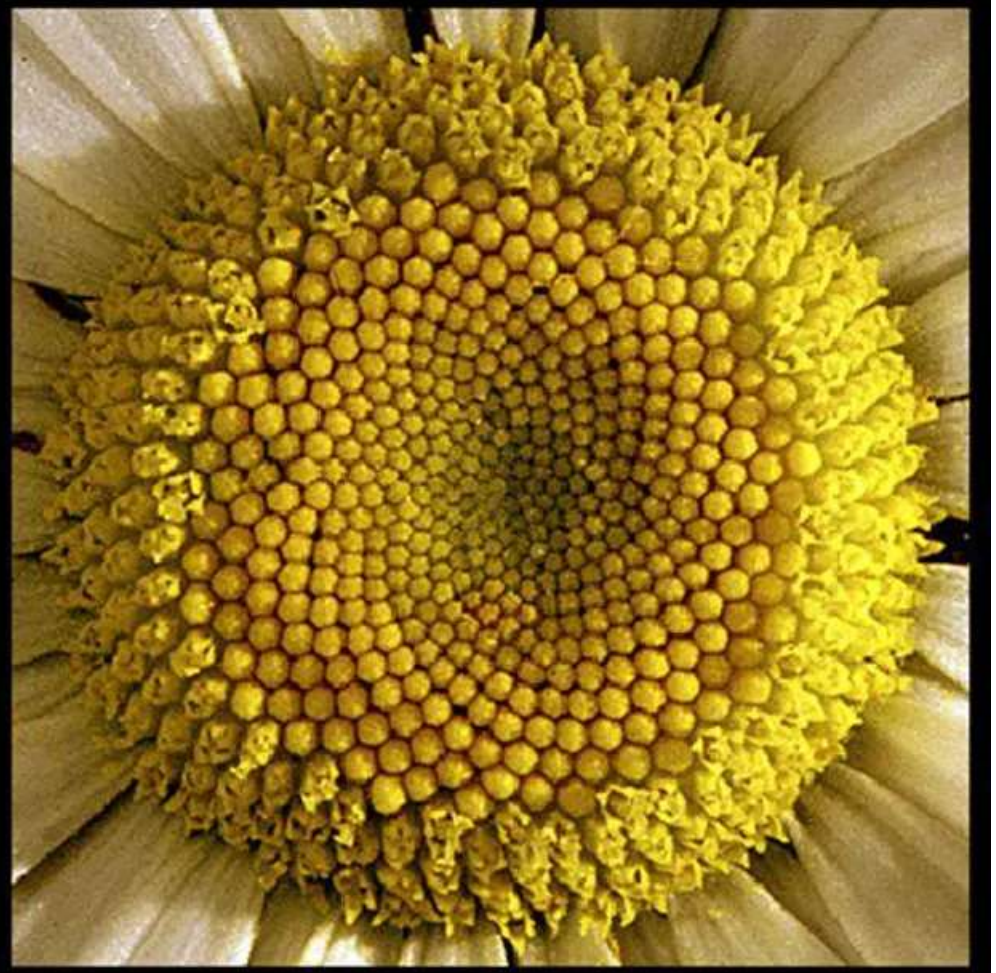








34/21 = 1.690476

Nautilus: Golden Spiral Poster Child

The nautilus is a pelagic marine mollusc of the cephalopod family Nautilidae. The nautilus is the sole extant family of the superfamily Nautilaceae and of its smaller but near equal suborder, Nautilina. It comprises nine living species in two genera, the type of which is the genus Nautilus.

- https://www.youtube.com/watch?v=7EO7FdTlvbU

Phi in Nature

- https://www.mathnasium.com/blog/14-interesting-examples-of-the-golden-ratio-in-nature
- https://blogs.glowscotland.org.uk/glowblogs/cbteportfolio/2017/11/24/maths-in-art-and-the-fibonacci-sequence/

- https://www.google.com/search?q=golden+ratio&client=firefox-b-1-d&sxsrf=AB5stBgdb9UXgdQuSuGZVMr3_E0uAtrr8g:1688603058565&source=lnms&tbm=vid&sa=X&ved=2ahUKEwjfrePL6Pj_AhVoPEQIHcK9A8QQ_AUoAnoECAIQBA&biw=1600&bih=775&dpr=1#fpstate=ive&vld=cid:818da729,vid:c8ccsE_IumM
- https://craftwhack.com/the-golden-ratio-in-art/
- https://www.youtube.com/watch?v=2tv6Ej6JVho

- https://www.widewalls.ch/magazine/golden-ratio-examples-art-architecture-music

Leonardo Da Vinci

Da Vinci created the illustrations for “De Divina Proportione” (On the Divine Proportion), a book about mathematics written by Luca Pacioli around 1498 and first published in 1509.

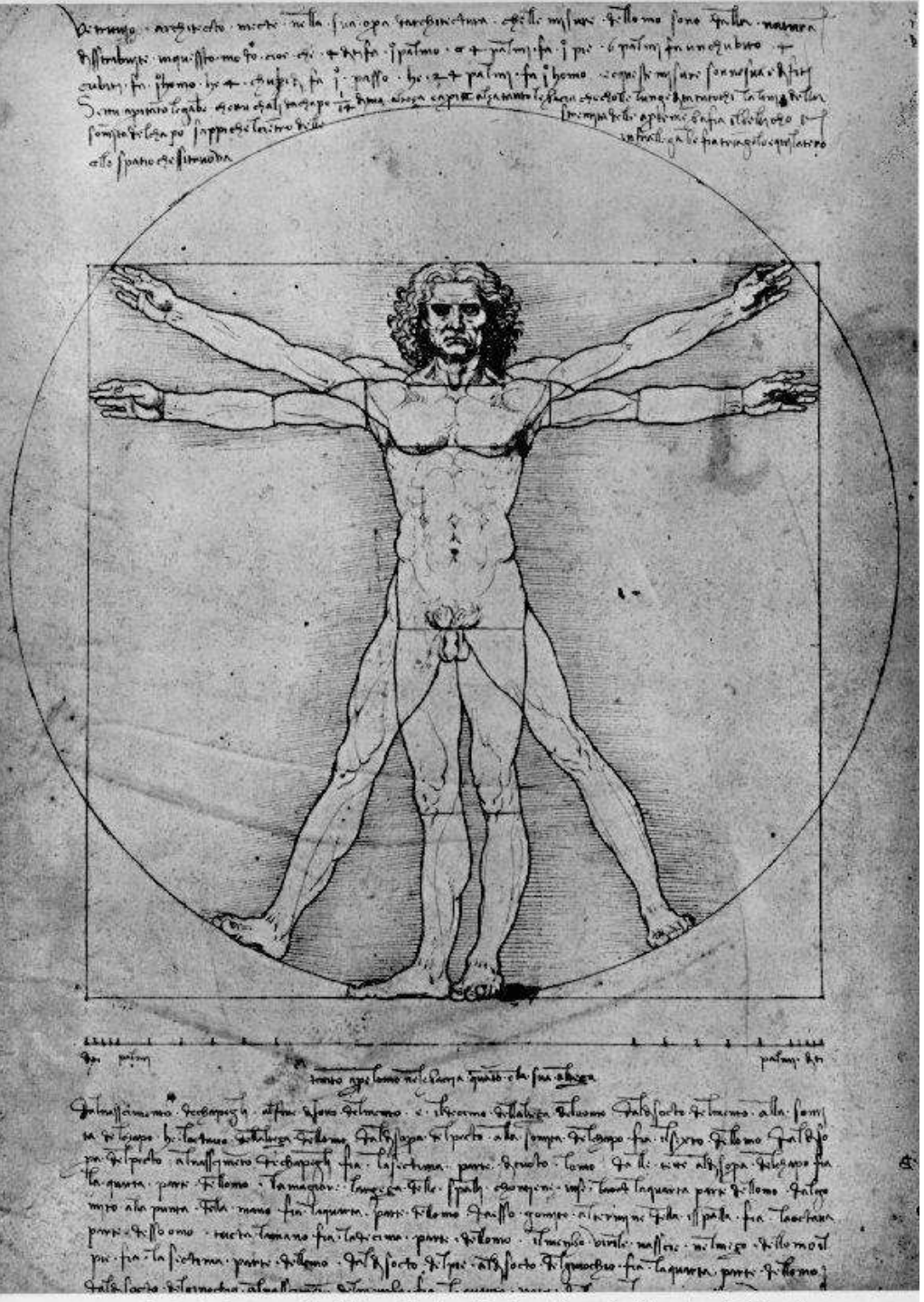
In the book, Pacioli writes about mathematical and artistic proportion, particularly the mathematics of the golden ratio and its application in art and architecture. The book contains dozens of beautiful illustrations of three-dimensional geometric solids and templates for script letters in calligraphy.

