

I libri non sono fatti per crederci, ma per essere sottoposti a indagine. Di fronte a un libro non dobbiamo chiederci cosa dica ma cosa vuole dire.

Guglielmo: Quarto giorno, Dopo compieta

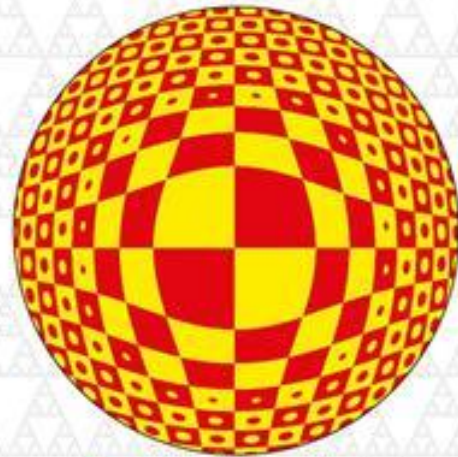
Il bene di un libro sta nell'essere letto. Un libro è fatto di segni che parlano di altri segni, i quali a loro volta parlano delle cose. Senza un occhio che lo legga, un libro reca segni che non producono concetti, e quindi è muto.

Guglielmo: Quinto giorno, Vespri

Il nome della rosa –Umberto Eco

PIER FRANCESCO SCIUTO


# PATTERNLAND



■  $\sin(r \sin rx \cdot \sin ry) > 0$

■  $\sin(r \sin rx \cdot \sin ry) < 0$

UN PICCOLO ATLANTE MATEMATICO  
DI TASSELLAZIONI

 Pendragon

## Capacità di calcolo

### *Nell'antichità*

2000 a.C. Babilonesi: Ciclo di Saros. Le eclissi di Luna si ripetono a intervalli di 18 anni e 11 giorni

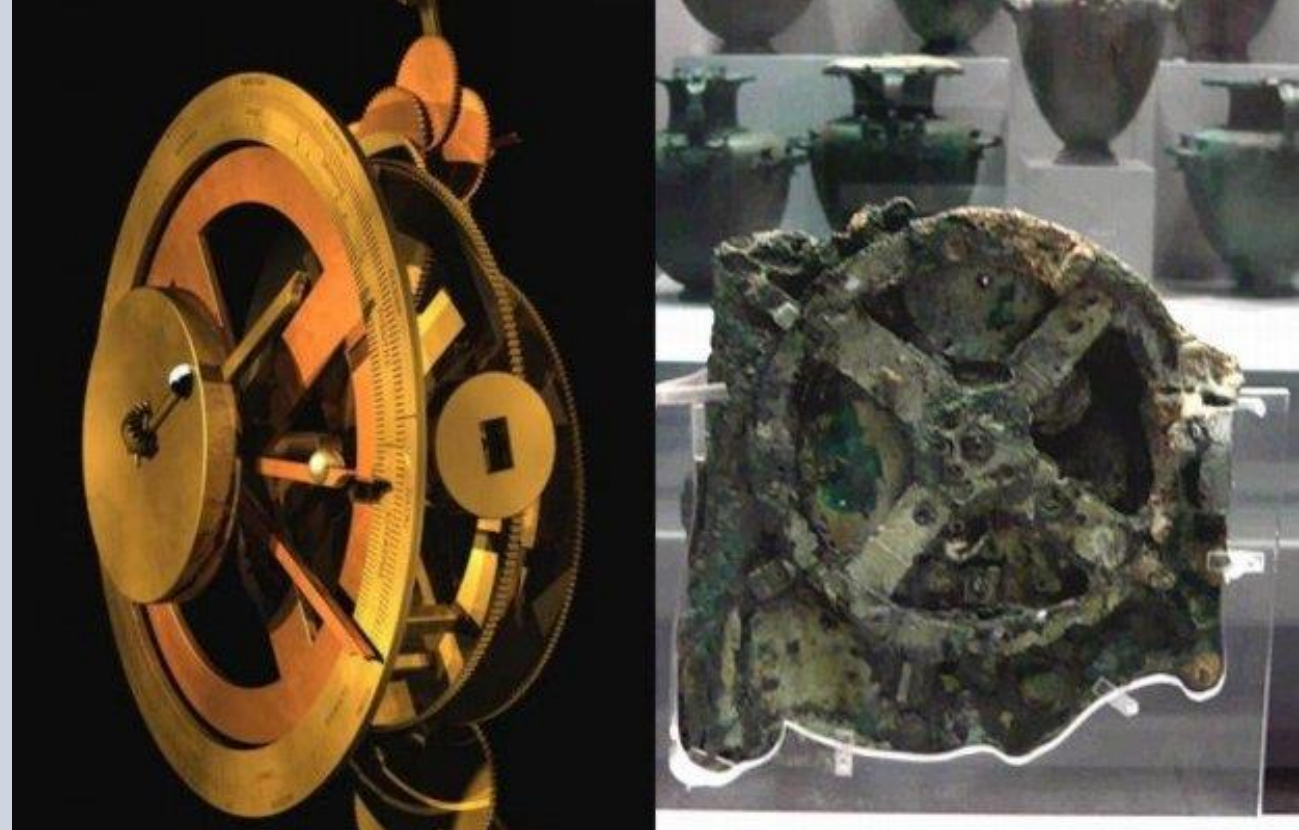
200 a.C. Erastotene di Cirene :  
misurazione eclittica e del raggio terrestre.

Archimede di Siracusa: Calcolo integrale

### *In un recente passato*

1968 – Apollo 11 prima missione lunare.

computer 20k ram 30k disco (equivale a una piccola calcolatrice scientifica)





## Struttura espositiva

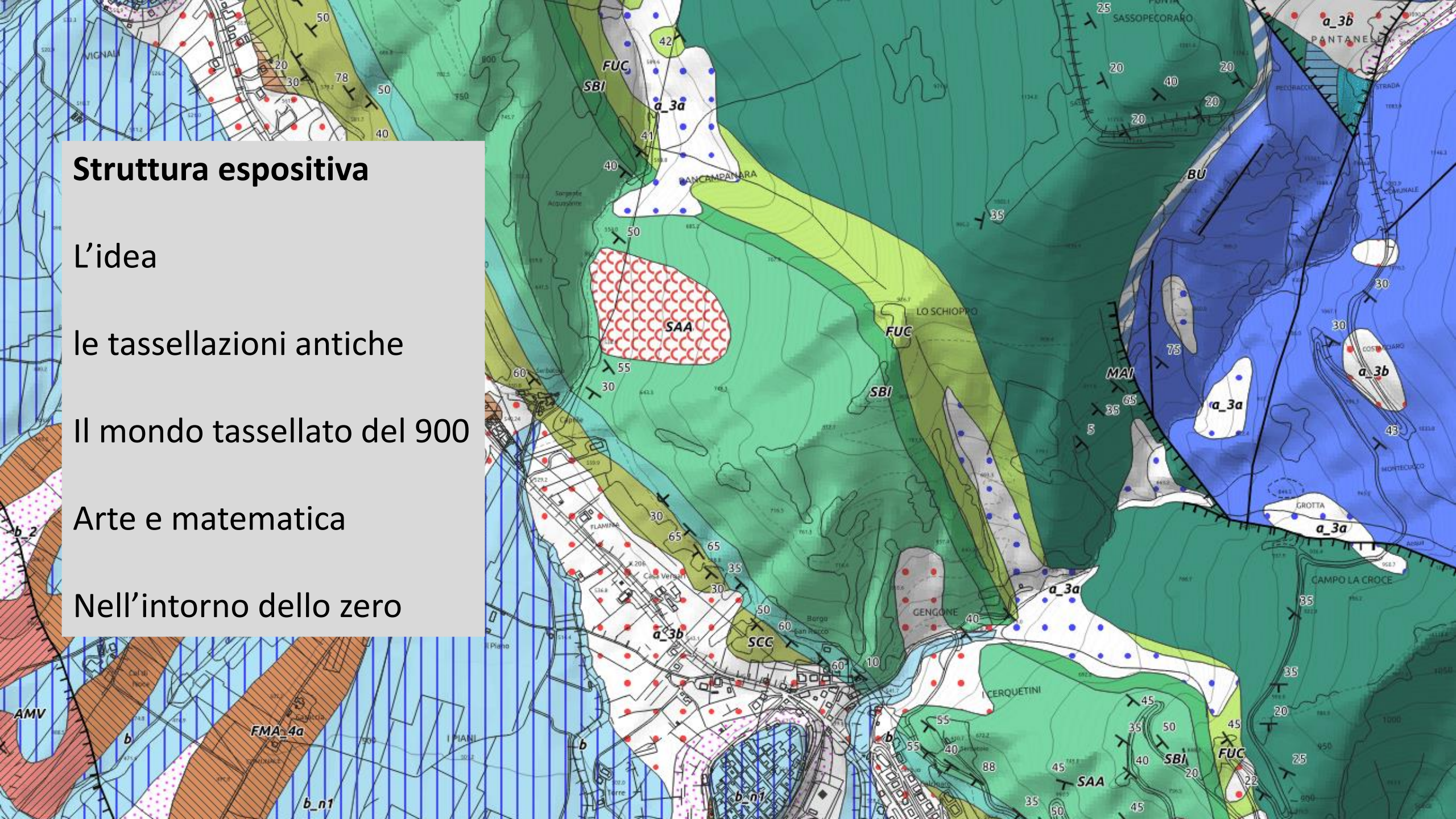
L'idea

le tassellazioni antiche

Il mondo tassellato del 900

Arte e matematica

Nell'intorno dello zero

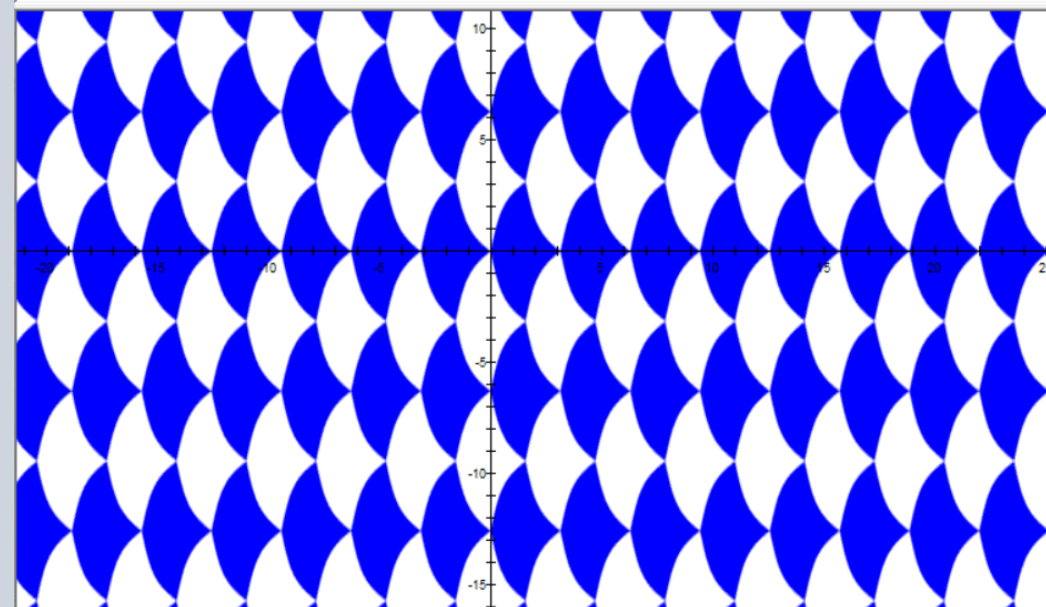




# Idea

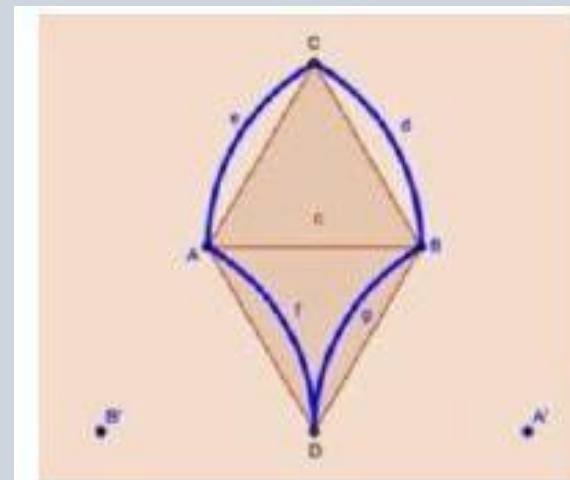
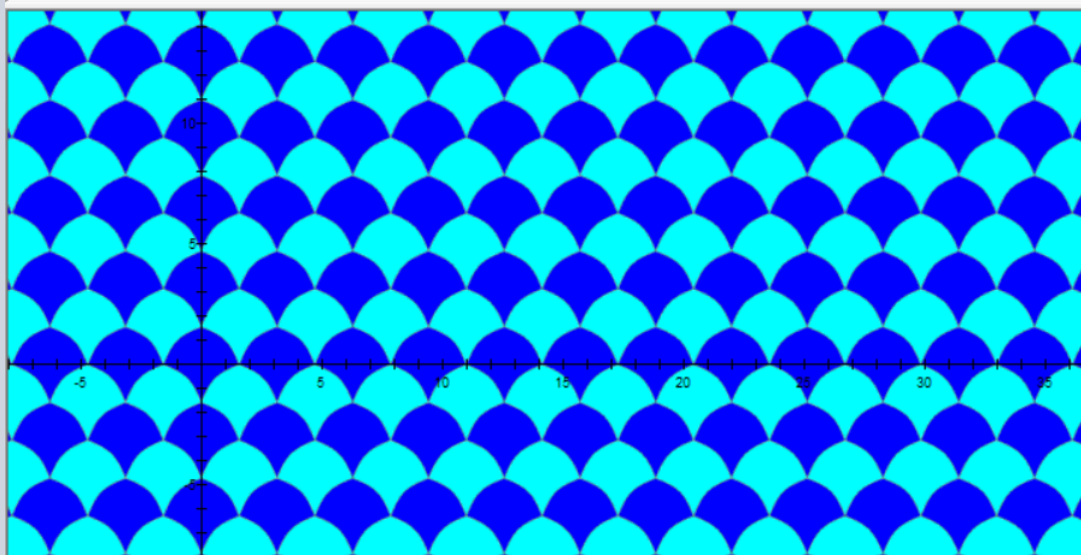