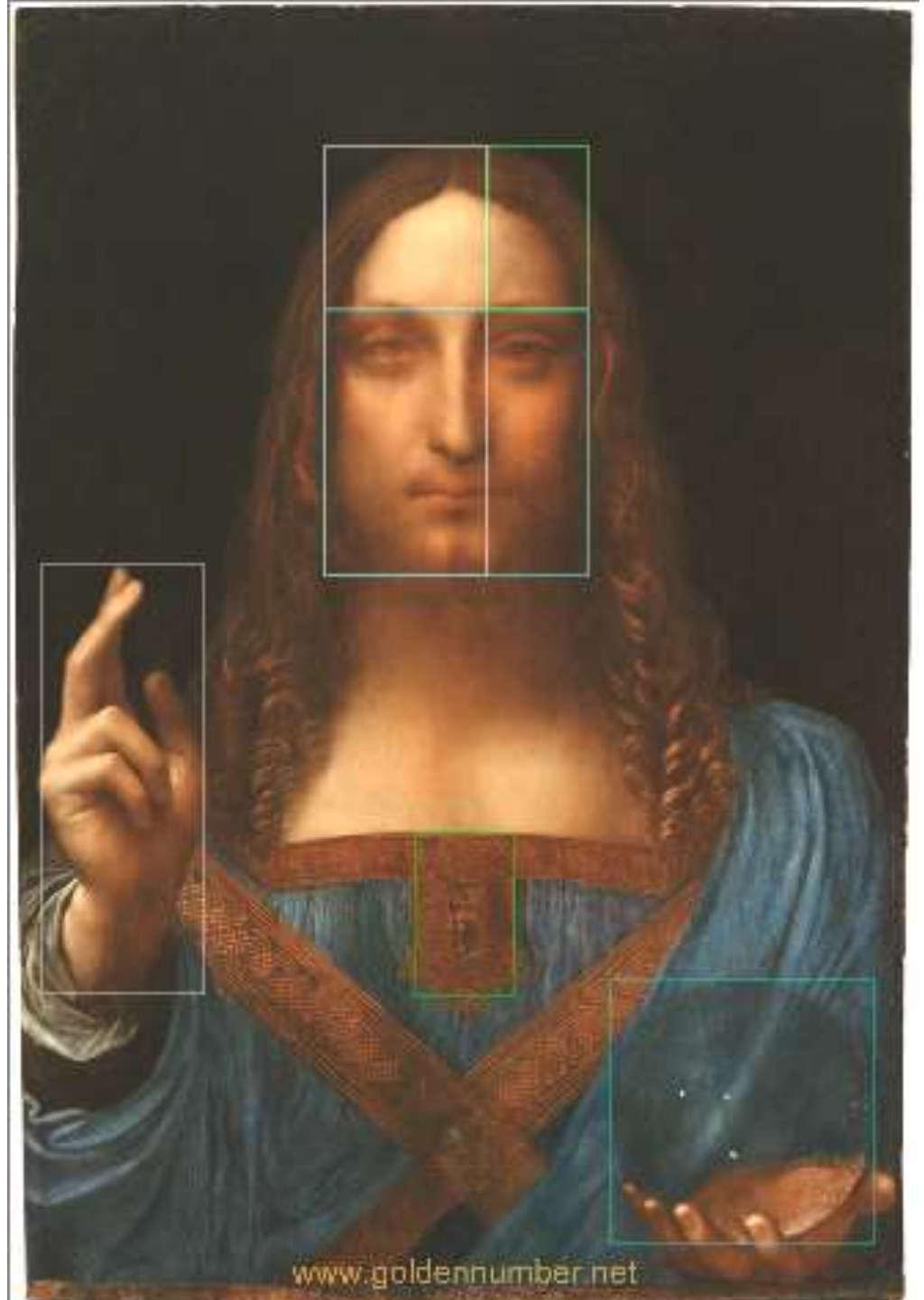
Vitruvian Man

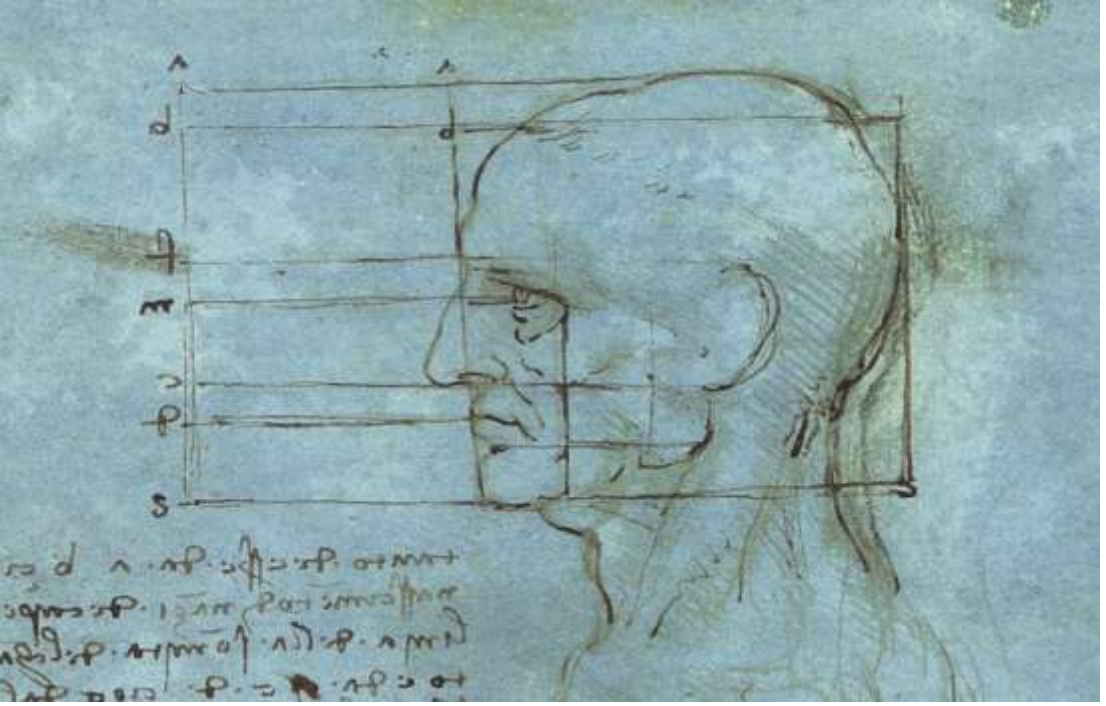
The Vitruvian Man is a drawing by the Italian Renaissance artist and scientist Leonardo da Vinci, dated to c. 1490. Inspired by the writings of the ancient Roman architect Vitruvius, the drawing depicts a nude man in two superimposed positions with his arms and legs apart and inscribed in both a circle and square.

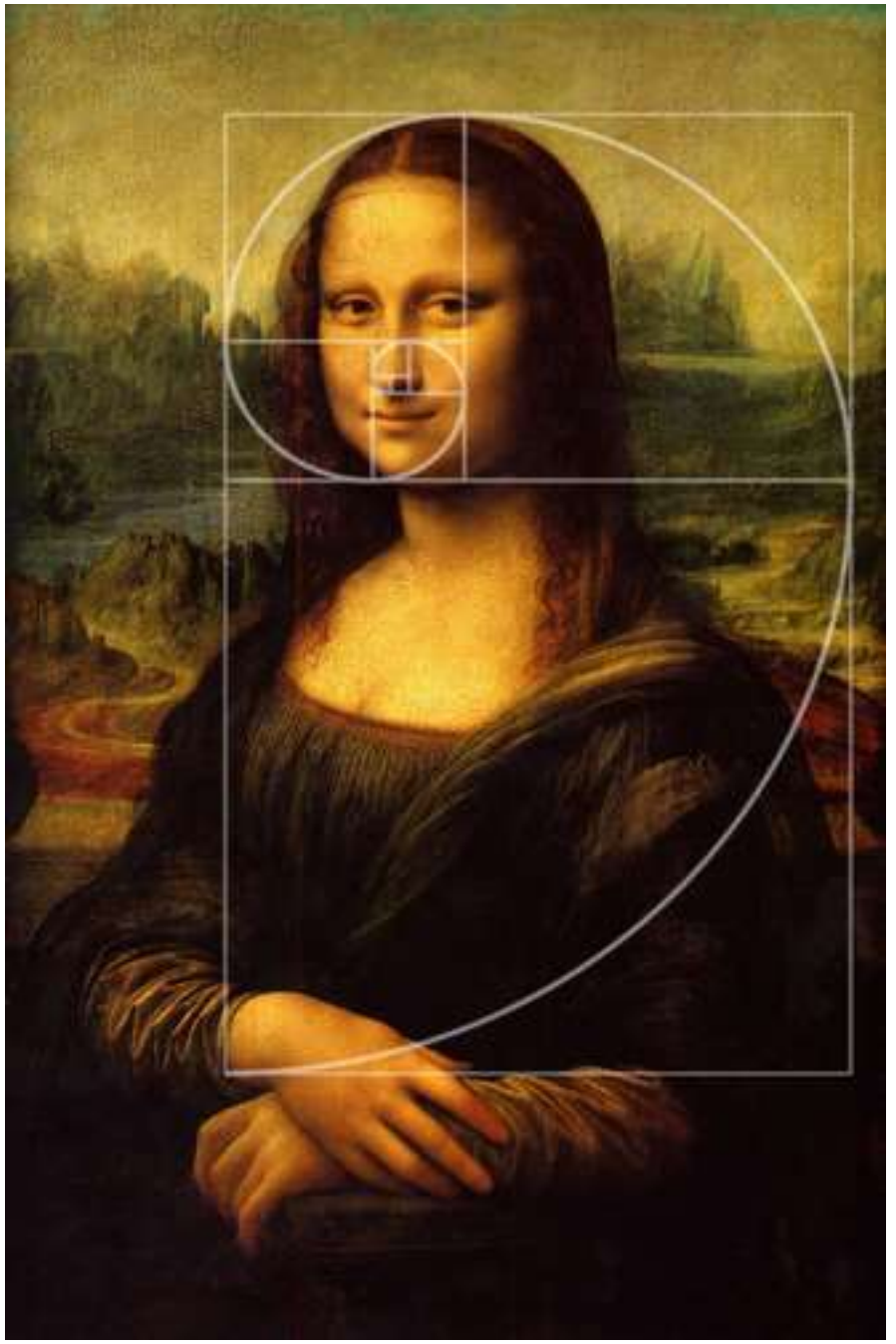
https://www.youtube.com/watch?v=hTjEkhzA17I

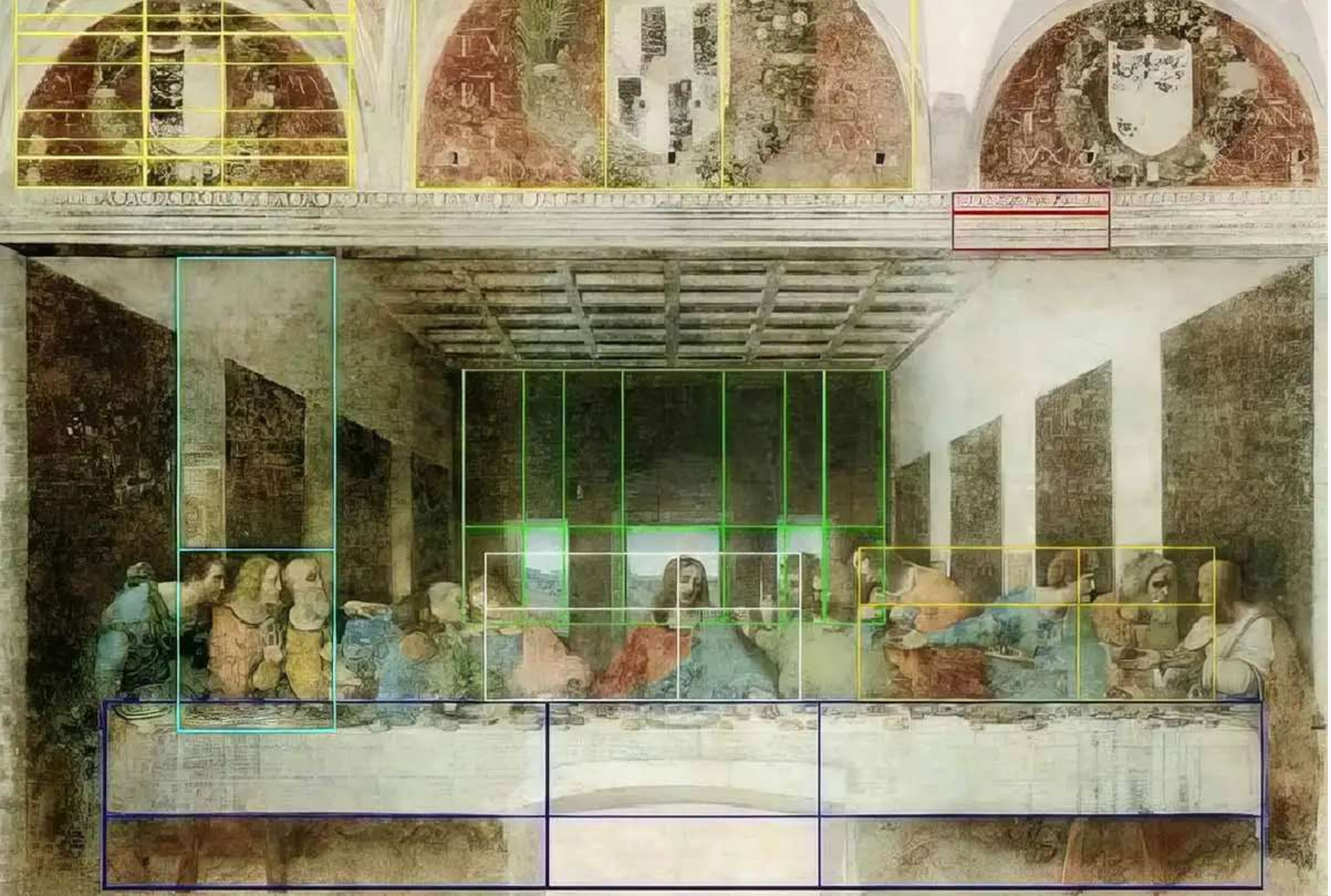
https://www.youtube.com/watch?v=nXDmAtTJ6JY




www.goldennumber.net

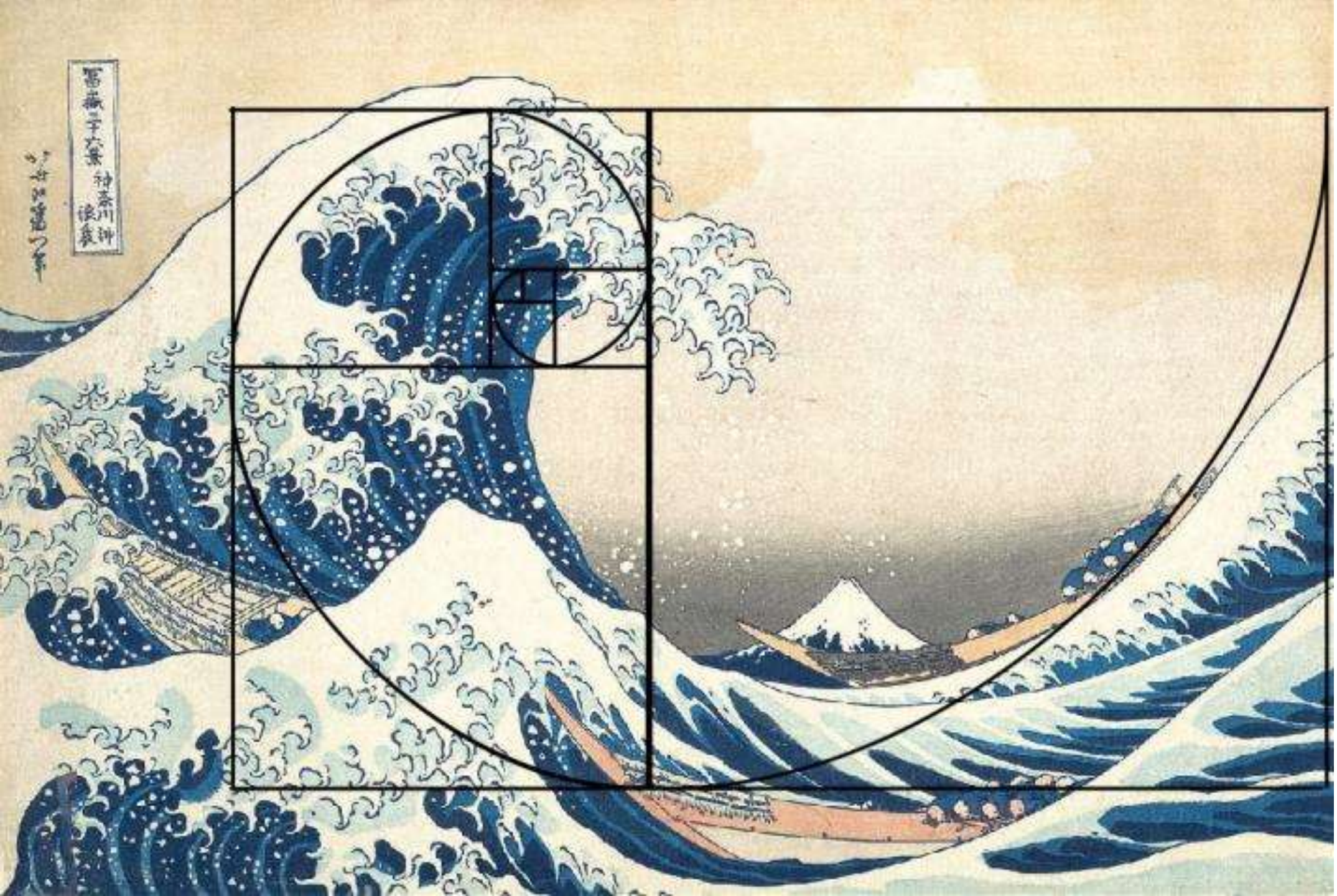






Hokusai, The Great Wave off Kanagawa, 1831

While the wave may at first appear wild and spontaneous, closer examination reveals that Hokusai has in fact made a mathematically ordered design, in which **a series of curved lines follow the golden ratio sequence**.



Casper **David Friedrich,** ***Monk by the Sea***

The Monk by the Sea is an oil painting by the German Romantic artist Caspar David Friedrich. It was painted between 1808 and 1810 in Dresden and was first shown together with the painting The Abbey in the Oakwood in the Berlin Academy exhibition of 1810.

The monk is positioned a little over a third of the way into the painting from the left, to a ratio of around **1:1.6**. The same ratio can be found frequently in Western art and is known variously as the golden ration, rule or section.

- https://smarthistory.org/friedrich-monk-by-the-sea/

Salvador Dali

In 1955, Dalí painted *The Sacrament of the Last Supper*. This great work contains the golden ratio in two ways. The proportions of the painting correspond directly to the golden ratio. It also features a huge dodecahedron harmoniously dominating the background of the scene.

https://www.youtube.com/watch?v=U_sS6F2iXqE&t=235s

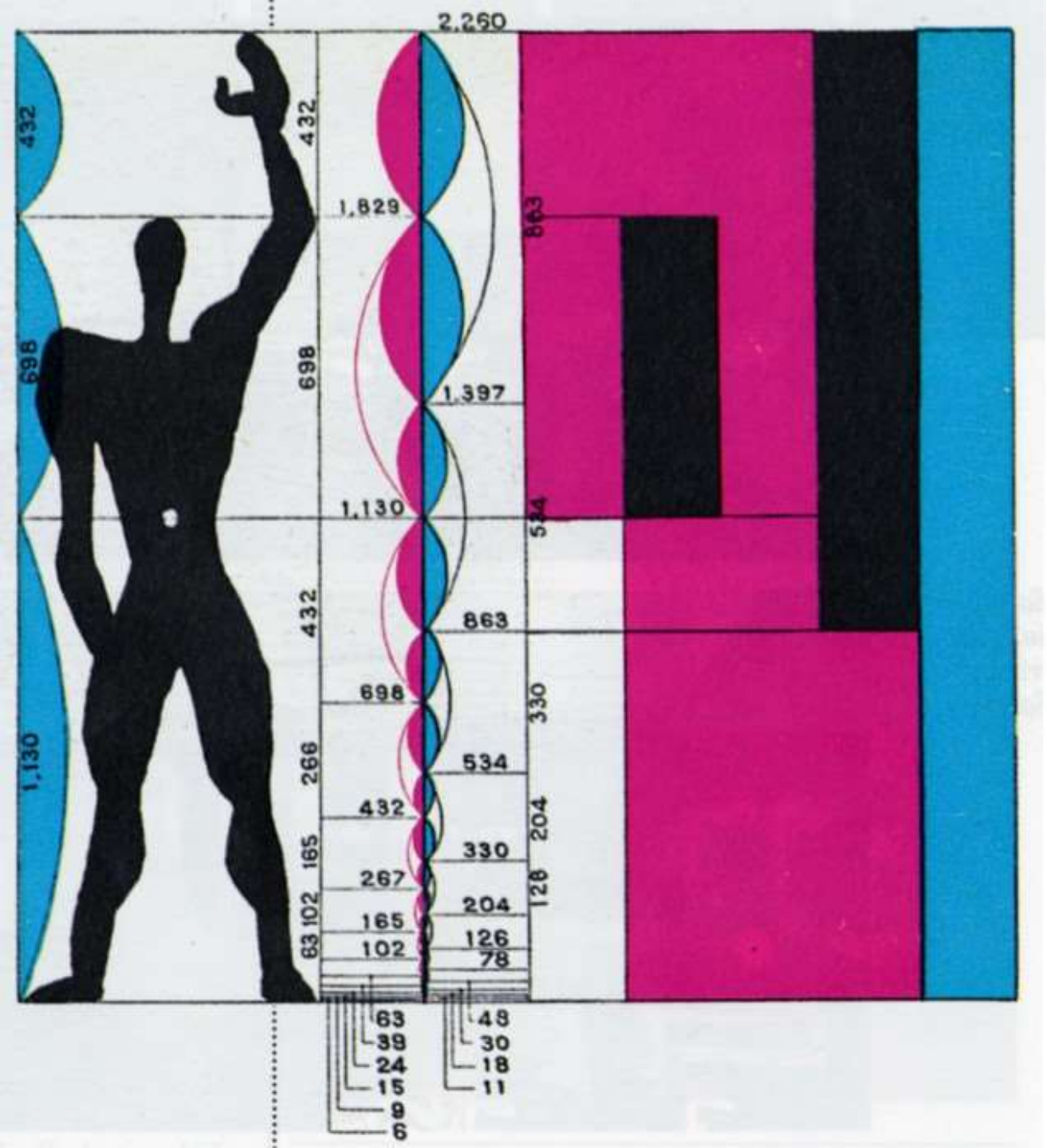
Le Corbusier

Famous brutalist architect, Le Corbusier, made the golden ratio a basic rule for his constructions. This was notably the case for his well-known housing complex, Cité radieuse, in Marseille, France. More than that, Le Corbusier used the golden ratio to develop the Modulor, a scale of proportions. This system was used to build more harmonious dwellings and to do so more quickly.

In his work, ***Le Modulor***, the architect Le Corbusier synthesizes the work that led him to become interested in the golden ratio. Le Corbusier believes that the metric system has dehumanized objects. A meter corresponds to nothing in particular, whereas the ancient measures (the foot, the cubit, the hand-span...) referred to the human body.

Le Corbusier set out to build a more human system, based on the proportions of a body and the golden ratio.

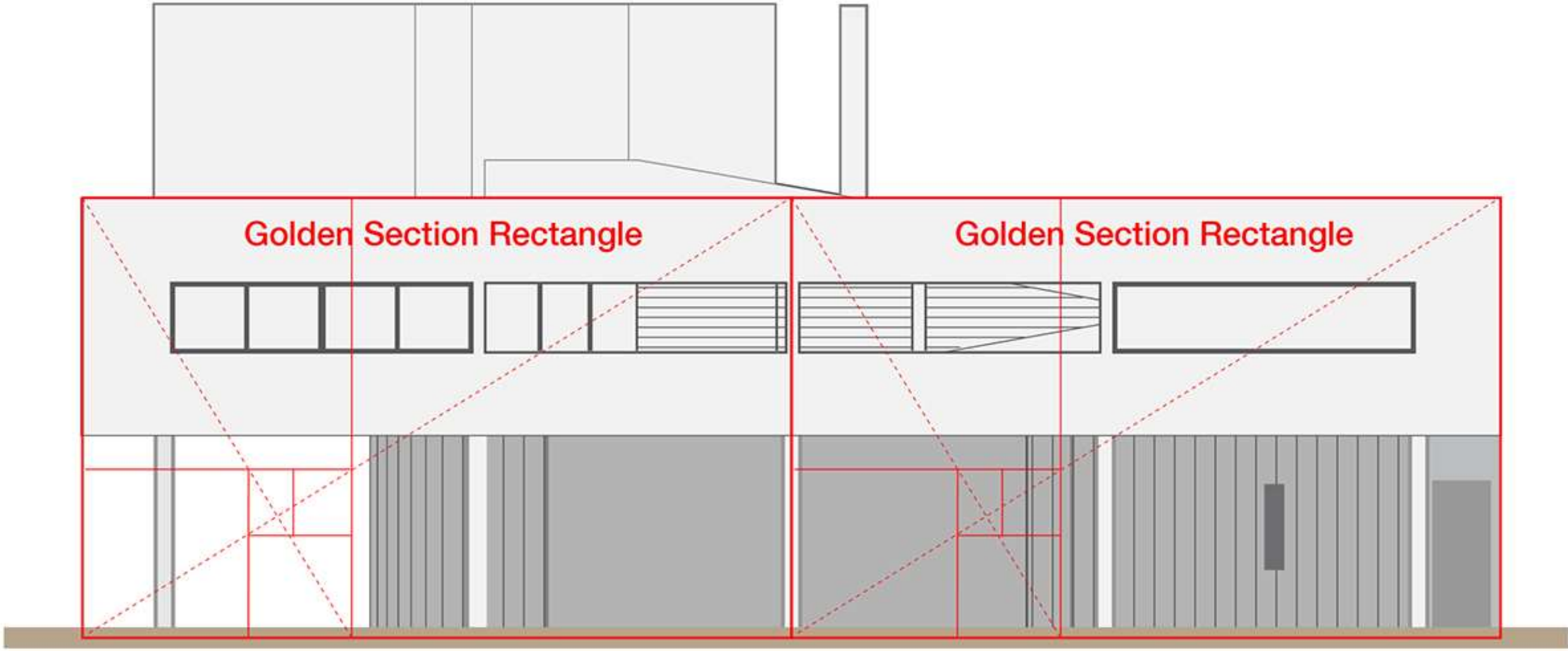
The Modulor is conceived based on a human of 1 meter and 83 centimeters. All you have to do is divide 1.83 by the golden ratio to get the first set. By multiplying by two the first series, we obtain a second one. These series of lengths will then serve as a reference for all constructions, from the width of corridors to the height of stools. The Cité Radieuse is a practical implementation of this model that Le Corbusier used throughout his life.