$$\blacksquare \sin 2x \cdot |\sin y| > \cos 2x - \cos y$$



$$\blacksquare |\sin 2x| \sin 2y > -\cos 2x - \cos 2y$$

$$\blacksquare |\sin 2x| \sin 2y < (-\cos 2x - \cos 2y)$$



El pétalo





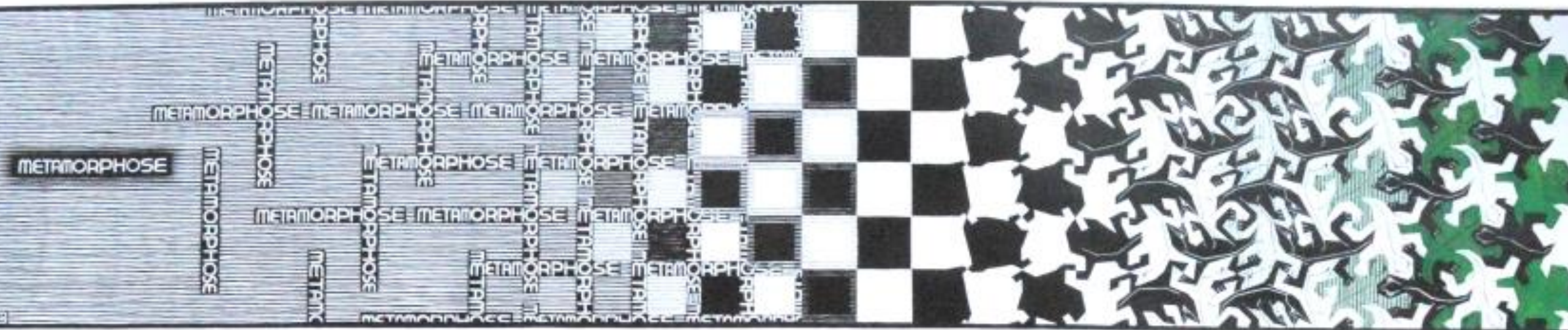
**Ingredienti per una tassellazione**

**2 variabili ( X, Y)**

**Una o più Disequazioni**

**Un po' di Trigonometria**

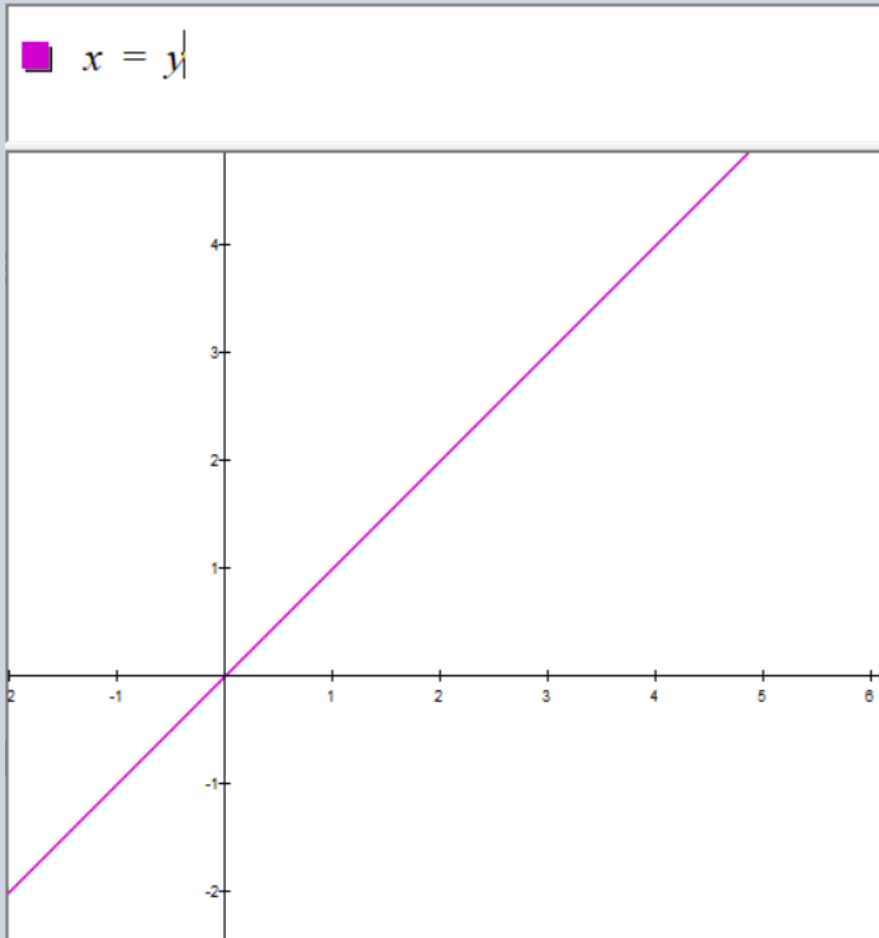
**Un Abaco**





# Ingredienti

2 variabili X Y  
1 equazione

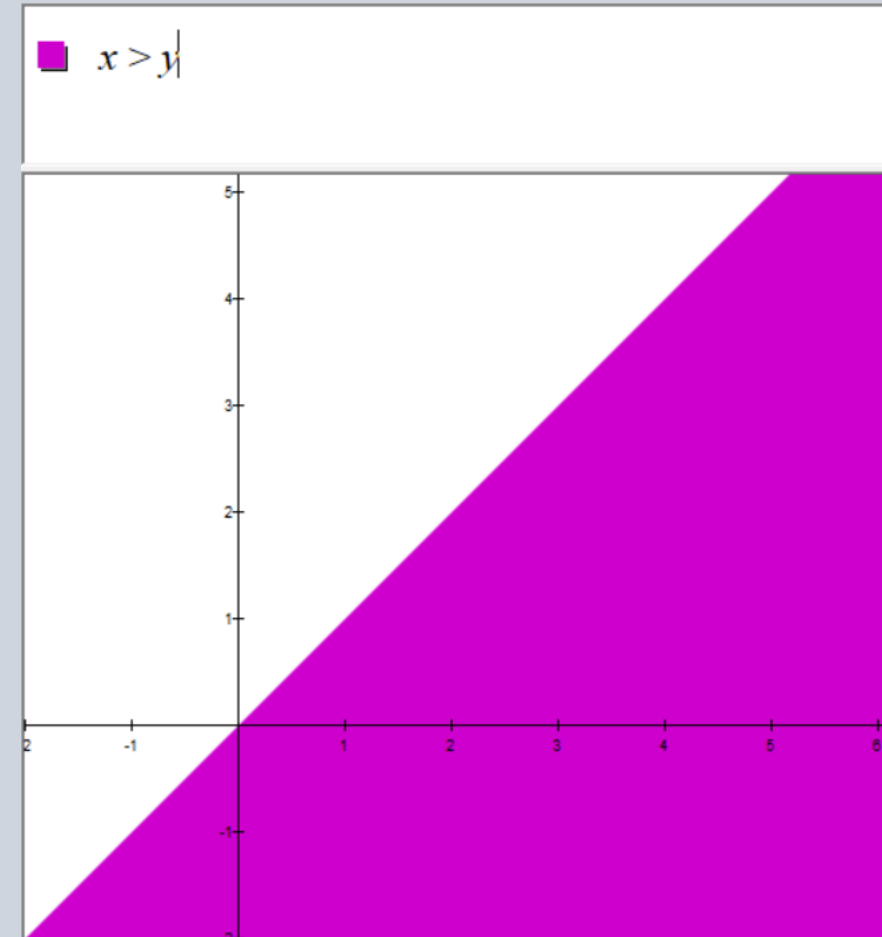


# Ingredienti

2 variabili X Y  
1 disequazione

## Risultato

Tassellazione  
Aperiodica  
semplice



# Ingredienti

2 variabili X Y

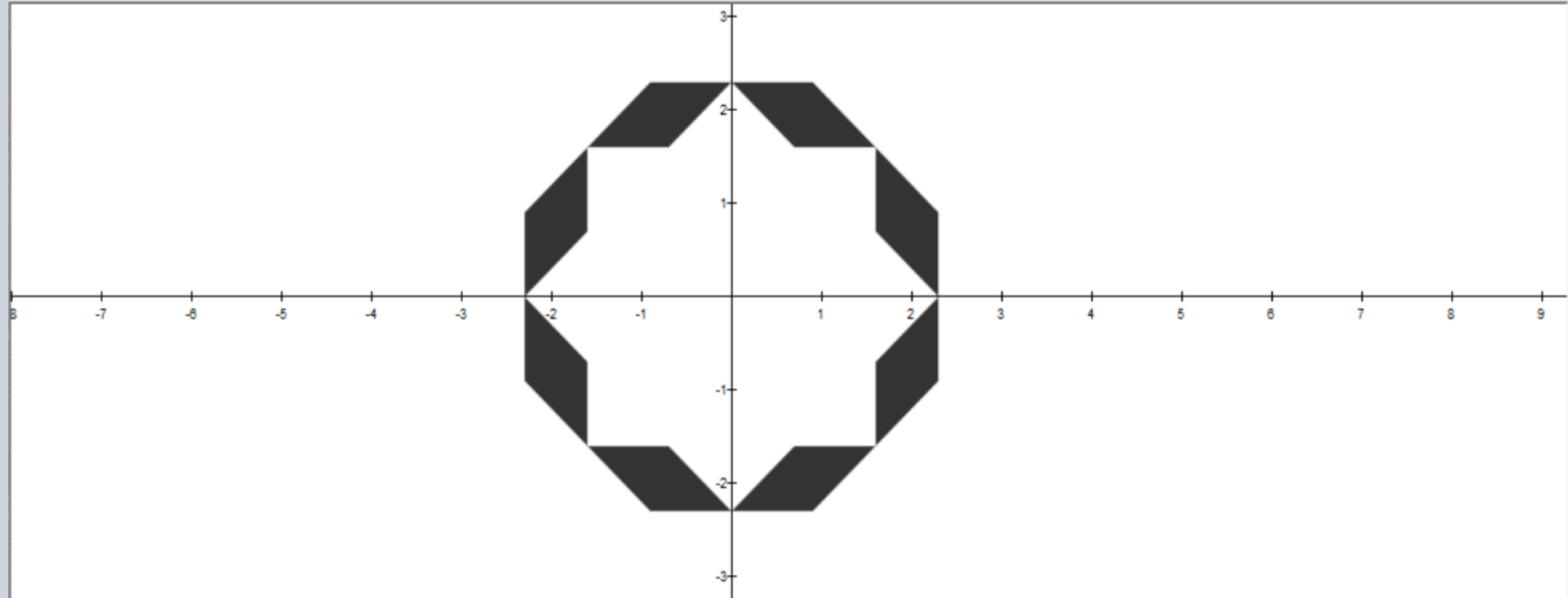
4 disequazioni

No trigonometria

## Risultato

Tassellazione  
aperiodica  
complessa

$$\blacksquare \quad 4,6 < |x| + |y| + (|x| + |y|), |x| + |y| + (|x| + |y|) < 6,4, |x + y| + |y - x| < 4,6, |x + y| + |y - x| > 3,2$$





# Caratteristiche

1 disequazione

2 variabili X Y

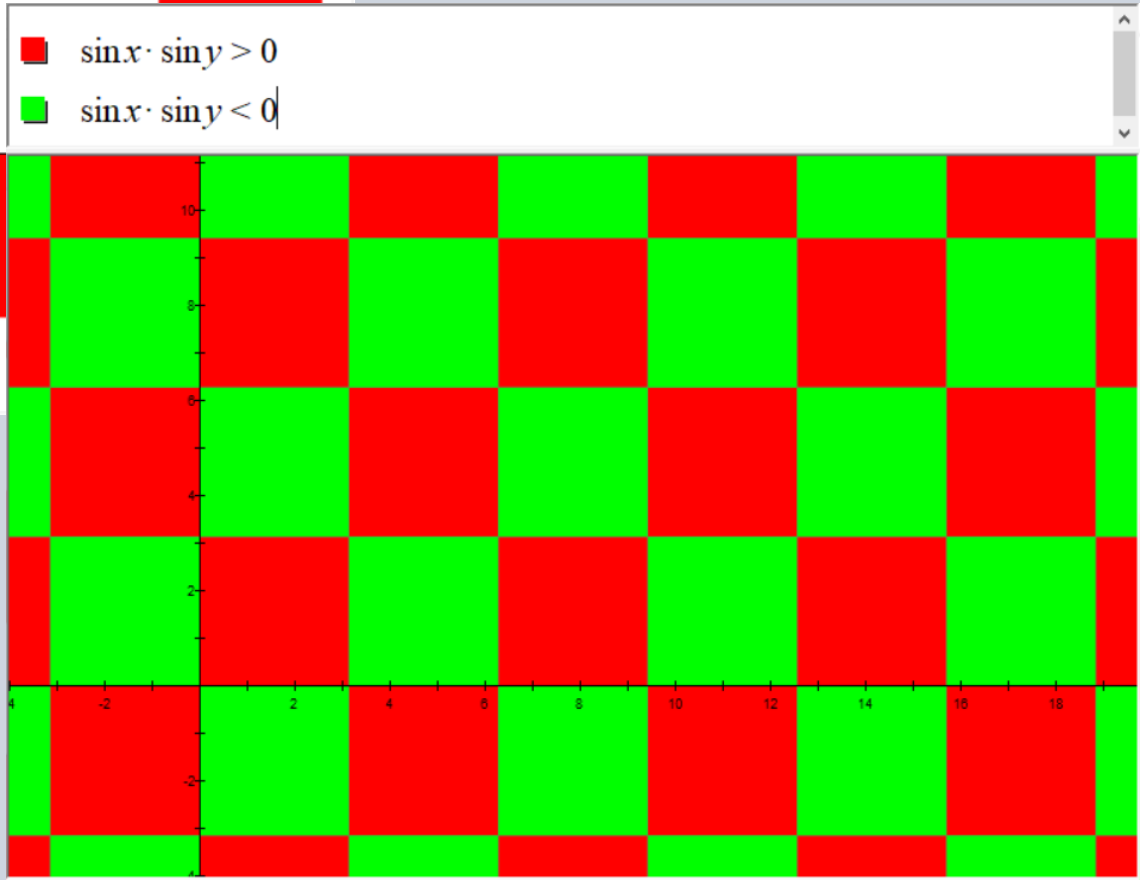
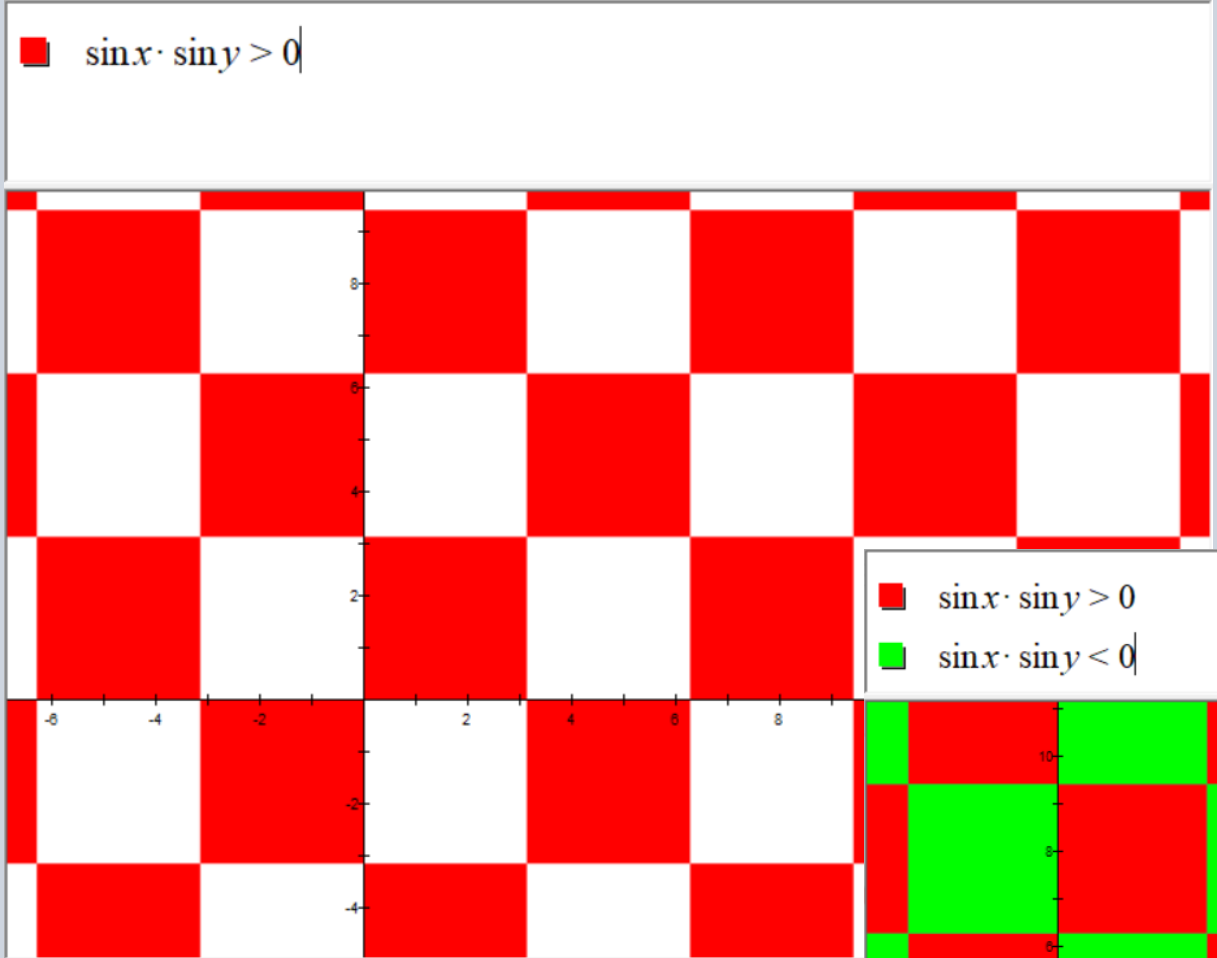
trigonometria