In art, design and architecture, scale and proportion are incredibly important. You're probably already familiar with some of these concepts, such as the Fibonacci Sequence or the Golden Ratio. Architect Le Corbusier embraced this philosophy with his use of the so-called Modulor Man, a fictional man standing at exactly six feet tall.

https://www.youtube.com/watch?v=JGMaND8tQoM&t=63s

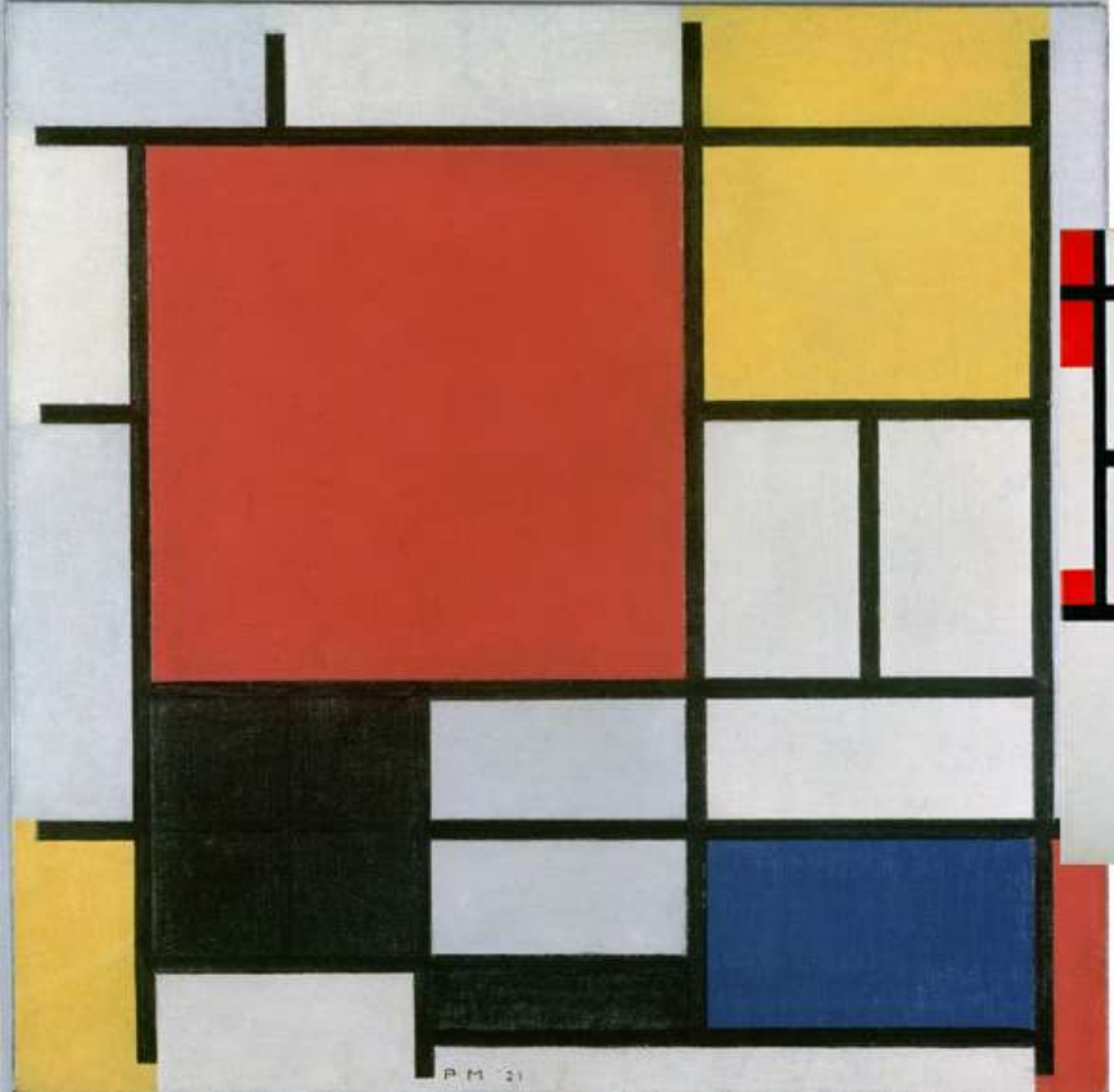
https://www.youtube.com/watch?v=nT4fdkA0nGM


Golden Section Rectangle
Golden Section Rectangle

Piet Mondrian

Believing that with the use of the vertical and horizontal lines, geometrical shapes, and primary colors, one is able to express reality, nature and logic, Mondrian also shared the views of Leonardo Da Vinci that saw **mathematics and art as closely linked**. The artist's painting *Composition in Red, Blue, and Yellow* show the **reoccurring golden rectangle**, one of the most frequently used compositional tools and shapes that fall under the golden ratio rule.

https://smarthistory.org/mondrian-composition-ii-in-red-blue-and-yellow/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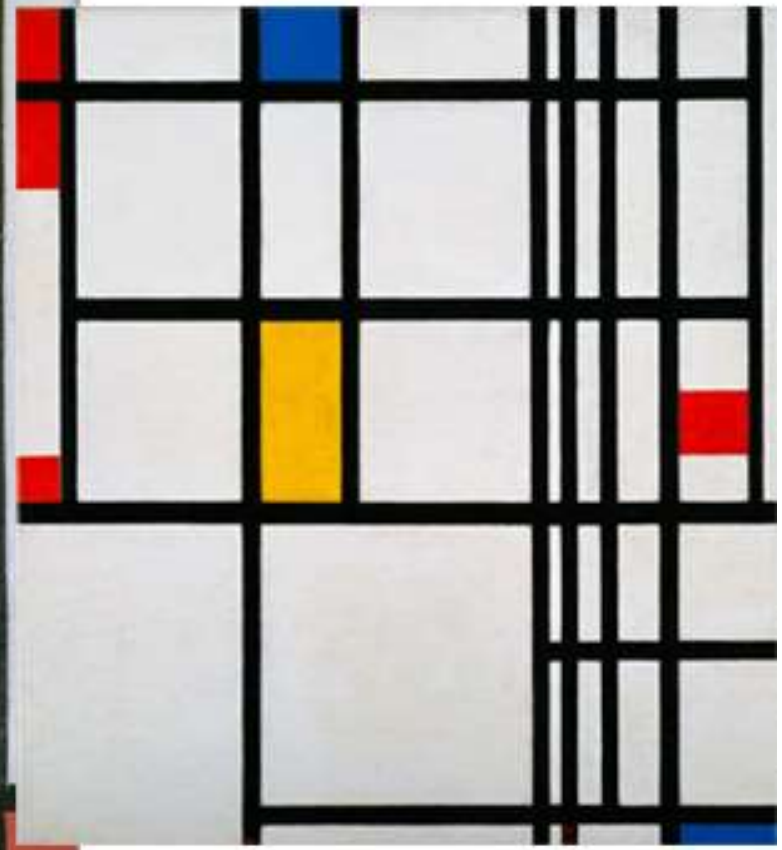
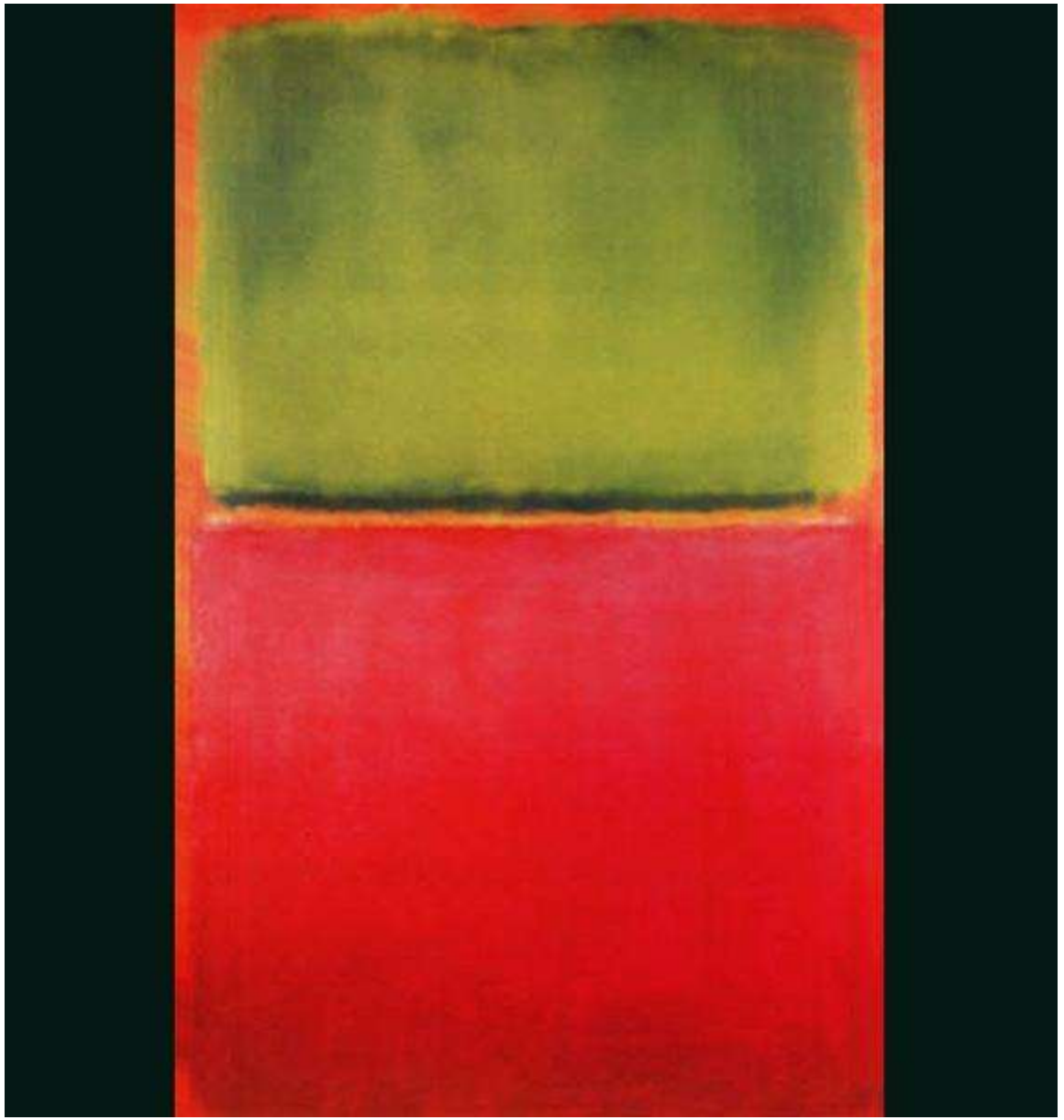


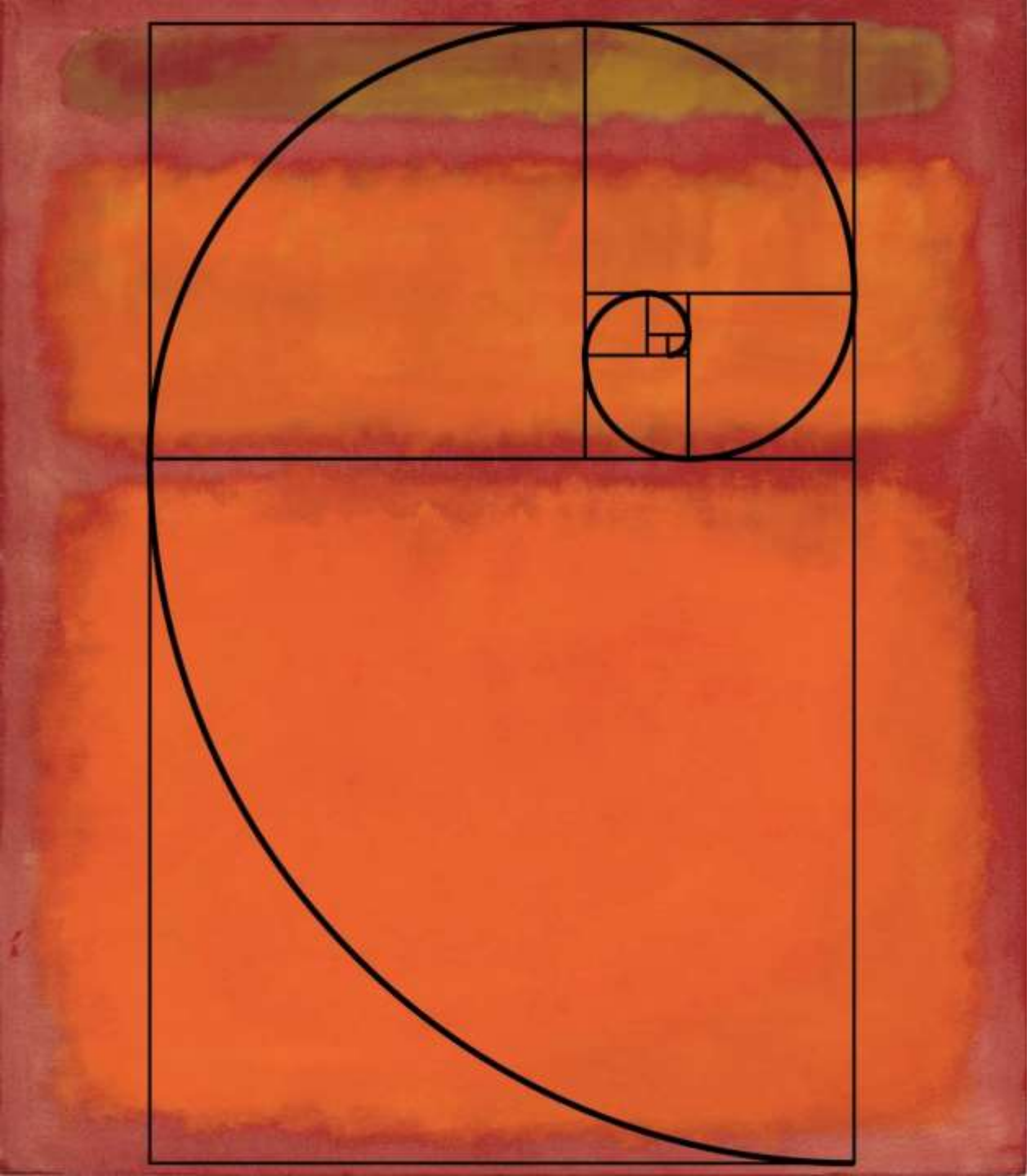
Kazimir Malevich

During the early 20th century, seen as the period of early Modern Art, the dominance of Abstract art and the radical move away from the figurative expression was an influential period in art history. The Russian painter, **Kazimir Malevich**, influential for the rise of the geometric abstract art and theories about art, is an important figure of the **Suprematist movement**. His complete rejection of Realism was crucial for the understanding of the role of the art. The Realism, Malevich saw as a distraction away from the transcendental experience that the art was meant to evoke. Many of his paintings, may not fall under the golden ratio rule, but the use of geometrical shapes, the relationship between different elements in the paintings, as well as the divine aspect that the artist wished to express relate to the concept.