# Risultato

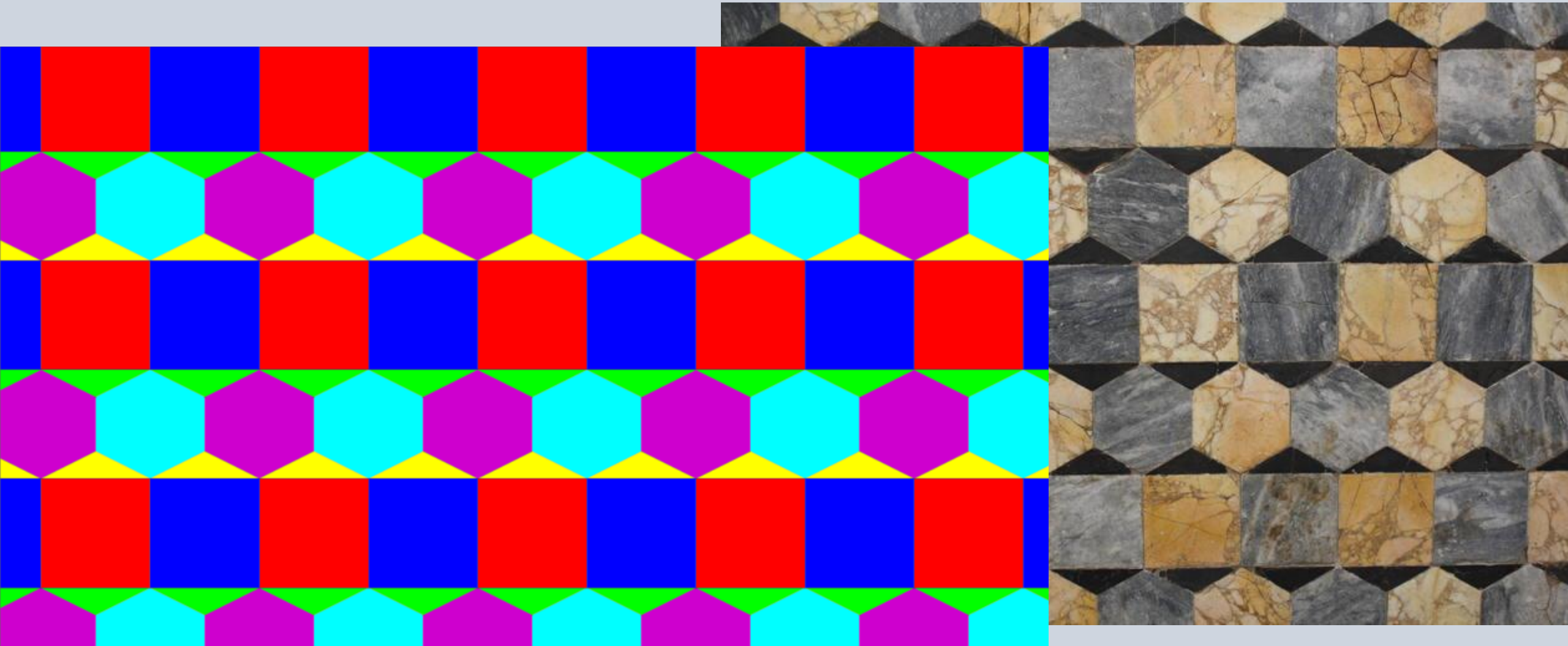
Tassellazione

Periodica

Una seconda disequazione colma i vuoti



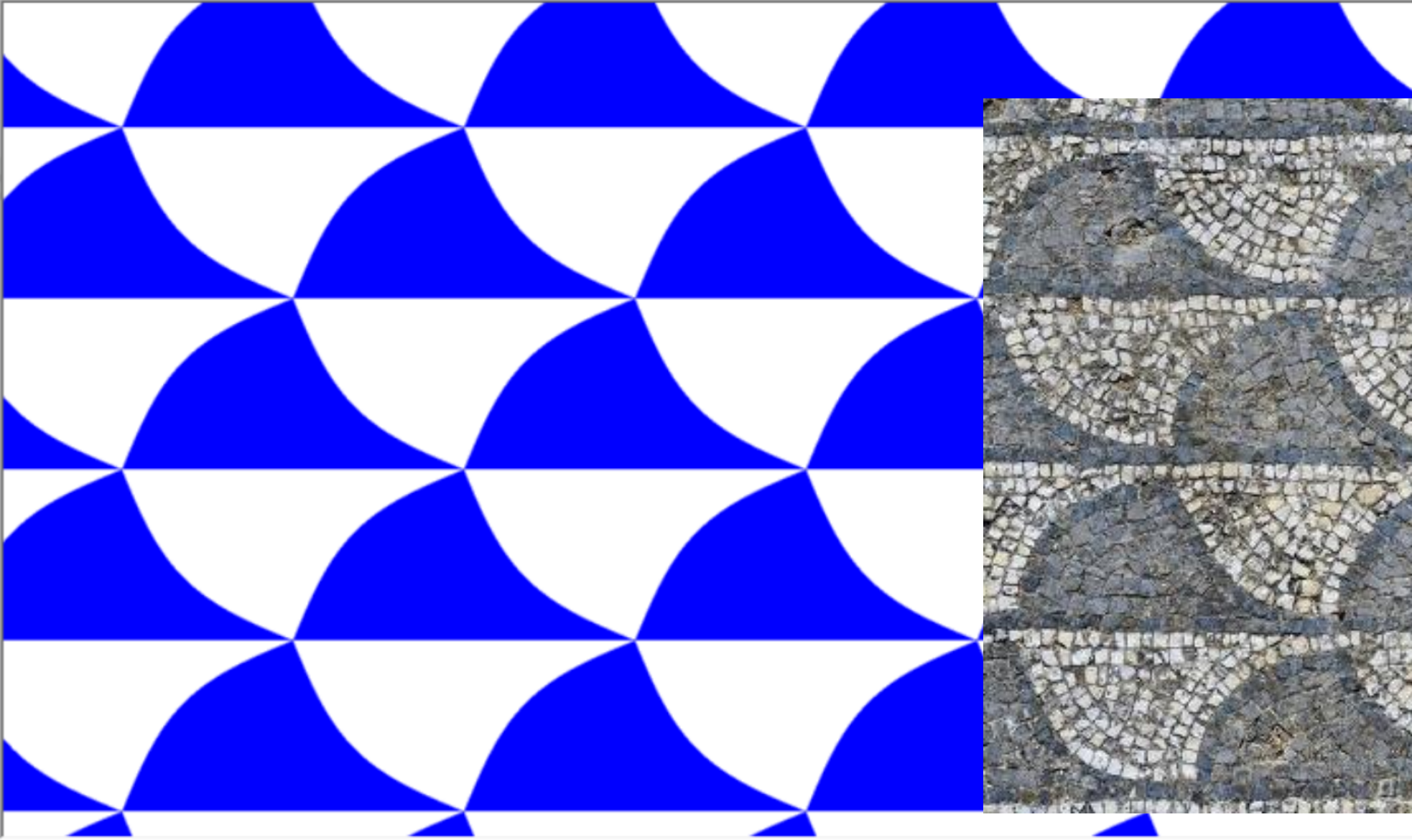
# Mondo greco-romano





■  $\cos y - \cos x < \sin x \cdot \sin y, \sin y < 0$

■  $\cos y + \cos(x + \pi) > \sin(x + \pi) \cdot \sin y, \sin y > 0$









# UN PAESAGGIO CON ROVINE SUL MARE: LA DOMITIANA POSITIO

*di Mariagrazia Celuzza*





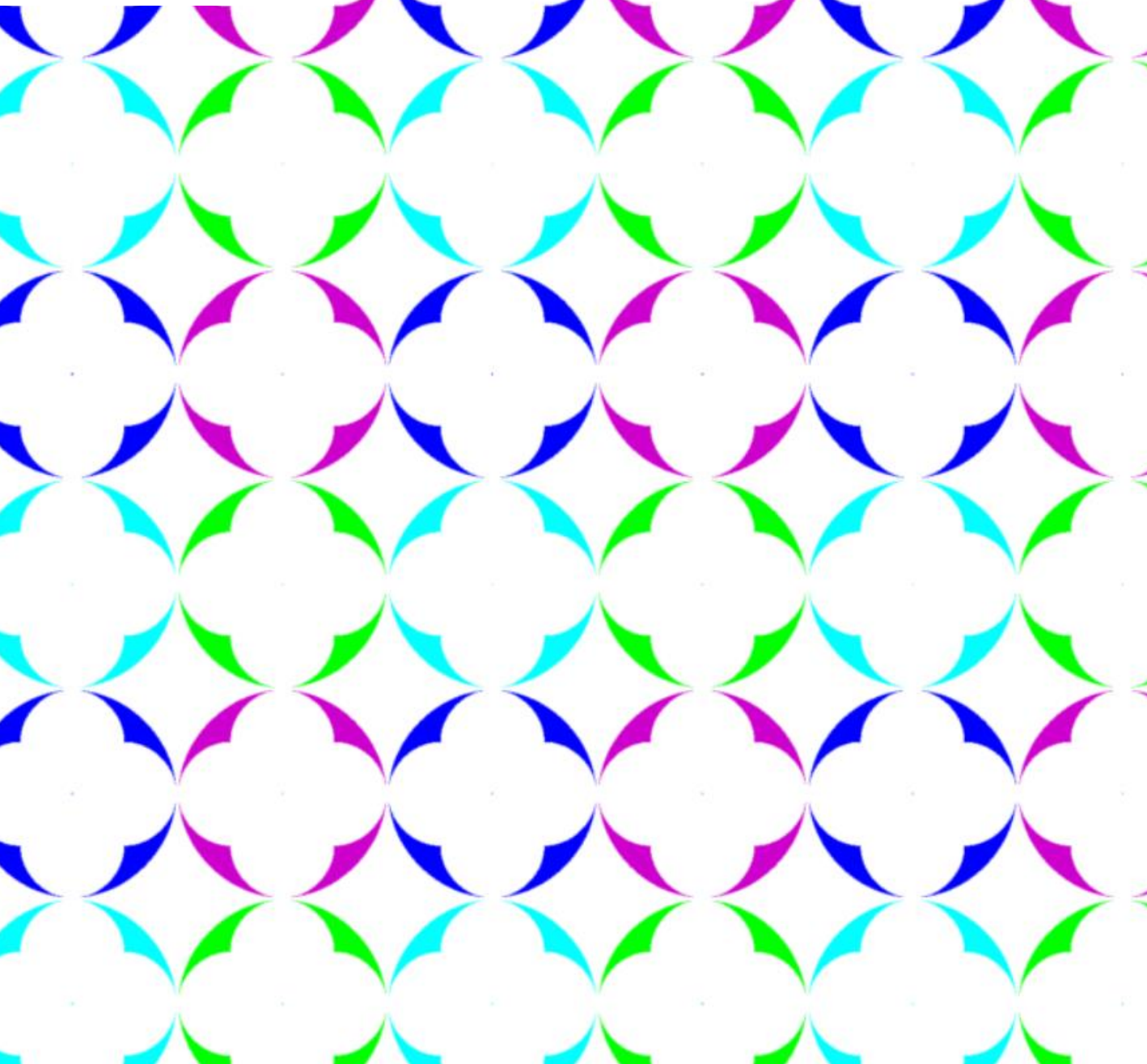
UN PAESAGGIO CON ROVINE  
SUL MARE: LA DOMITIANA POSITIO

di Mariagrazia Colucci

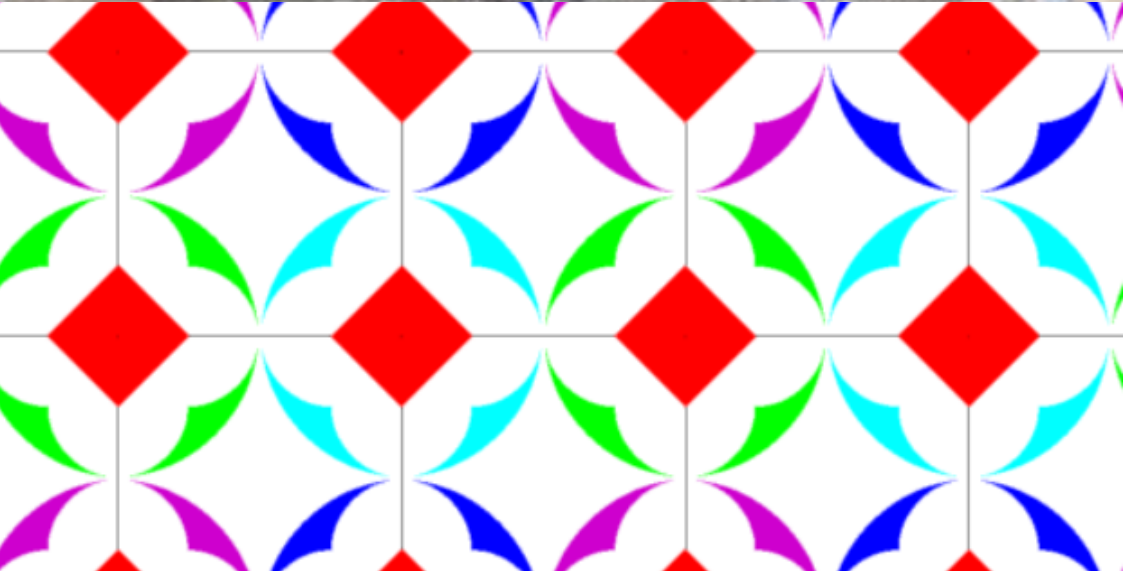
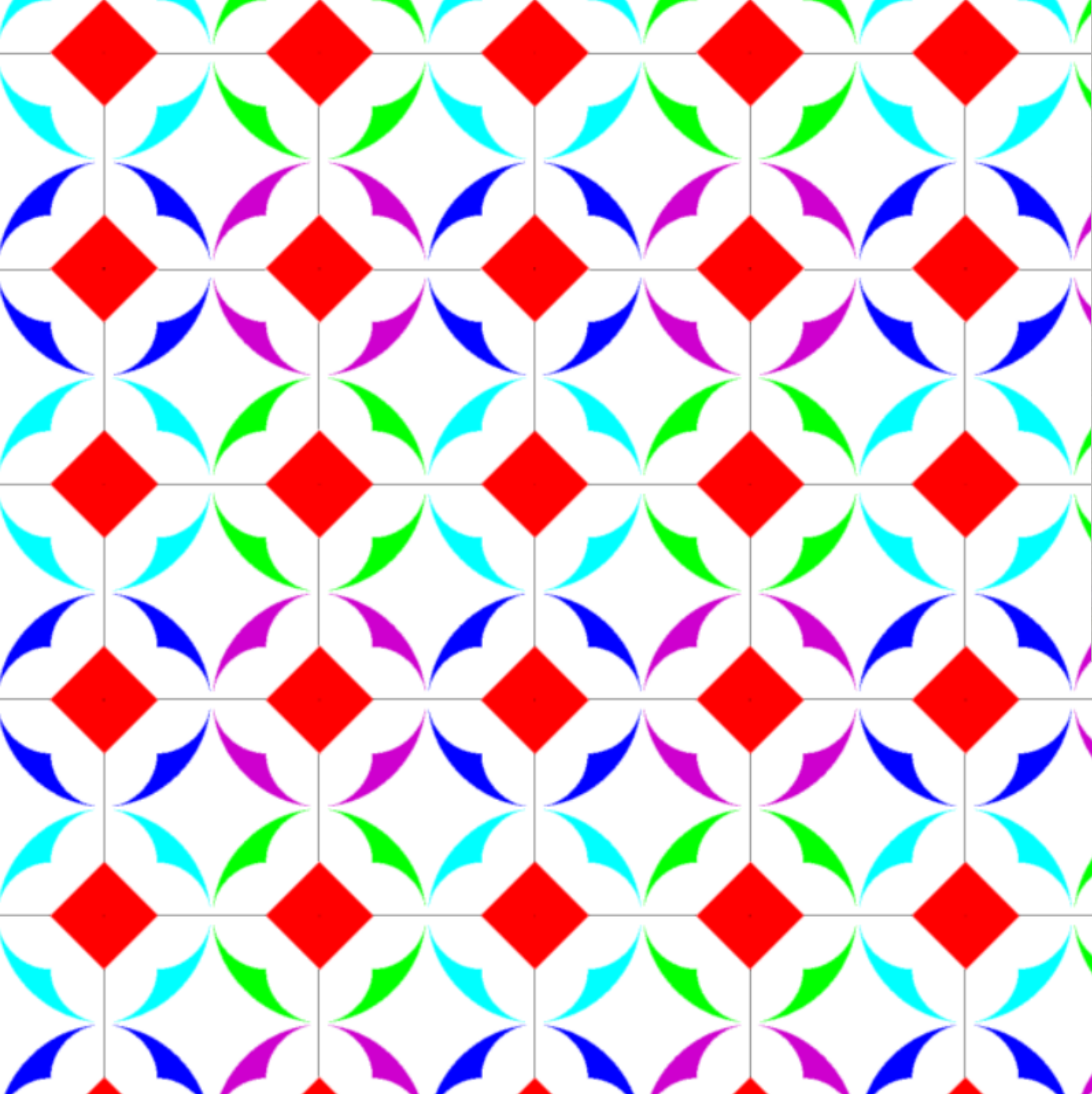