Rothko

- https://www.youtube.com/watch?v=V5ncTeyGM3Y





Joaquín Torres-García

Torres-García's *Color Structure*, made in Paris in 1930, demonstrates his interest in many of the same principles as the Neoplasticists, including the grid, a reduced palette of primary colors, and the use of the Golden Ratio. These qualities are also evident in Mondrian's *Composition with Red, Blue, and Yellow* (made the same year as Torres-Garcia's *Color Structure*), a non-objective painting divided asymmetrically by thick black lines into squares of various sizes filled with flat planes of white and primary colors, the largest one, a bright red. Torres-García was inspired by De Stijl's emphasis on the grid and Constructivism's geometry, as well as what he believed to be the "universalism" of nonobjective art—in other words, he believed that geometric abstraction, which does not depict recognizable figurative imagery, could be visually understood across all cultures. In Torres-Garcia's *Color Structure*, we also see a grid composed of different sized of rectangles in blue, yellow, white, and red, arranged vertically and horizontally.

Torres-García also adopted van Doesburg's and Mondrian's use of the Golden Ratio, an important concept to him, which he felt would help his art become integrated with natural and cosmic forces. But, unlike Mondrian, Torres-García emphasizes *Color Structure*'s imperfections: the grid is drawn freehand with wavy lines and the colors are muddy and include tonal variation and rough brushwork.

https://smarthistory.org/torres-garcia-composition/


JTG 38

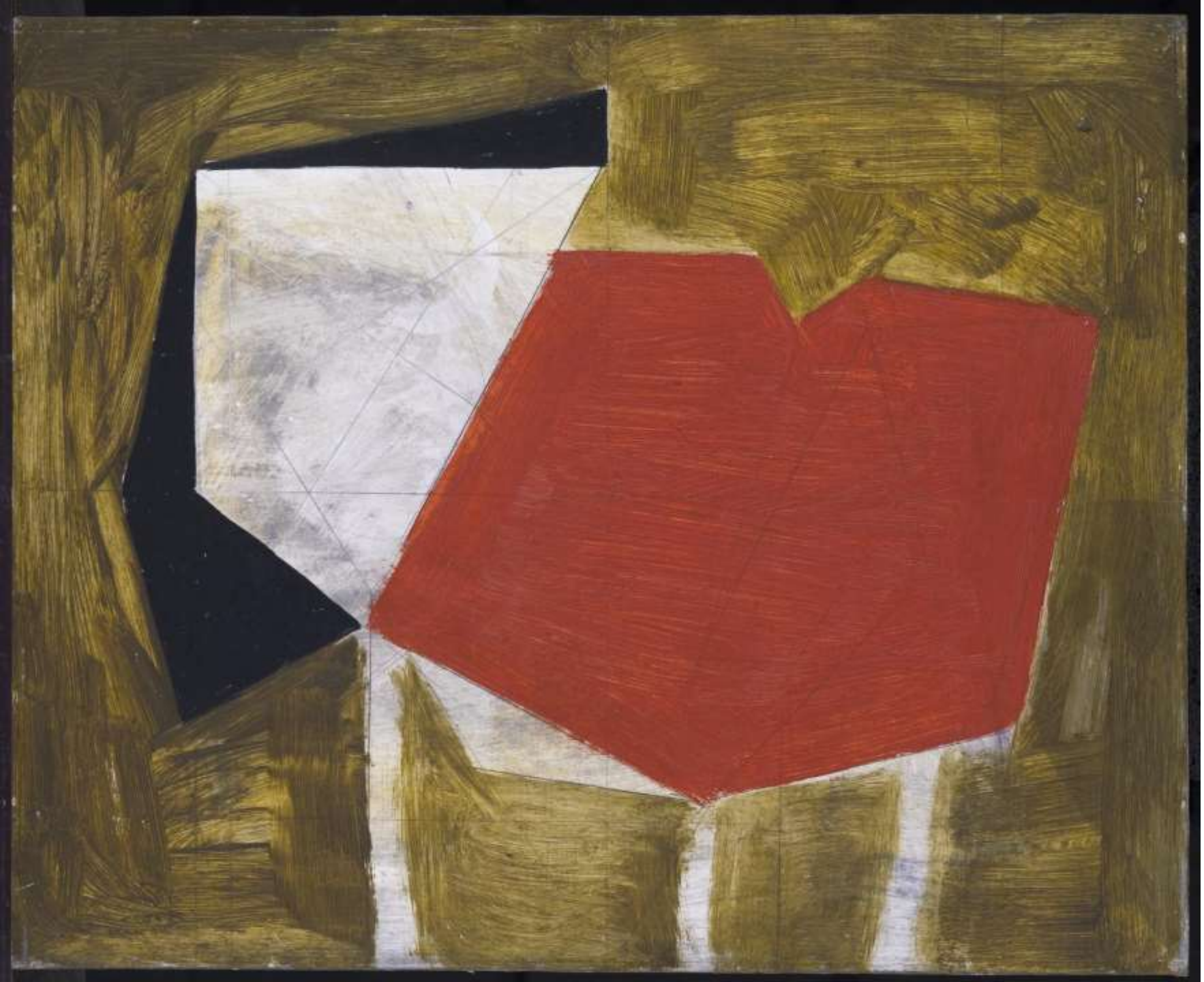
Wilhelmina Barns-Graham

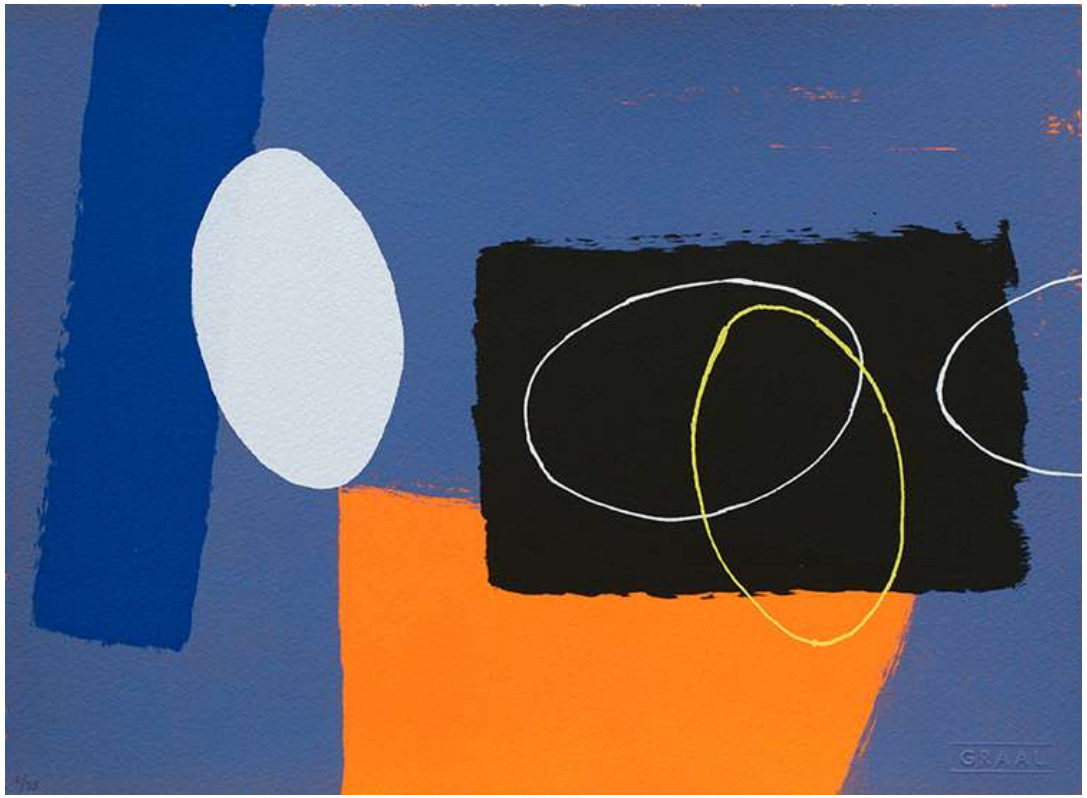
Wilhelmina Barns-Graham, Red Form 1954

Born in St Andrews, Wilhelmina Barns-Graham visited Paris and Rouen as a teenager. She studied painting at Edinburgh College of Art between 1932 and 1936, and in 1940 moved to St Ives in Cornwall, on the recommendation of an artist friend, Margaret Mellis. There she got to know Ben Nicholson, Barbara Hepworth, Bernard Leach and Naum Gabo. The economy of Gabo's sculptural shapes and the translucency of the modern materials he used had a great impact on her. 'Red Form' was painted in her St Ives studio by Porthmeor beach, and reflects the interest she took at the time in the Golden Section.

https://www.youtube.com/watch?v=pFTyODQMRKY&t=22s

https://www.dailymotion.com/video/x8cu6qb (short)

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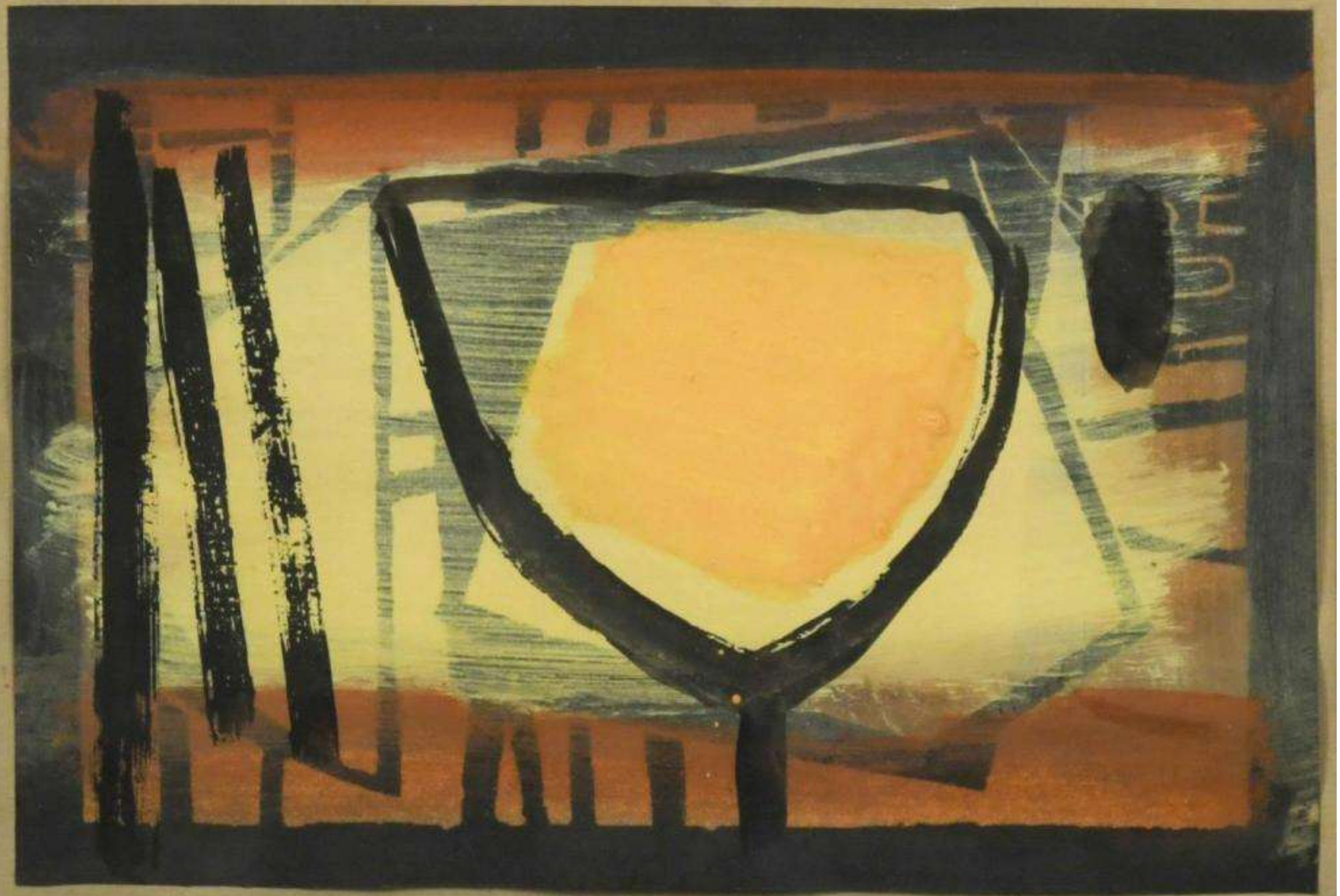

N Barnet Newman 1958

Hans Hofmann

The father of Modernism Hans Hofmann was a natural at utilizing the Golden Ratio in his paintings. In his abstracted landscape *Miller Hill*, he organizes the tightest cluster of forms around the upper left Golden Ratio sweet spot. When a Golden Ratio grid is placed over this painting, we also discover that Hofmann has incidentally placed a spiral in the smaller rectangle within the rectangle.

https://www.youtube.com/watch?v=GtWpEjUrkcc&t=8s

Robert Motherwell

Robert Motherwell was an American abstract expressionist painter, printmaker, and editor of The Dada Painters and Poets: an Anthology. He was one of the youngest of the New York School, which also included Willem de Kooning, Jackson Pollock, and Mark Rothko.

https://www.youtube.com/watch?v=MgyLSnXgaro

Paul Sellers

In this all too brief video woodworker Paul Sellers gives us a close-up view as he creates a number of ultra satisfying ‘Fibonacci’ spiral shavings. Between the soothing music, camerawork, and the mathematical perfection of each spiral as it rises from the wood, I could watch something like this all day. Somebody call somebody and turn this into an episode of Slow TV?

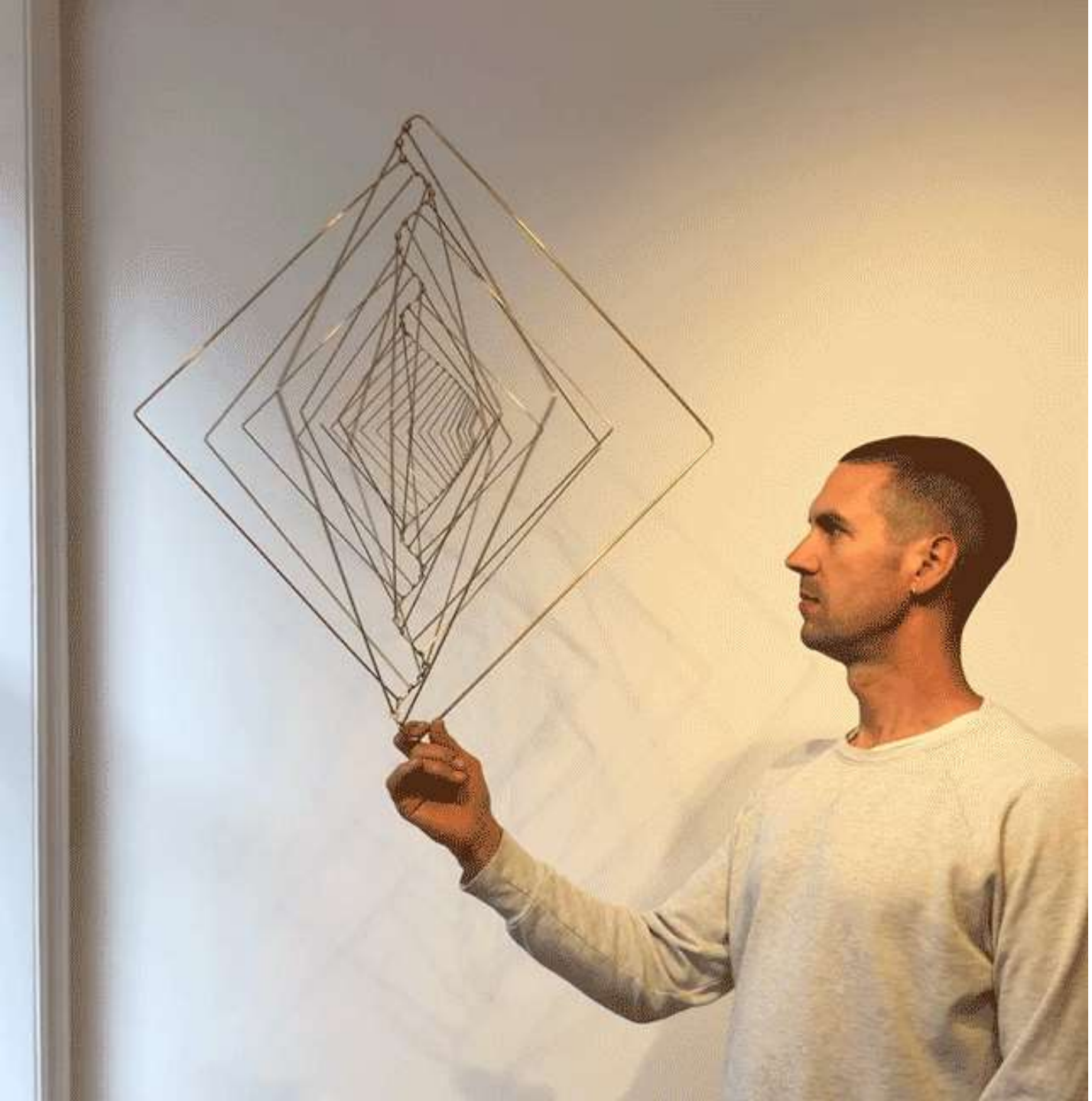
- https://www.thisiscolossal.com/2017/04/super-satisfying-video-of-a-woodcarver-making-fibonacci-spiral-shavings/

Ivan Black

A Kinetic Sculpture Twists and Morphs Based on the Fibonacci Sequence

Wales-based sculptor Ivan Black creates large-scale kinetic sculptures that are inspired by mathematical formulae and minimal design. One of his latest pieces, *Square Wave*, is smaller than his typical works and was designed in response to the Fibonacci sequence. The mobile-like object is made up of several metal bands which curve and flatten as the work twists, creating a mesmerizing movement that is at once fluid and strictly geometric.

https://www.ivanblack.com/shop



Joshua Abarbanel

LA-based sculptor Joshua Abarbanel fabricates wood sculptures and installations reminiscent of coral reefs comprised of concentric flower-like blooms. The artist builds both smaller standalone artworks that rest on a pedestal and larger wall or ceiling-mounted pieces that seem to grow organically in every direction. Each piece first takes shape on a computer before being cut from assorted woods with the aid of a laser cutter. From Abarbanel's artists statement:

Finding inspiration in fractals, accretive formations, and the Fibonacci sequence, Abarbanel creates art that often simultaneously evokes microscopic and aerial perspectives, such that the compositions serve as metaphors for archetypal relationships between people, between individuals and communities, and between humankind and the planet. His work also illustrates how disparate parts can come together to make a whole in beautiful and startling ways.

John Edmark

These 3d-printed zoetrope sculptures were designed by John Edmark, and they only animate when filmed under a strobe light or with the help of a camera with an extremely short shutter speed. He shares about the project:

These are 3-D printed sculptures designed to animate when spun under a strobe light. The placement of the appendages is determined by the same method nature uses in pinecones and sunflowers. The rotation speed is synchronized to the strobe so that one flash occurs every time the sculpture turns 137.5º—the golden angle. If you count the number of spirals on any of these sculptures you will find that they are always Fibonacci numbers.

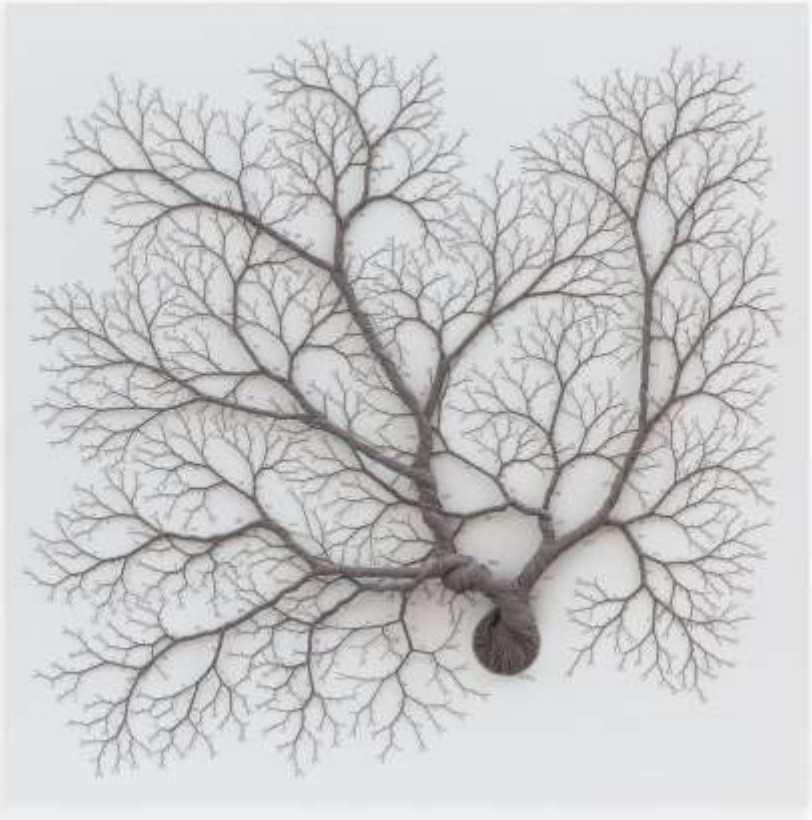
https://thekidshouldseethis.com/post/creating-the-never-ending-bloom-john-edmarks-spiral-geometries