UN PAESAGGIO CON ROVINE  
SUL MARE: LA DOMITIANA POSITIO

di Mariagrazia Colucci



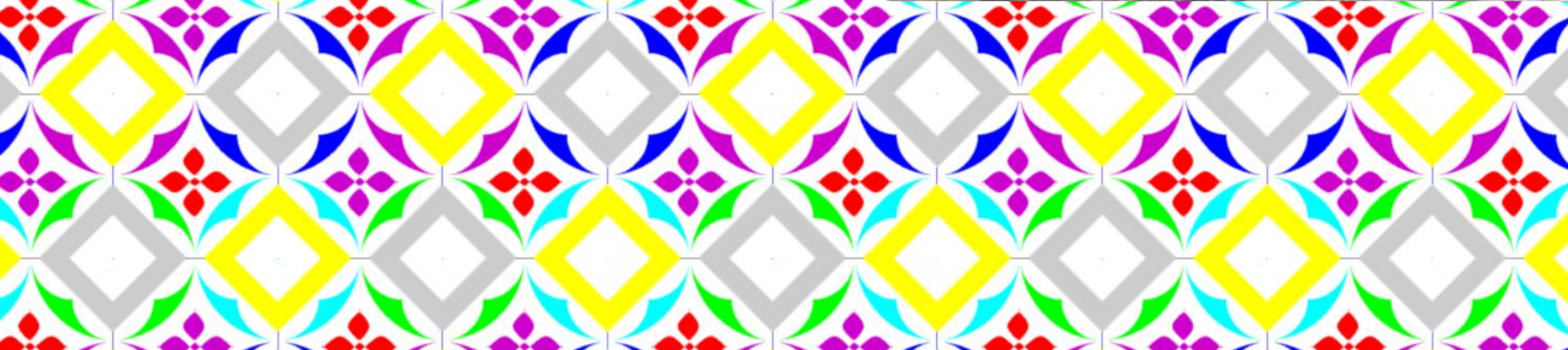
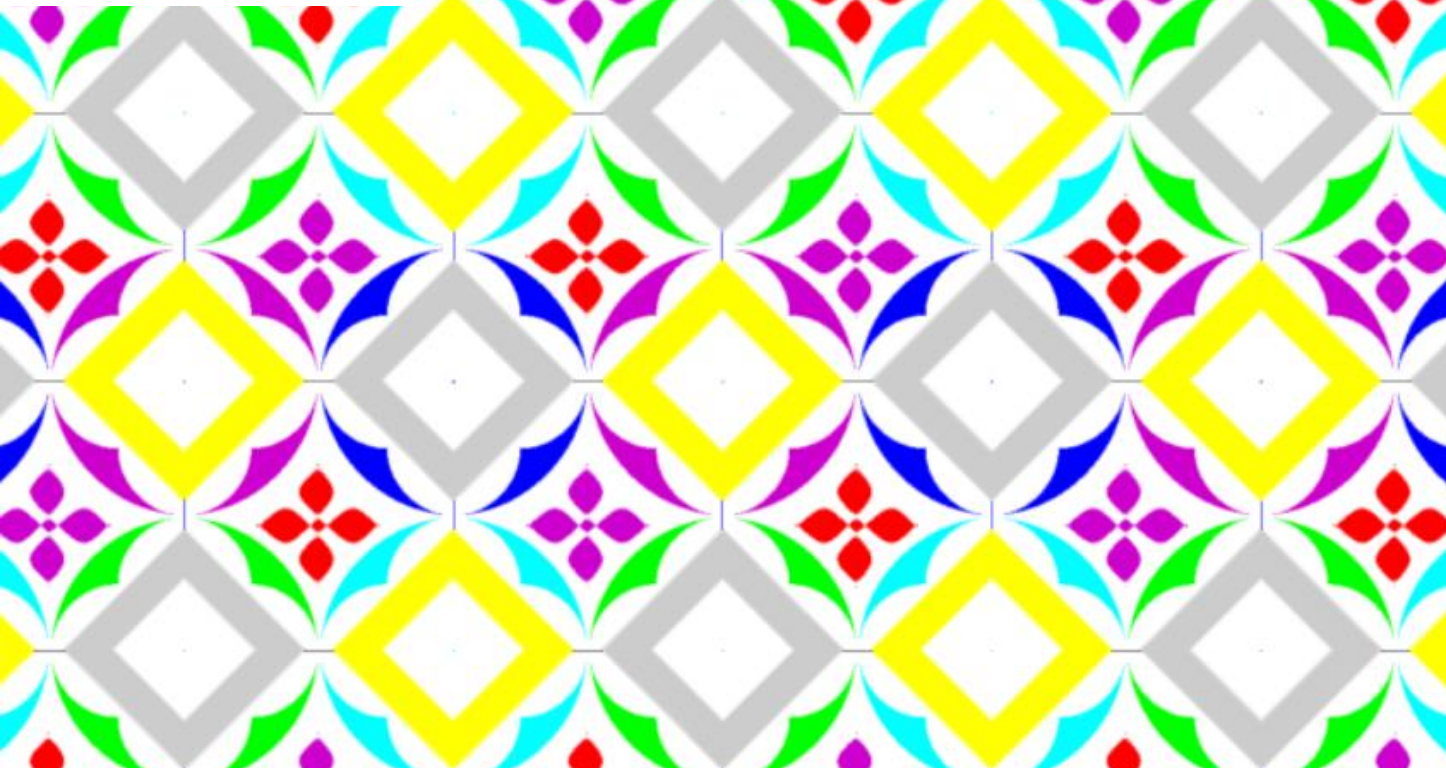






UN PAESAGGIO CON ROVINE  
SUL MARE: LA DOMITIANA POSITIO

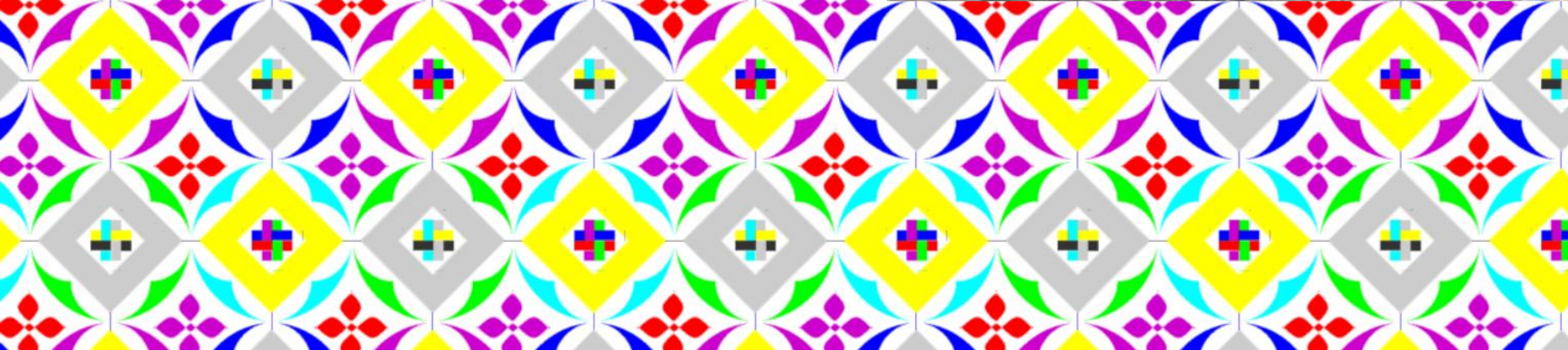
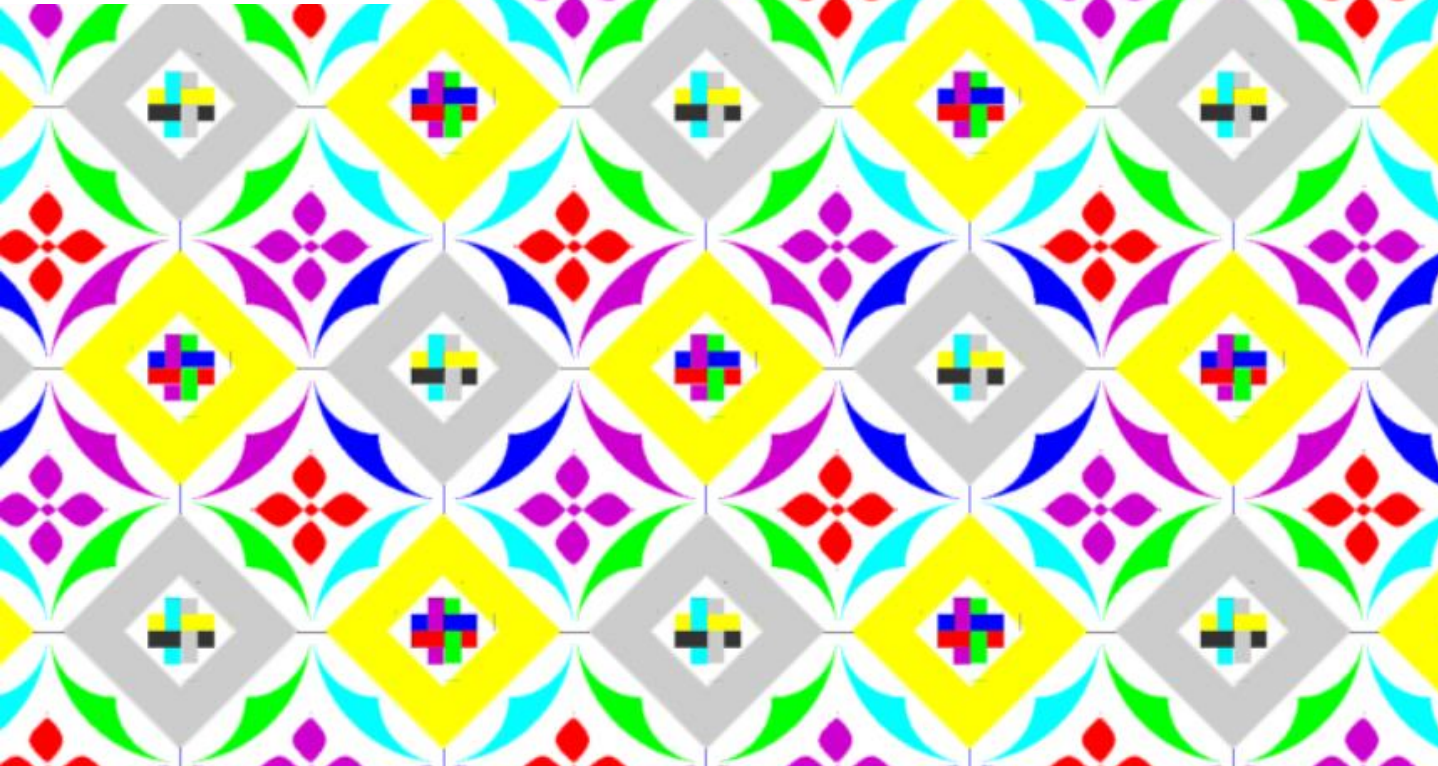
di Mariagrazia Caluso





UN PAESAGGIO CON ROVINE  
SUL MARE: LA DOMITIANA POSITIVO

di Mariagrazia Colucci





UN PAESAGGIO CON ROVINE  
SUL MARE: LA DOMITIANA POSITIVO

di Mariagrazia Colucci





■  $\sin x \cdot \sin y > 0, \sin 3x > 0, \sin \frac{x}{2} \cdot \sin \frac{y}{2} > 0, \sin \frac{x}{2} > 0, \sin \frac{y}{2} > 0, \sin x < 0, \sin \frac{(x+\pi)}{4} > 0, \sin \frac{(y+\pi)}{4} > 0$

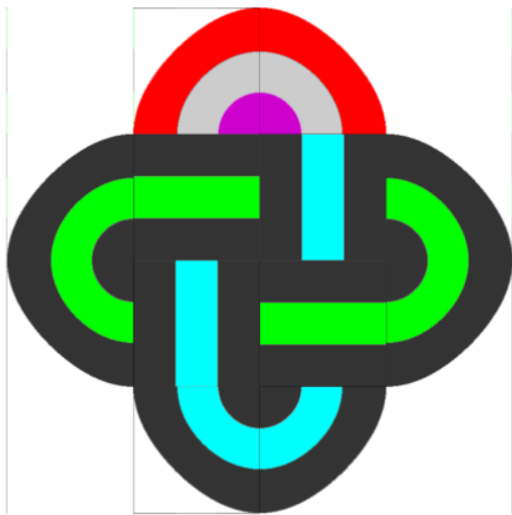
■  $\sin(x+\pi) \cdot \sin(y+\pi) > 0, \sin 3(x+\pi) > 0, \sin \frac{(x+\pi)}{2} \cdot \sin \frac{(y+\pi)}{2} > 0, \sin \frac{(x+\pi)}{2} > 0, \sin \frac{(y+\pi)}{2} > 0, \sin(x+\pi) < 0$   
 $, \sin \frac{(x+\pi)}{4} > 0, \sin \frac{(y+\pi)}{4} > 0$

■  $\sin x \cdot \sin y > 0, \sin 3x < 0, \sin \frac{x}{2} \cdot \sin \frac{y}{2} > 0, \sin \frac{x}{2} > 0, \sin \frac{y}{2} > 0, \sin x < 0, \sin \frac{(x+\pi)}{4} > 0, \sin \frac{(y+\pi)}{4} > 0$

■  $\sin(x+\pi) \cdot \sin(y+\pi) > 0, \sin 3(x+\pi) < 0, \sin \frac{(x+\pi)}{2} \cdot \sin \frac{(y+\pi)}{2} > 0, \sin \frac{(x+\pi)}{2} > 0, \sin \frac{(y+\pi)}{2} > 0, \sin(x+\pi) < 0$   
 $, \sin \frac{(x+\pi)}{4} > 0, \sin \frac{(y+\pi)}{4} > 0$

■  $\sin x \cdot \sin y < 0, \sin 3y < 0, \sin \frac{x}{2} \cdot \sin \frac{y}{2} > 0, \sin \frac{x}{2} > 0, \sin \frac{y}{2} > 0, \sin x < 0, \sin \frac{(x+\pi)}{4} > 0, \sin \frac{(y+\pi)}{4} > 0$



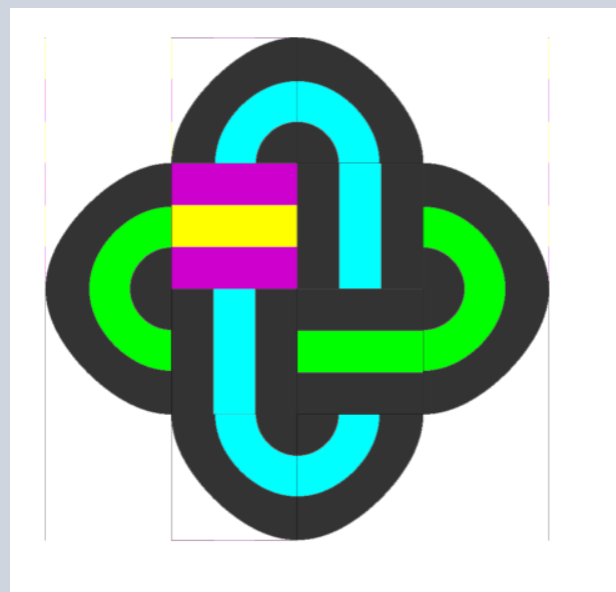


3 equazioni per ogni lobo costituito  
da 3 elementi circolari  
Totale  $3 \times 4 = 12$  equazioni

Totale 20 equazioni

Aggiungendo un lobo su un lato 42 equazioni

Aggiungendo due lobi su un lato 78 equazioni



2 equazioni per ogni tassello  
costituito da 2 elementi lineari  
Totale  $2 \times 4 = 8$  equazioni



3 equazioni per ogni lobo costituito  
da 3 elementi circolari  
Totale  $3 \times 12 = 36$  equazioni

2 equazioni per ogni tassello  
costituito da 2 elementi circolari  
Totale  $3 \times 4 = 12$  equazioni









■  $\sin x \cdot \sin y > 0, \sin 3x > 0, \sin \frac{x}{2} \cdot \sin \frac{y}{2} > 0, \sin \frac{x}{2} > 0, \sin \frac{y}{2} > 0, \sin x < 0, \sin \frac{(x+\pi)}{4} > 0, \sin \frac{(y+\pi)}{4} > 0$

■  $\sin x \cdot \sin(y+2\pi) > 0, \sin 3x > 0, \sin \frac{x}{2} \cdot \sin \frac{y+2\pi}{2} > 0, \sin \frac{x}{2} > 0, \sin \frac{y+2\pi}{2} > 0, \sin x < 0, \sin \frac{x+\pi}{4} > 0, \sin \frac{y+3\pi}{4} > 0$

■  $\sin(x+2\pi) \cdot \sin(y+2\pi) > 0, \sin 3(x+2\pi) > 0, \sin \frac{x+2\pi}{2} \cdot \sin \frac{y+2\pi}{2} > 0, \sin \frac{x+2\pi}{2} > 0, \sin \frac{y+2\pi}{2} > 0, \sin x < 0$

$\sin \frac{x+3\pi}{4} > 0 \quad \sin \frac{y+3\pi}{4} > 0$

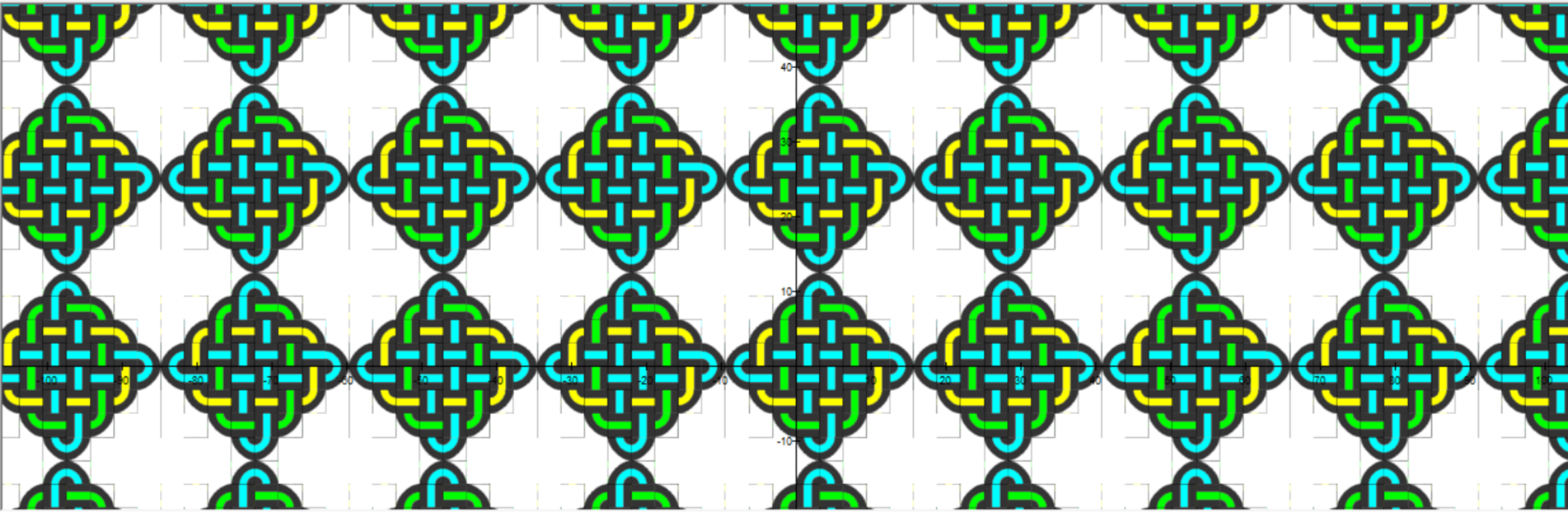




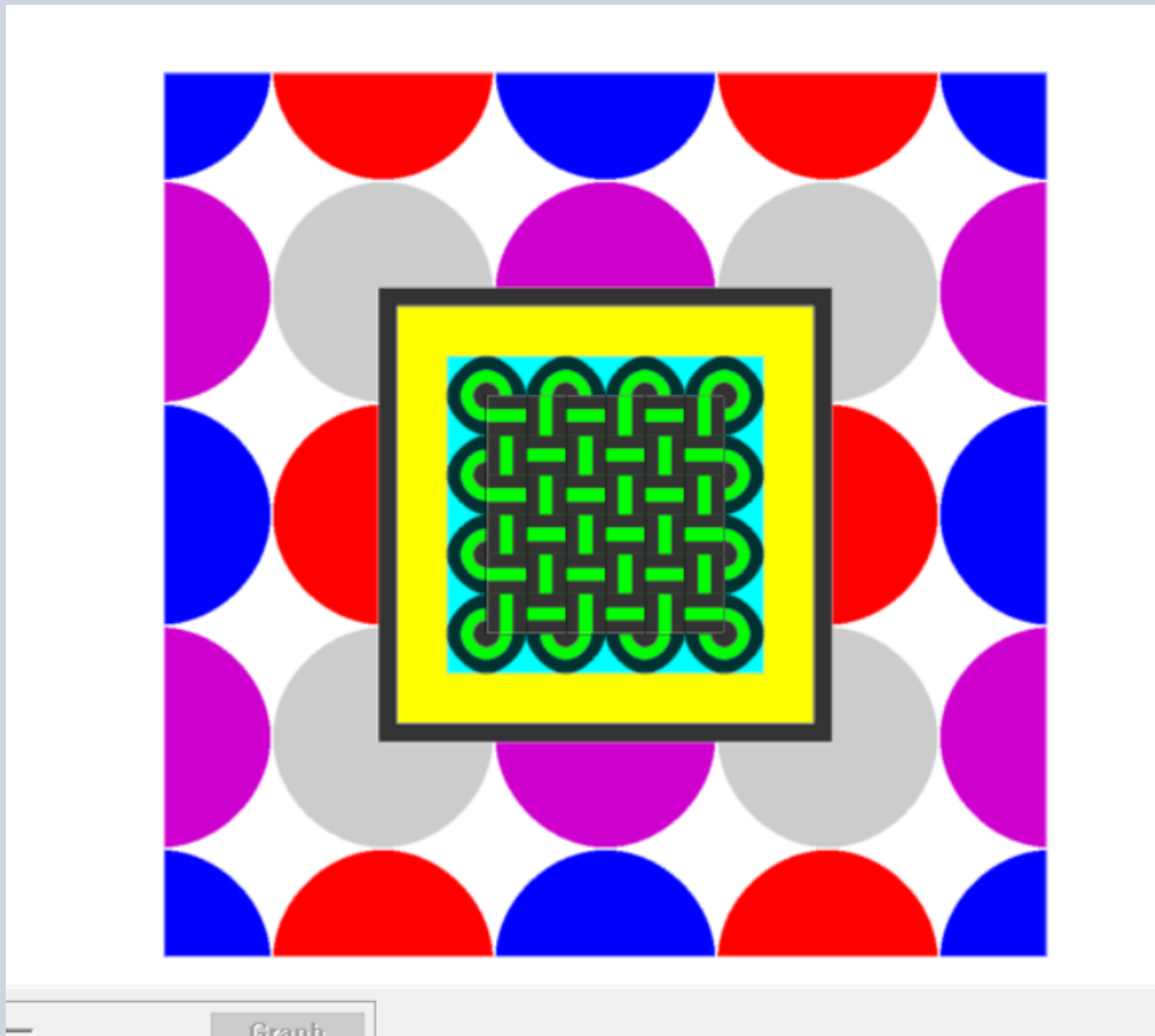
■  $\sin x \cdot \sin y > 0, \sin 3x > 0, \sin \frac{x}{2} \cdot \sin \frac{y}{2} > 0, \sin \frac{x}{2} > 0, \sin \frac{y}{2} > 0, \sin x < 0, \sin \frac{(x + \pi)}{4} > 0, \sin \frac{(y + \pi)}{4} > 0$

■  $\sin(x + 2\pi) \cdot \sin y > 0, \sin 3x > 0, \sin \frac{(x + 2\pi)}{2} \cdot \sin \frac{y}{2} > 0, \sin \frac{(x + 2\pi)}{2} > 0, \sin \frac{y}{2} > 0, \sin(x + 2\pi) < 0, \sin \frac{((x + 2\pi) + \pi)}{4} > 0$   
,  $\sin \frac{(y + \pi)}{4} > 0$

■  $\sin x \cdot \sin y > 0, \sin 3x < 0, \sin \frac{x}{2} \cdot \sin \frac{y}{2} > 0, \sin \frac{x}{2} > 0, \sin \frac{y}{2} > 0, \sin x < 0, \sin \frac{x + \pi}{2} > 0, \sin \frac{y + \pi}{2} > 0$













In sintesi:

I pavimenti sono il risultato della sovrapposizione / combinazione di più motivi geometrici

La complessità è in genere commisurata alla agiatezza del committente

Il tema nodi può avere diverse accezioni

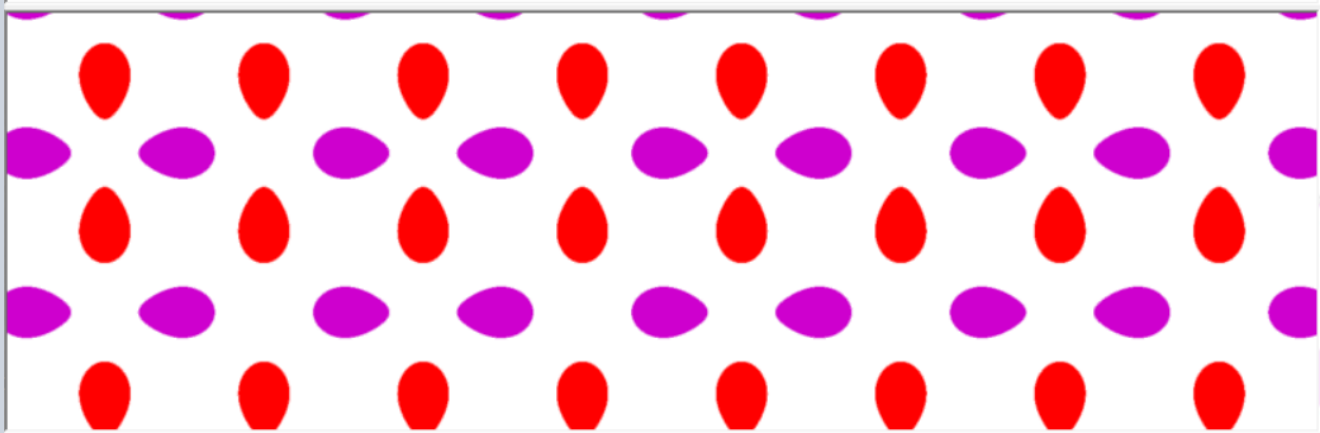
- è simbolo di legame, di vincolo alle persone e cose
- È un simbolo marittimo legato quindi al luogo e alle attività.
- È un semplice decoro

il tema circonferenze ellissi e «uova» può essere a sua volta

- Simbolo / augurio di fertilità e opulenza
- Richiamo alla perfezione e alla filosofia
- È un semplice decoro

■  $9 \cos^2 x + 16 \cos^2 y + 2 \cos x \cdot \cos^2 2y + \cos^2 y < 4$

■  $9 \cos^2 \left( y + \frac{\pi}{2} \right) + 16 \cos^2 \left( x + \frac{\pi}{2} \right) + 2 \cos \left( y + \frac{\pi}{2} \right) \cdot \cos^2 2 \left( x + \frac{\pi}{2} \right) + \cos^2 \left( x + \frac{\pi}{2} \right) < 4$