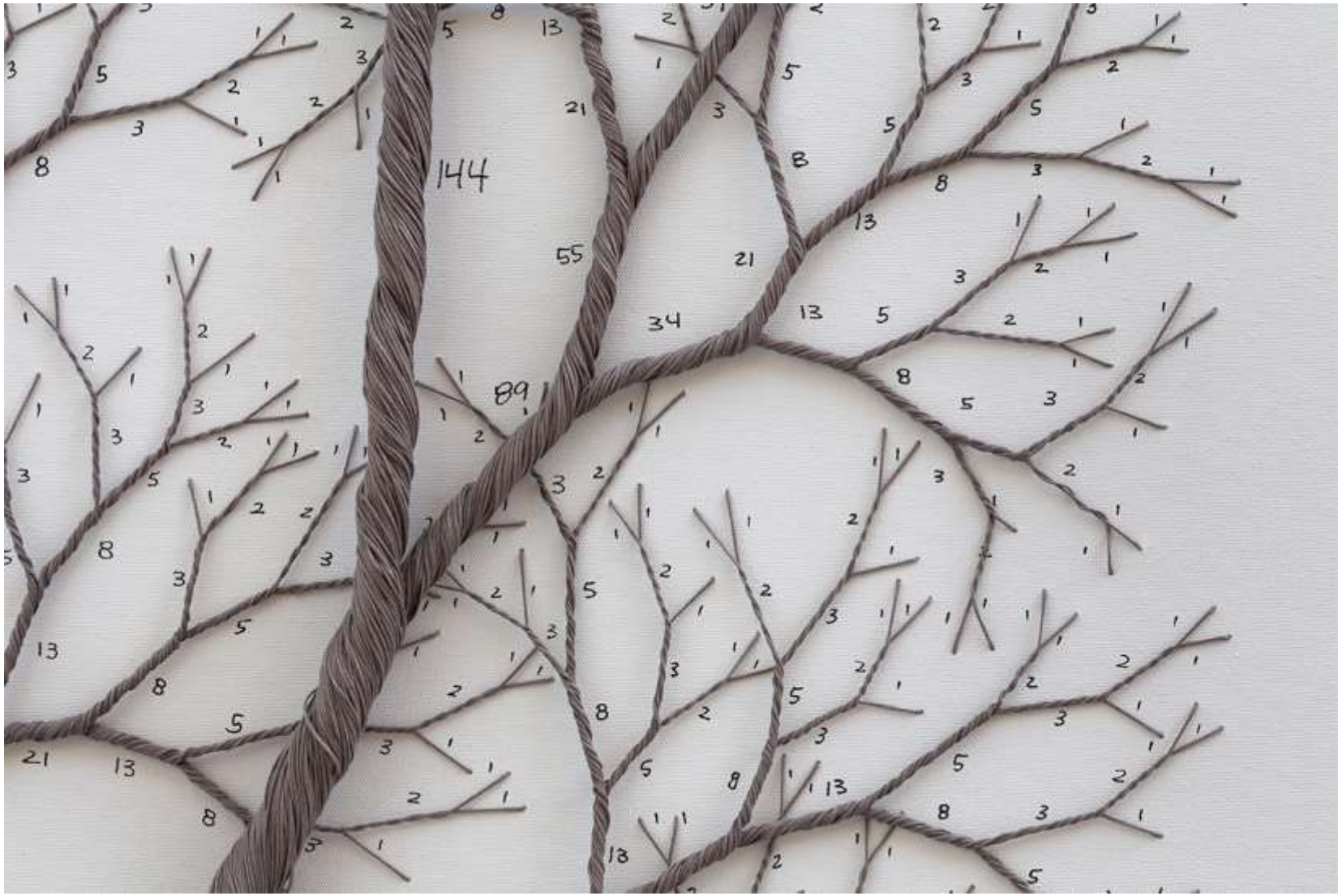
Janaina Mello Landini

Janaina Mello Landini unbraids lengths of rope to create fibrous labyrinths that breach canvases' edges and crawl from floor to ceiling. Including both sprawling site-specific installations and smaller pieces confined to a few dozen centimeters, the São Paulo-based artist's body of work is broad. All of her projects, though, explore tension and space as they spread into arboreal forms or perfectly round networks.

Her recent works include a massive tree-like installation that fans out across Zipper Gallery's floor and walls into delicate, tape blossoms. Another is a smaller, numbered piece that was born from the artist's response to the ongoing COVID-19 pandemic. "My days are quite slow now, no more assistants around, but I'm still working and thinking a lot," she shares with Colossal and notes that at the beginning of lockdowns, she completed "Ciclotrama 177 (Fibonacci)," which is shown below.

https://www.facebook.com/MetaOpenArts/videos/488874972147308/

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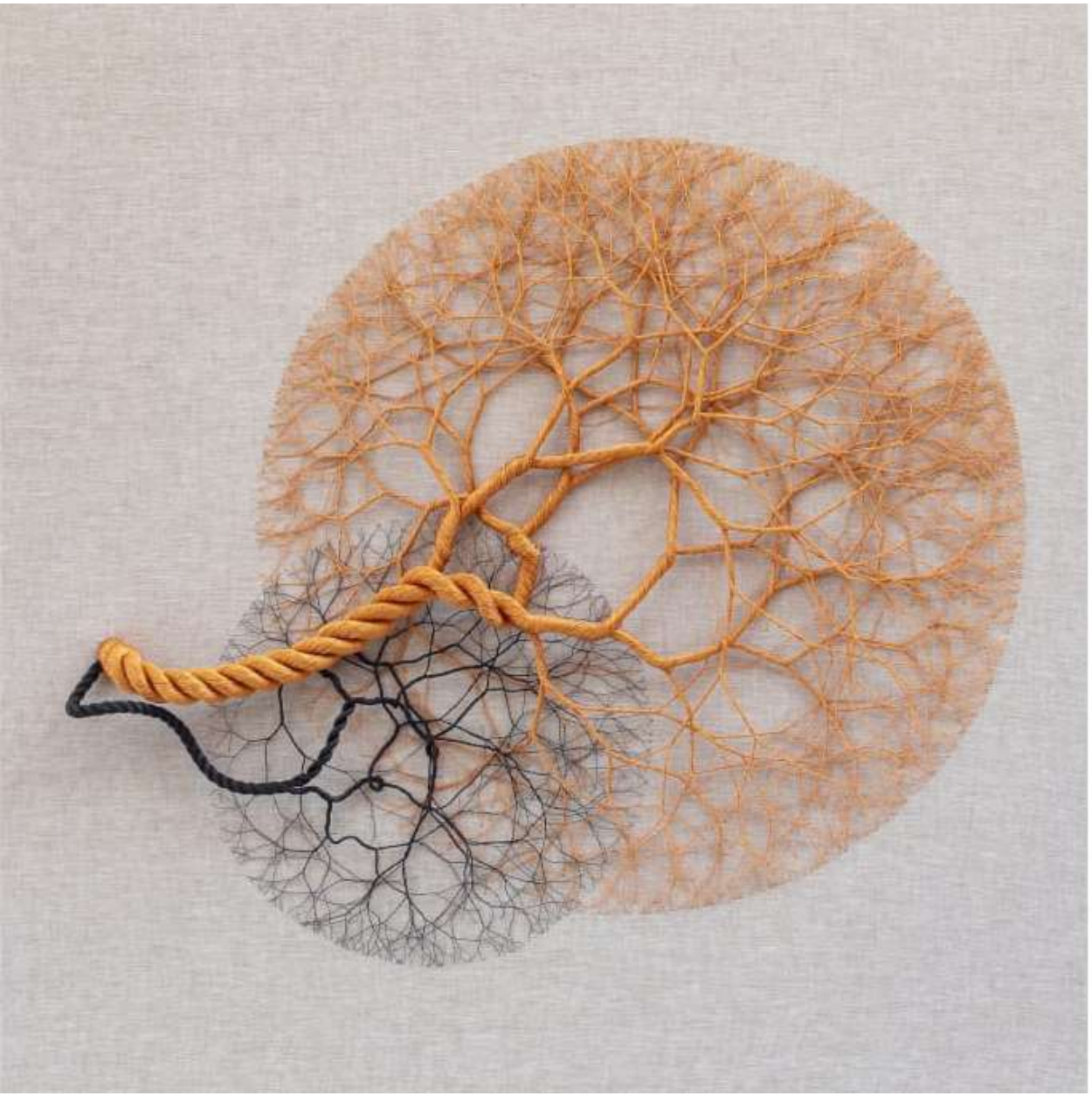
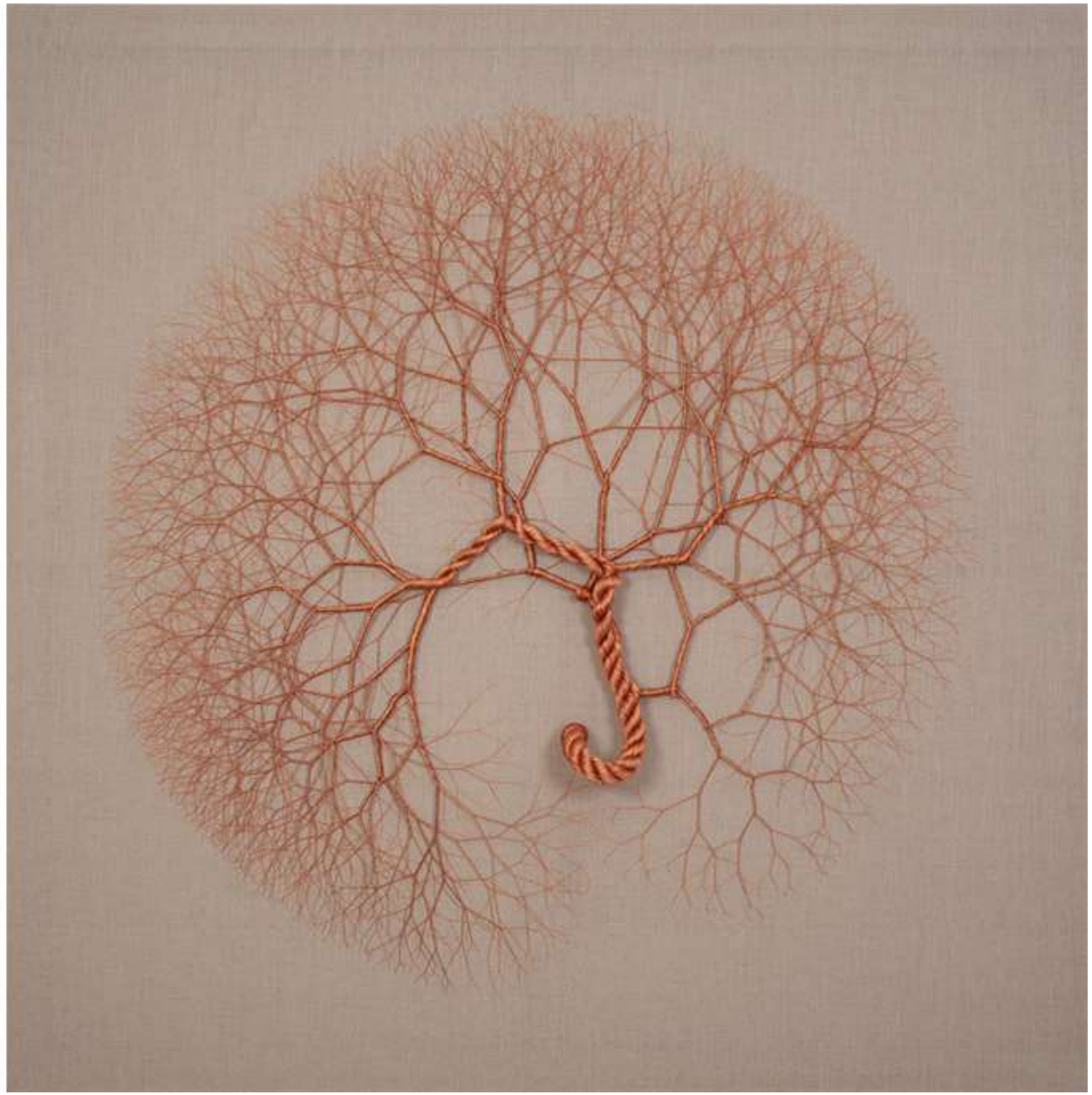
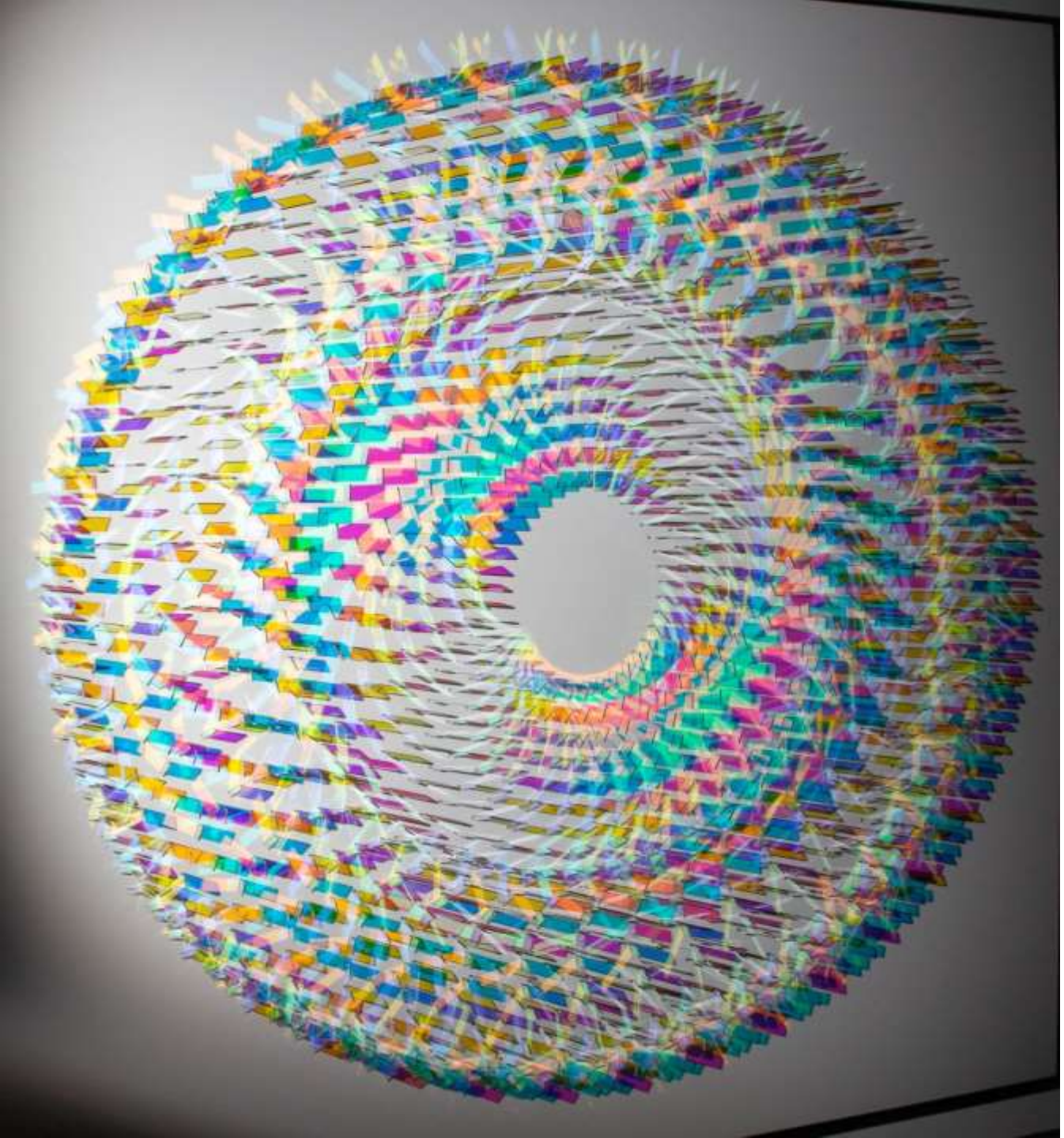