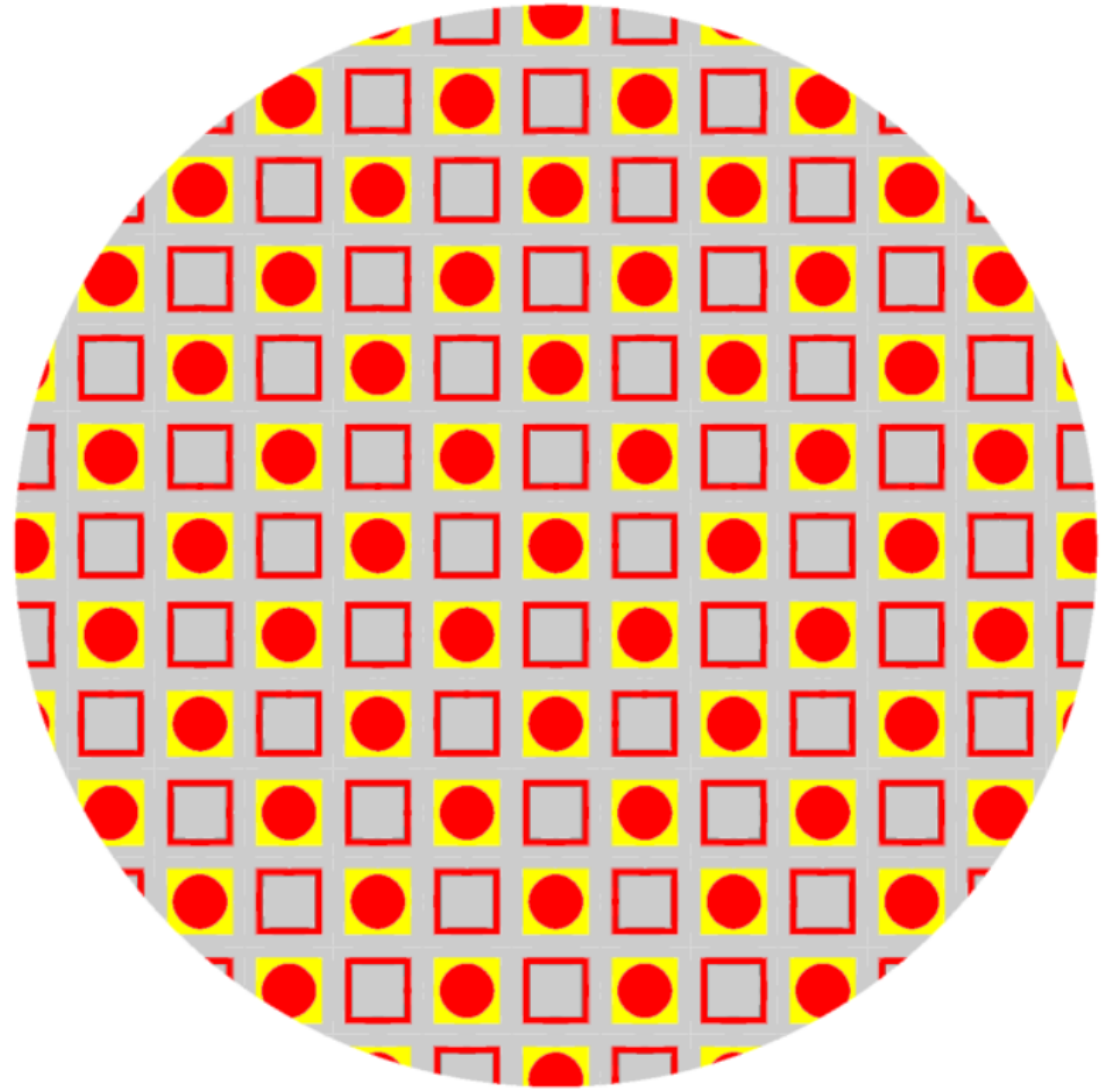
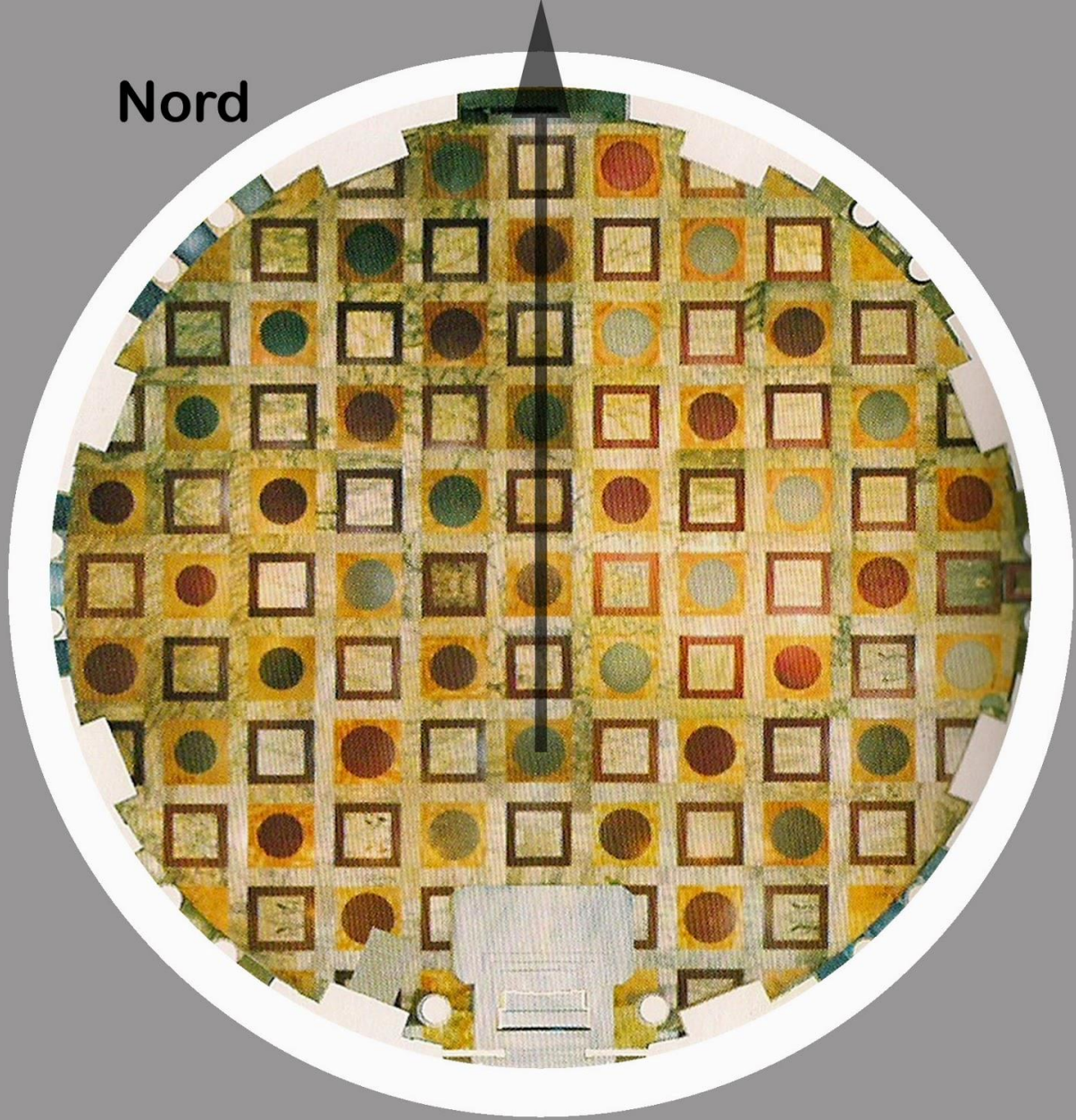




Roma – Pantheon  
Data di costruzione  
27 a. C. e poi riedificato  
tra il 118 e il 125 d.C.



Nord



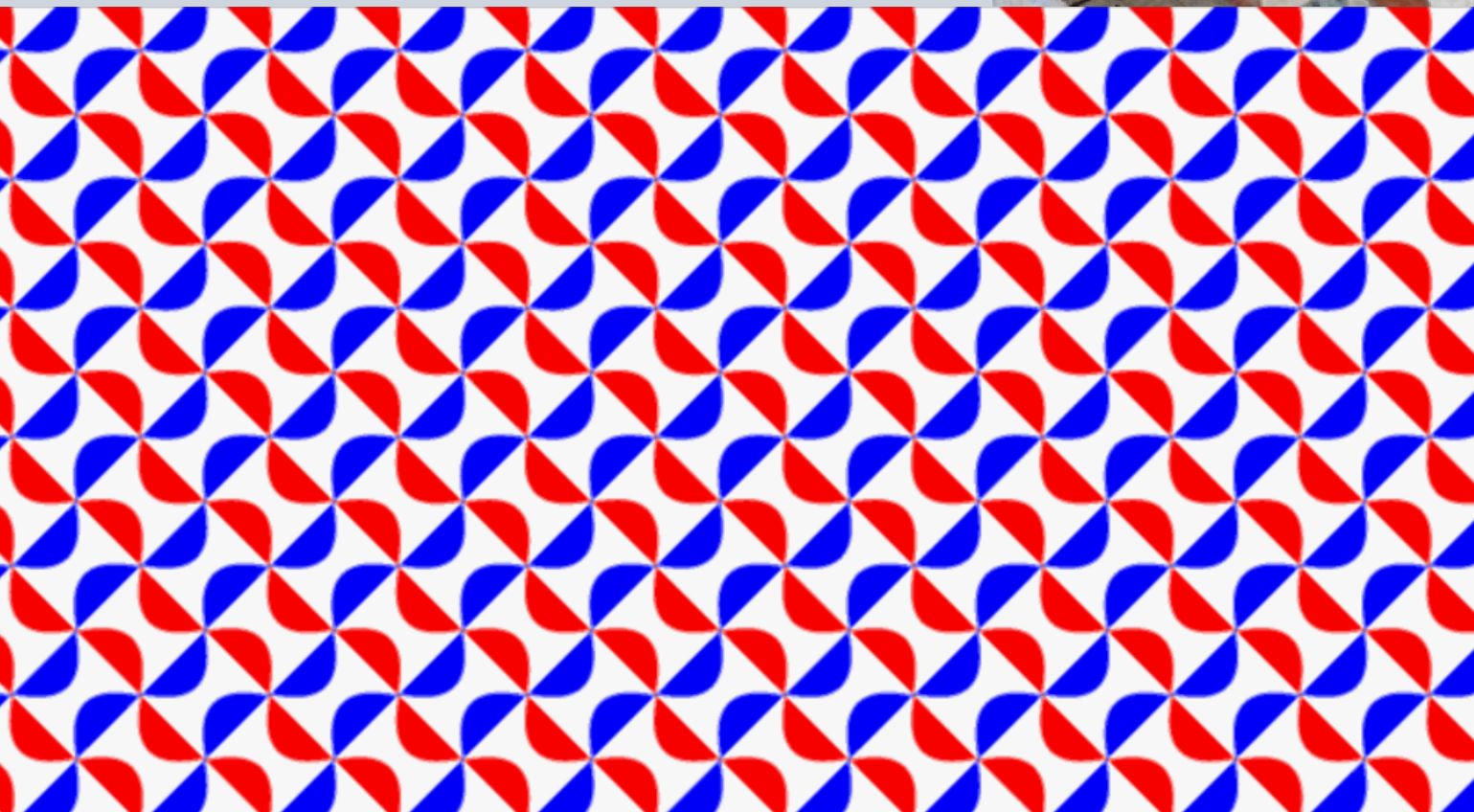
Graph

■  $\tan(2 \tan r + 3\theta) > 0, 1, x^2 + y^2 < 2$

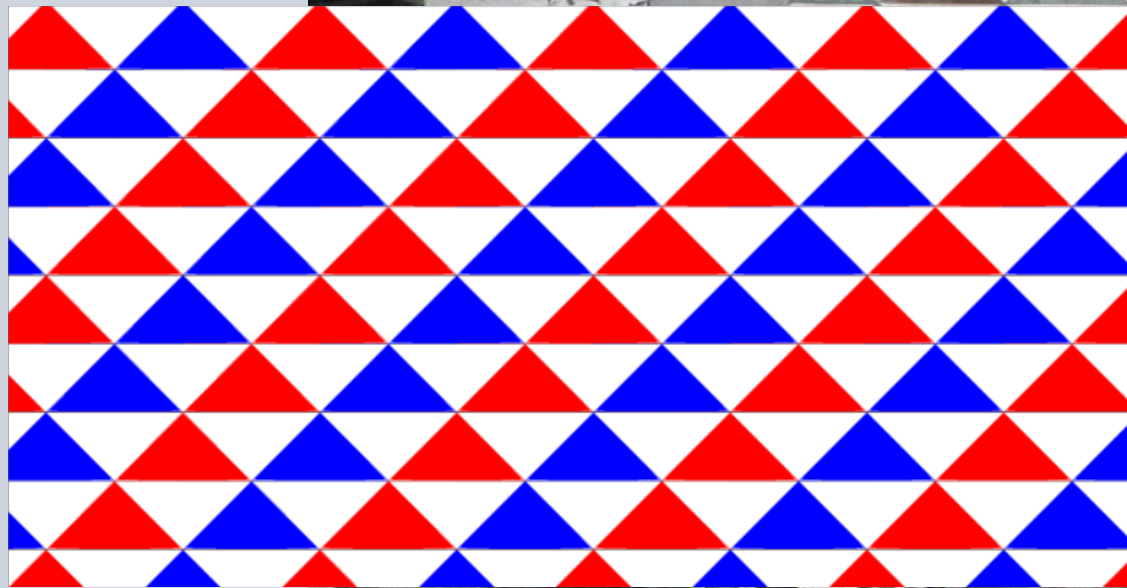
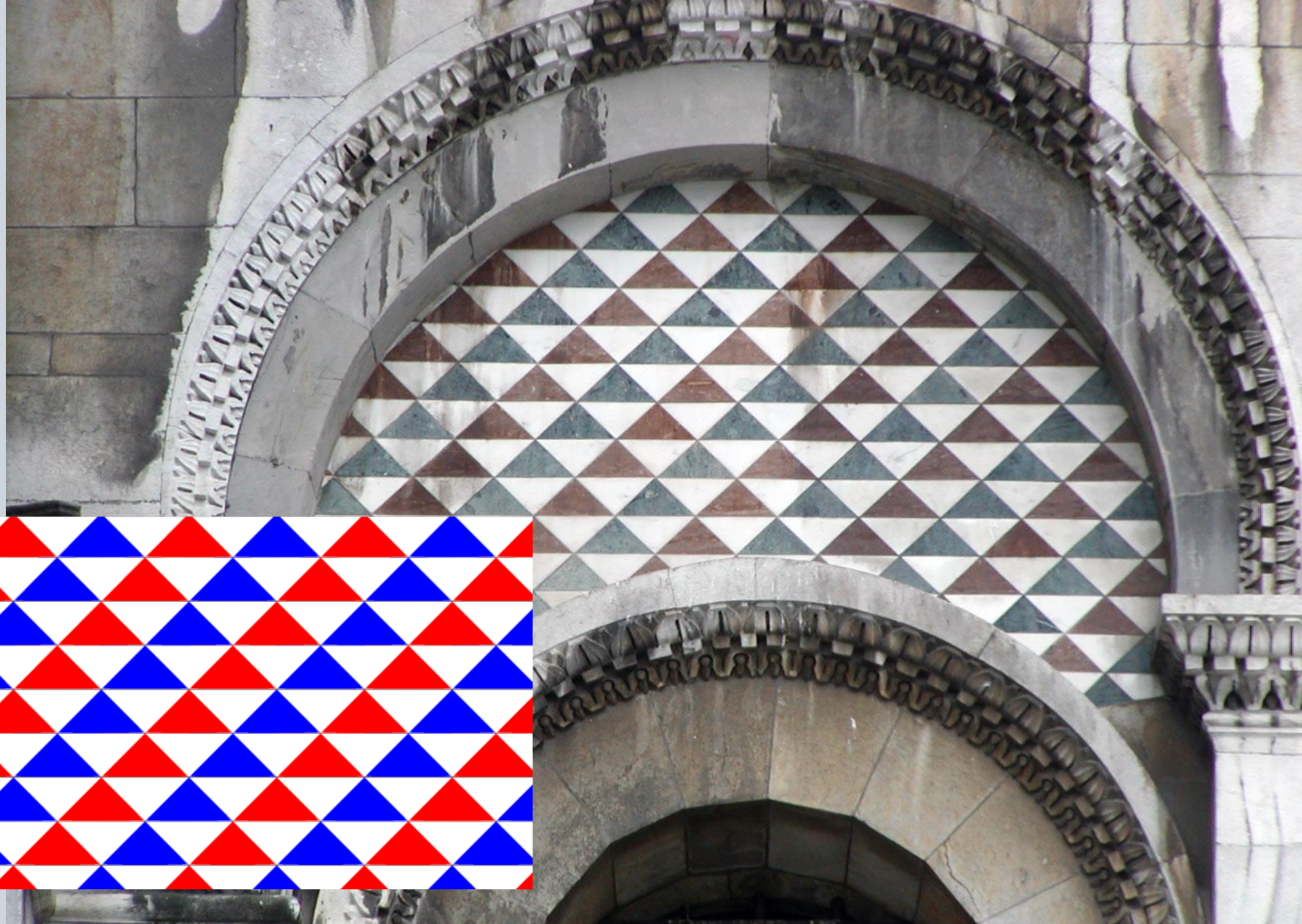




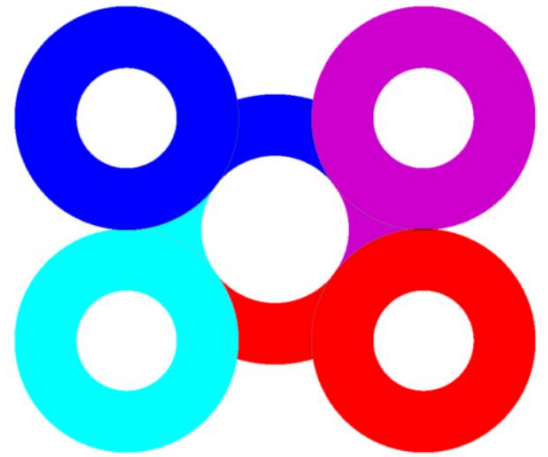
**Pisa**  
**Piazza dei Miracoli**










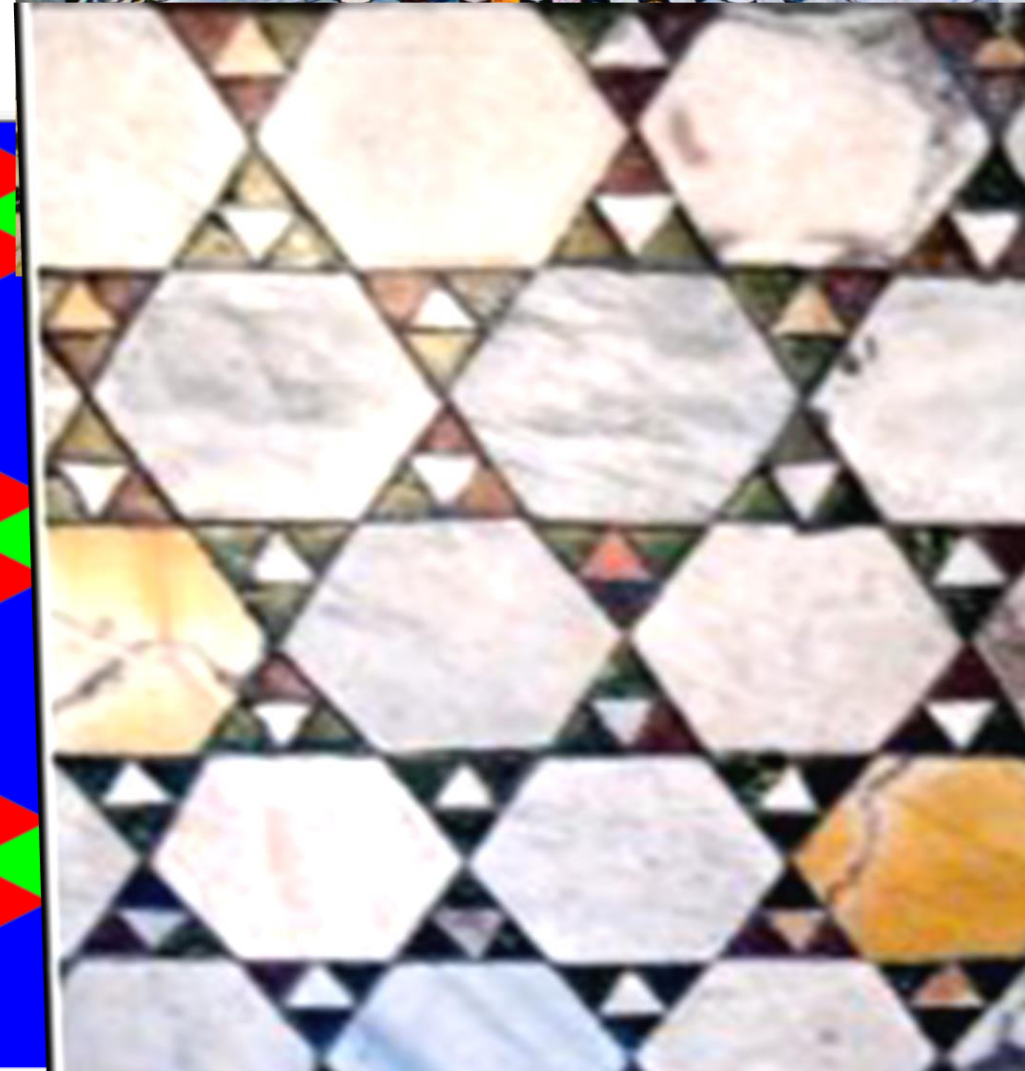
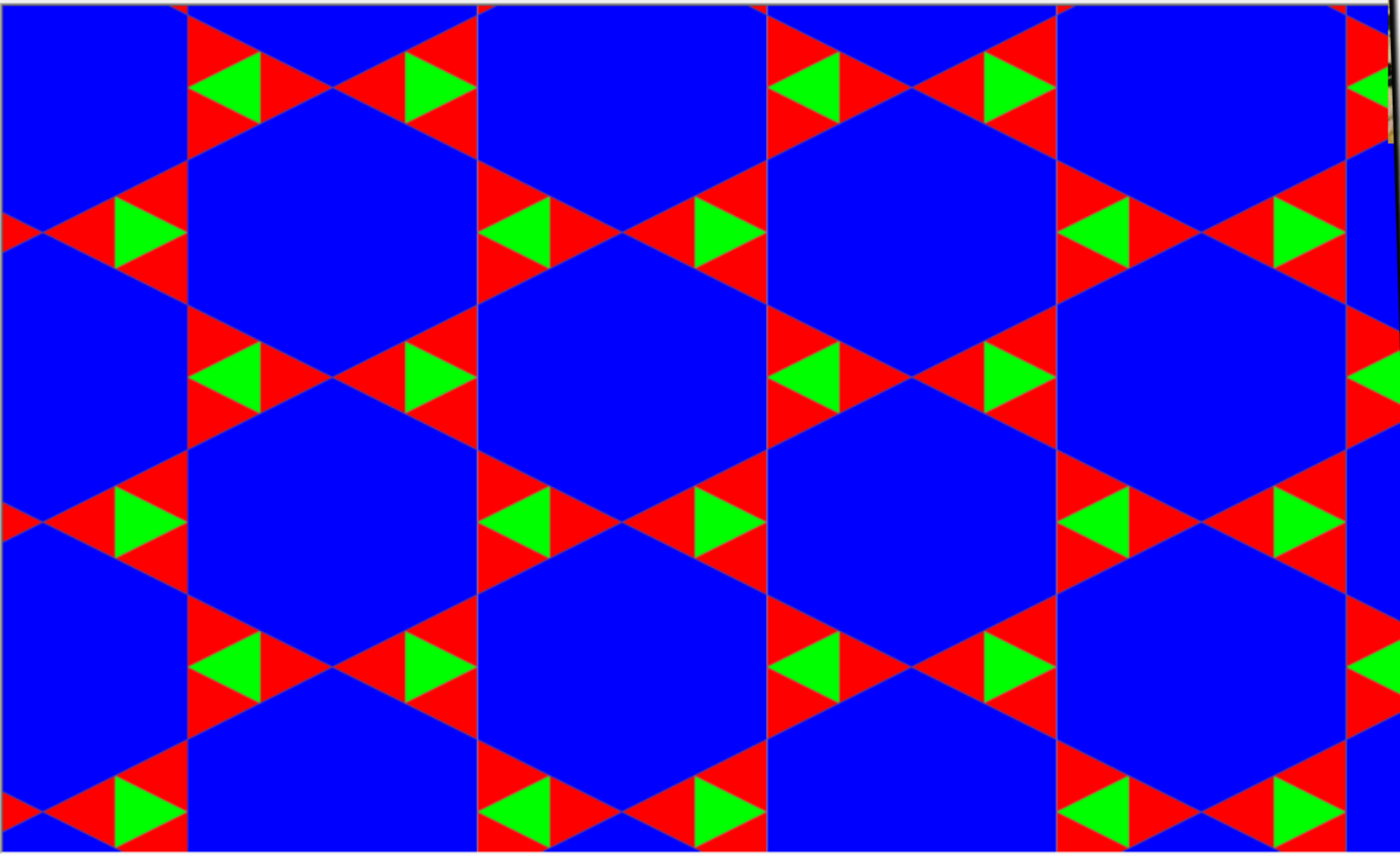






# Roma San Clemente

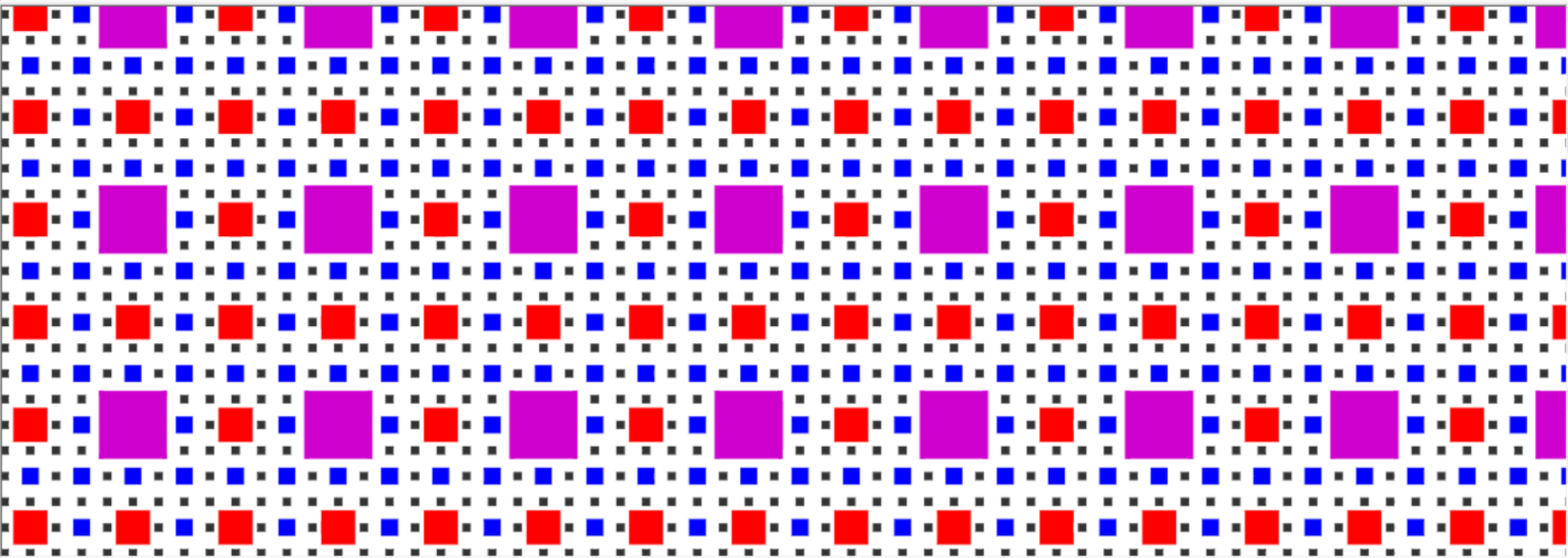
-   $(\sin x - \cos 2y) (\sin x - 3 \sin x) > 0, \sin(x + 2y) \cdot \sin(x - 2y) \cdot \cos 2x > 0$
-   $(\sin x - \cos 2y) (\sin x - 3 \sin x) > 0, \sin(x + 2y) \cdot \sin(x - 2y) \cdot \cos 2x < 0$
-   $(\sin x - \cos 2y) (\sin x - 3 \sin x) < 0$





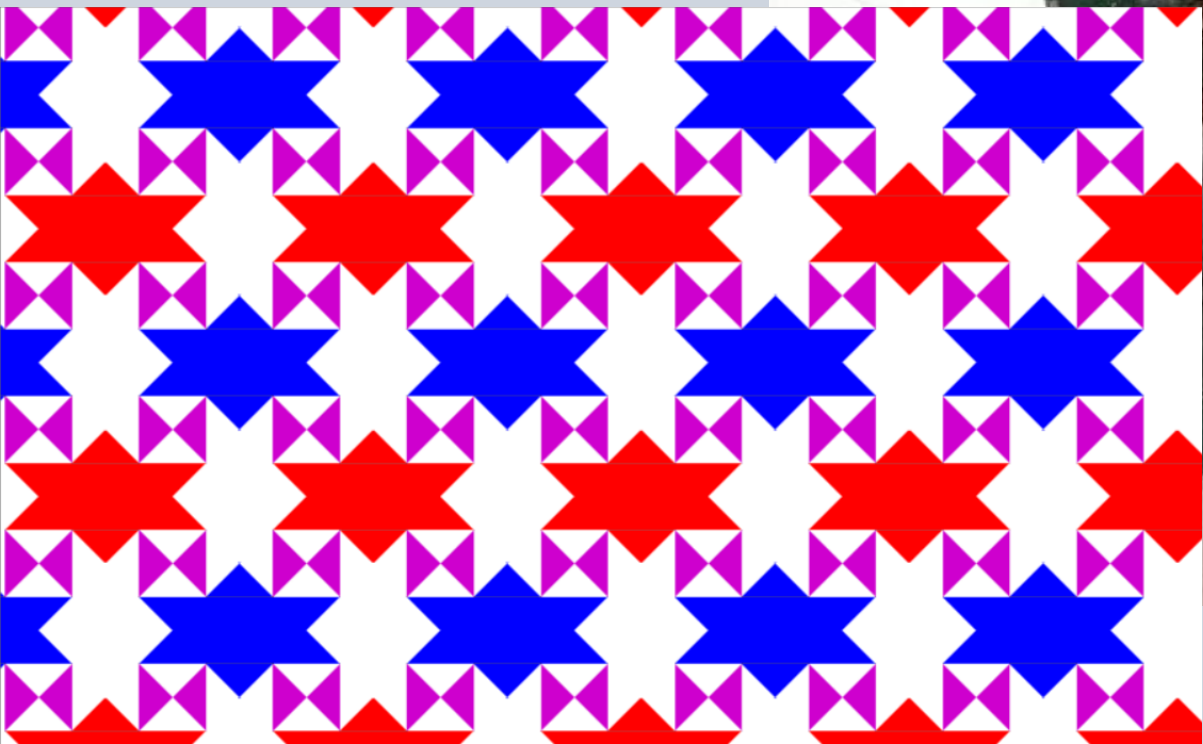
# Tappeto di Sierpinski

- $|\sin x + \sin y| + |\sin x - \sin y| < 1$
- $|\sin 2x + \sin 2y| + |\sin 2x - \sin 2y| < 1, |\sin x + \sin y| + |\sin x - \sin y| > 1$
- $|\sin 4x + \sin 4y| + |\sin 4x - \sin 4y| < 1, |\sin 2x + \sin 2y| + |\sin 2x - \sin 2y| > 1, |\sin x + \sin y| + |\sin x - \sin y| > 1$
- $|\sin 8x + \sin 8y| + |\sin 8x - \sin 8y| < 1, |\sin 4x + \sin 4y| + |\sin 4x - \sin 4y| > 1, |\sin 2x + \sin 2y| + |\sin 2x - \sin 2y| > 1, |\sin x + \sin y| + |\sin x - \sin y| > 1$