Chris Wood

“Light,” says Chris Wood, “is the purest form of radiance.” The Cambridgeshire-based artist is known for her dazzling installations made of dichroic glass—this transparent material produces a shifting spectrum of color depending on the viewpoint—that emit phenomenal prisms when illuminated. Often arranged on a panel or wall, the works evoke organic patterns, like helices, murmurations, and in the case of Wood’s most recent piece, the spiral of a nautilus shell.

https://www.youtube.com/watch?v=94JrRgcB5WU&t=6s



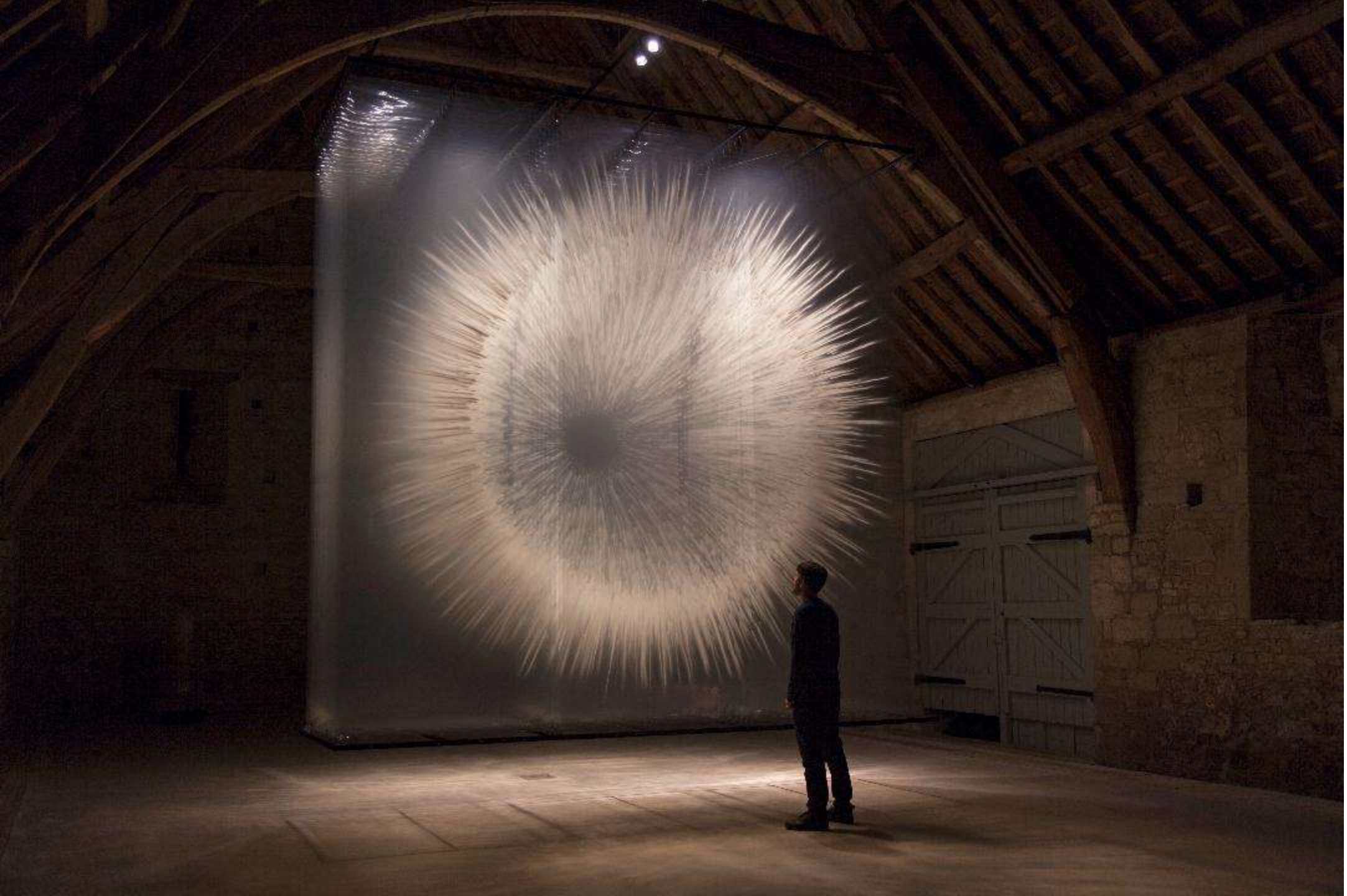
David Spriggs

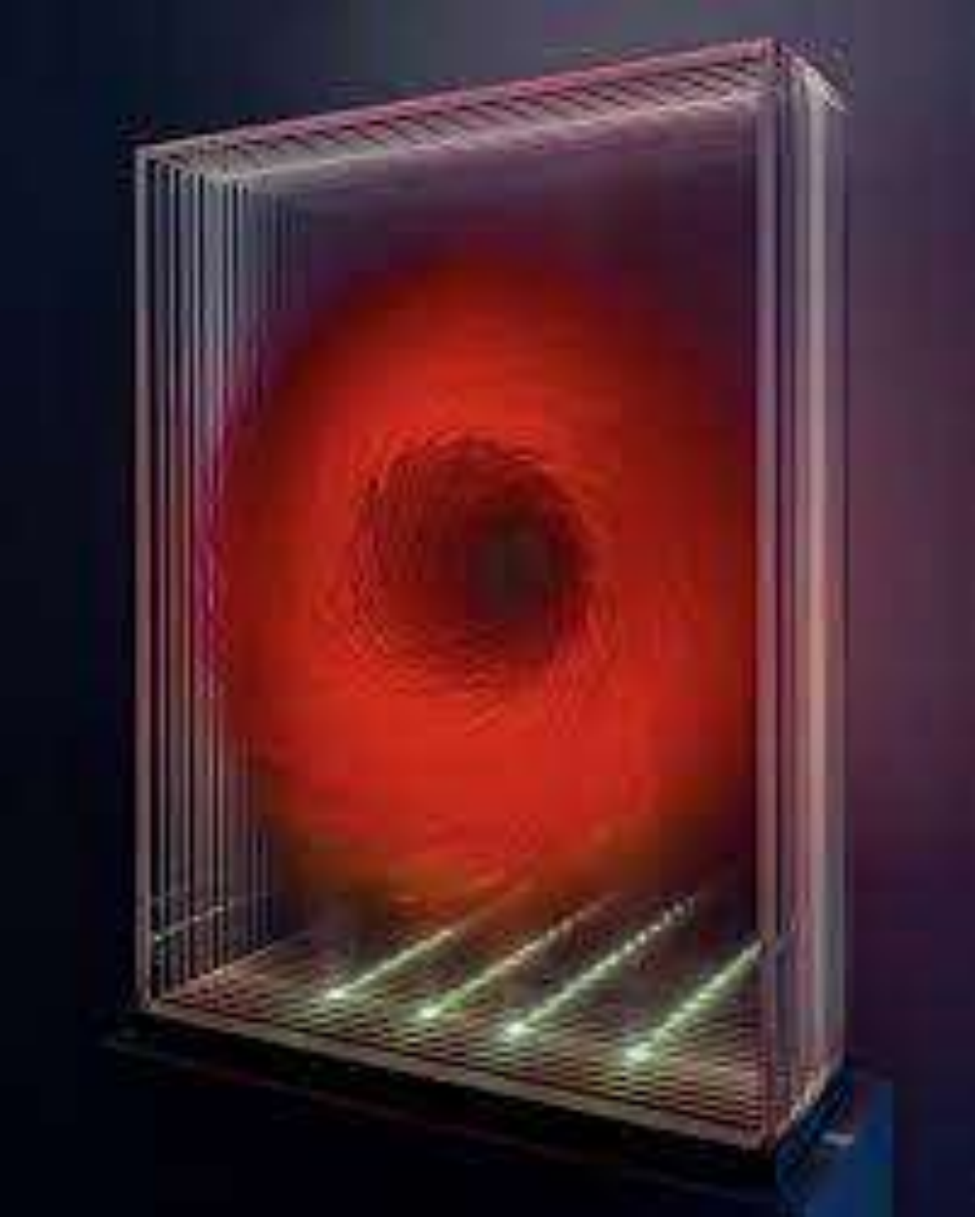
Vancouver-based artist David Spriggs creates large-scale 3D installations by by layering hand-painted transparencies within custom frameworks. The massive sculptural installations pull viewers in and shift based on perspective, while exploring themes of space-time, movement, surveillance, power dynamics, and other complex conceptual ideas.

For his larger installations, Spriggs tells Colossal that he creates and works from abstract topographical maps that are based on perfect geometric shapes. “I often use the golden ratio to determine placement and shape of a form. *Axis of Power* for example is based on a perfect golden spiral and the placement of the eye of the storm located at the golden ratio of the installation at 1.618. The artwork *Gravity* also is based on the golden spiral with all the marks following this spiral in a perfect hemisphere.” Spriggs also builds smaller models and digital maquettes to prepare for certain larger works.

https://www.youtube.com/watch?v=izEfMii2D9c&t=25s


DAVID SPRIGGS





Photography

The golden ratio is a composition guide. Some people call it the Fibonacci spiral, golden spiral, phi grid, divine proportion, or the golden mean. **It helps to lead the viewer through the entire photo**. The composition will be more pleasing and balanced for the human eye.

Try **placing important details at points where different lines intersect at the end of the spiral**. You can also place the details anywhere in the smallest boxes. The spiral works by focusing the viewer's eye on the end of the spiral and then leading them outwards to the whole scene.

- https://www.youtube.com/watch?v=9CiS3SU4lk0&t=177s

A Logaritmical Spiral Appears Around a Wet Tennis Ball Photographed by Arvin Rahimzadeh

Assignment Suggestions…

- Draw a golden spiral:
- https://www.youtube.com/watch?v=2VtYyHx77cs
- https://www.youtube.com/watch?v=Dgyki7gUMSs&t=12s
- Create an artwork that inspired by something from nature that exhibits the golden spiral/Fibonacci sequence (e.g., star nebulas, weather, sunflowers, pine cones, pine apples, snail shells etc.)
- Create an abstract artwork with golden rectangles.
- Photograph your artwork using the golden ratio.
- Create a nonsensical work composed of “golden” spirals