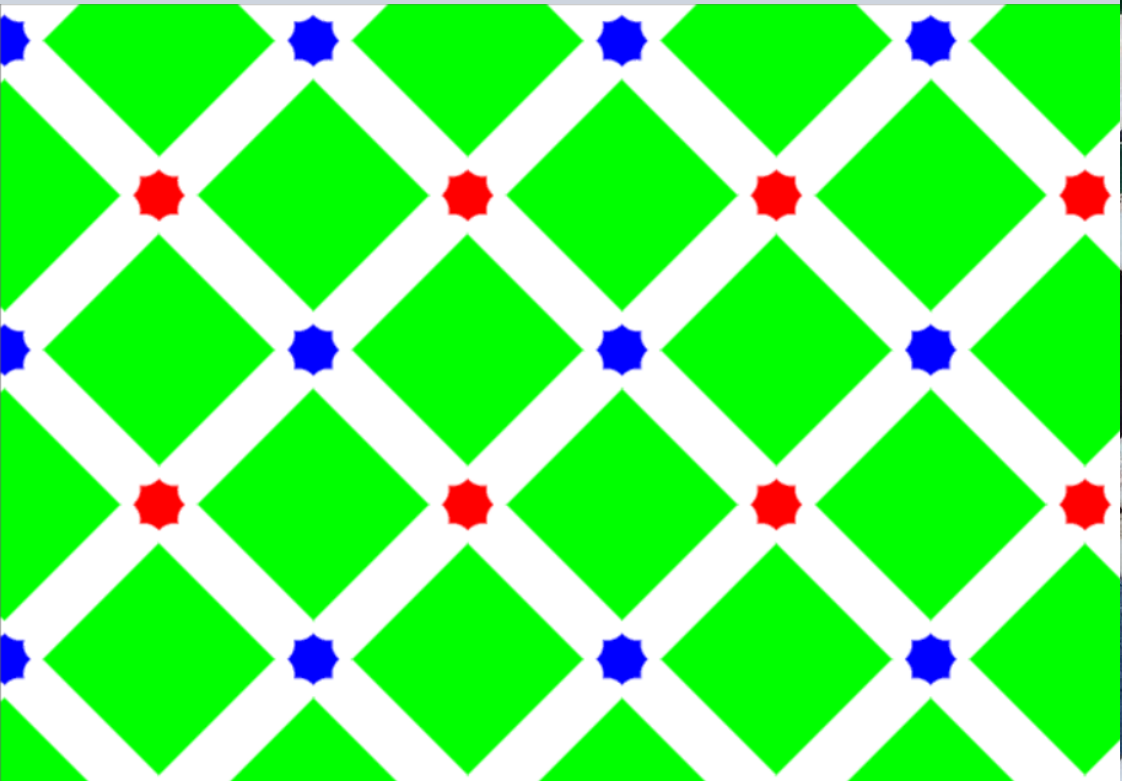
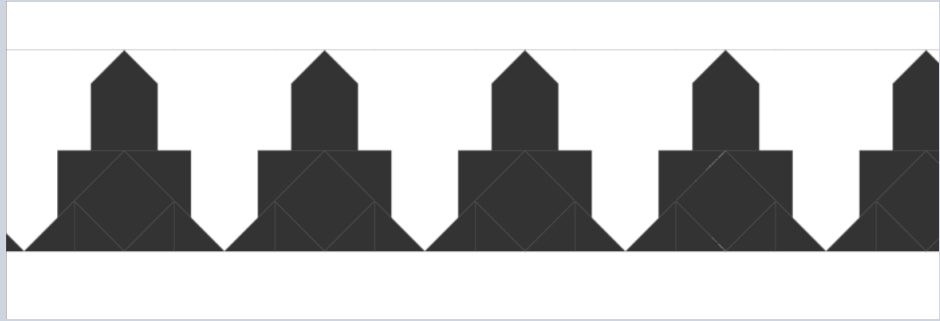


# Mondo Islamico





# Mondo Islamico





## Mondo Islamico

In Spagna i pattern dell'Alhambra e di altri edifici di epoca islamica, per distinguerli sono stati chiamati con nomi di fantasia come:

Celosia (reticolo)

Trapezios (trapezi)

L'aguia (l'ago)

Estrellas (stelle)

**Murcielago (pipistrello)**

Hojas (foglie)

**El Hueso (l'osso)**

**El Avion (l'aereo)**

Pezvolador (pesce volante)

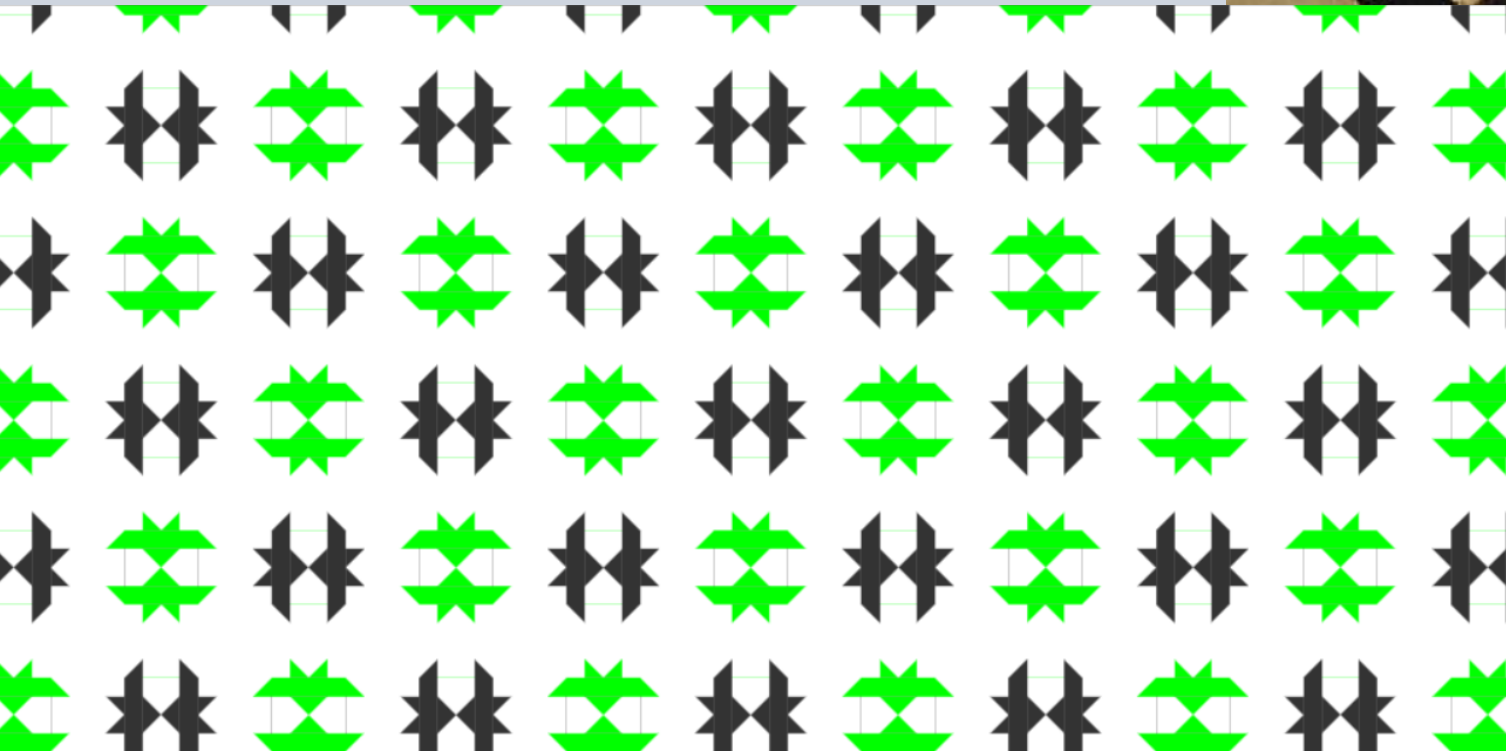
Molinete (verricelli)

Clavo (chiodi di garofano)

**Pajarita (cravatta a farfalla)**

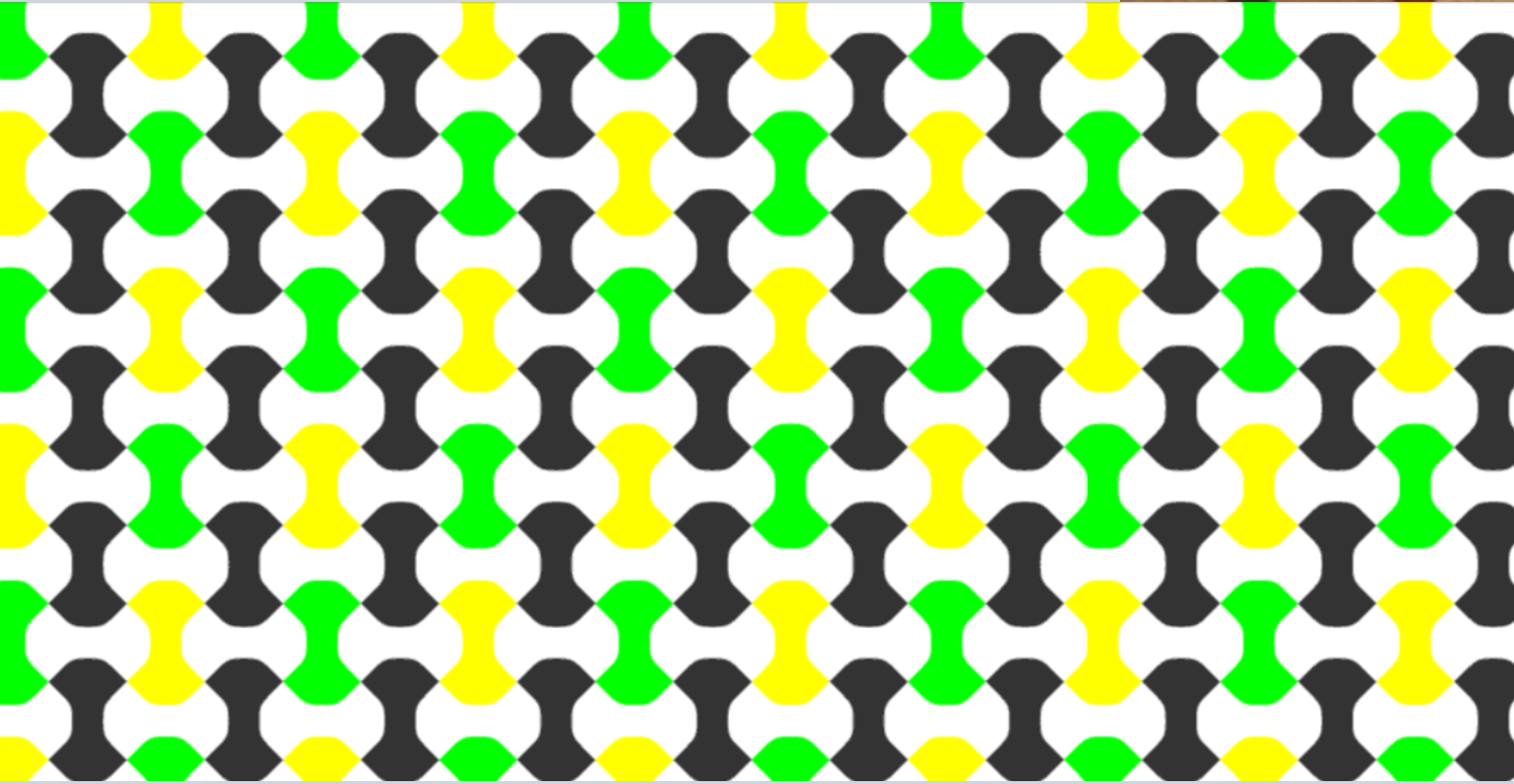
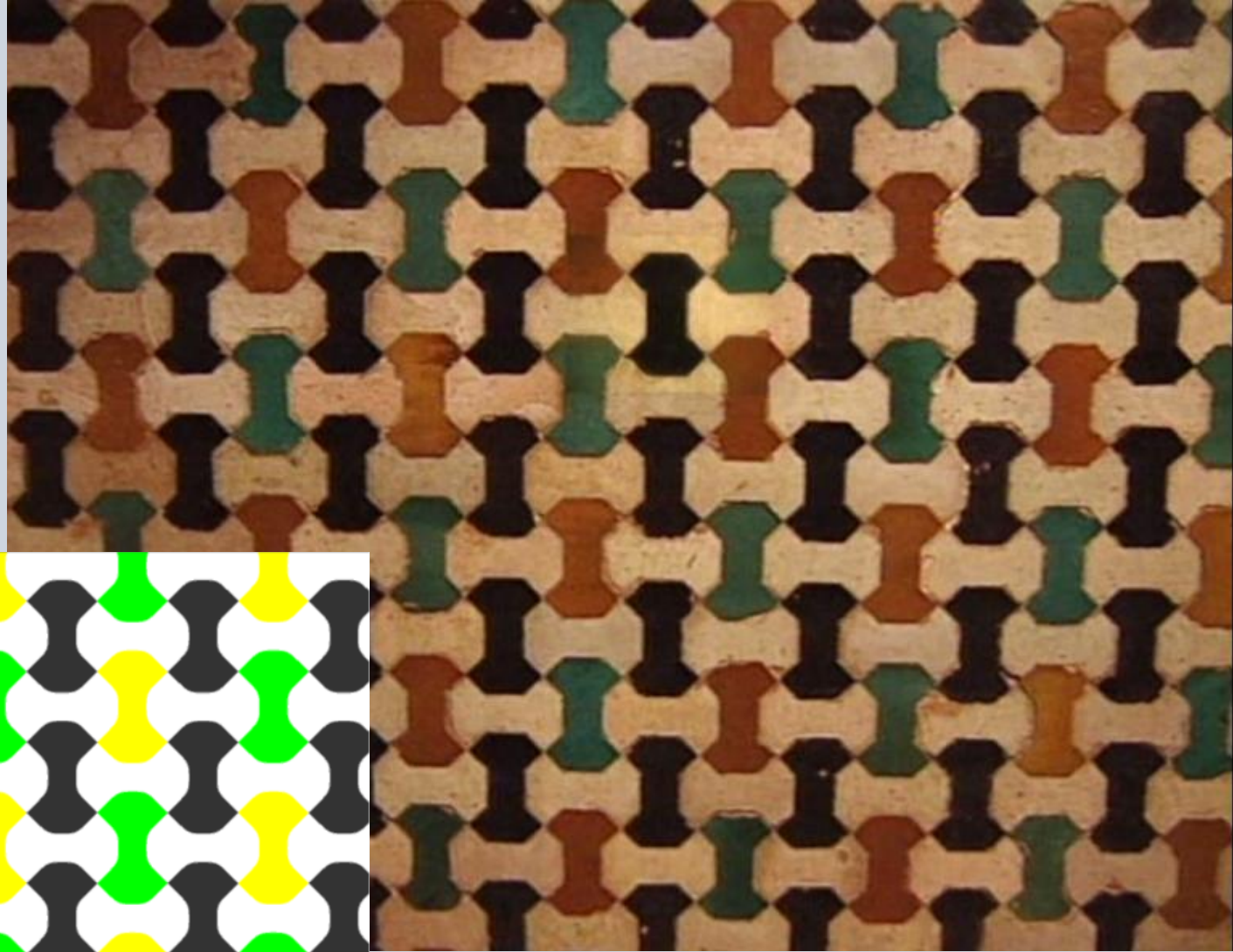


**Mondo Islamico  
(Murcielago -pipistrello)**

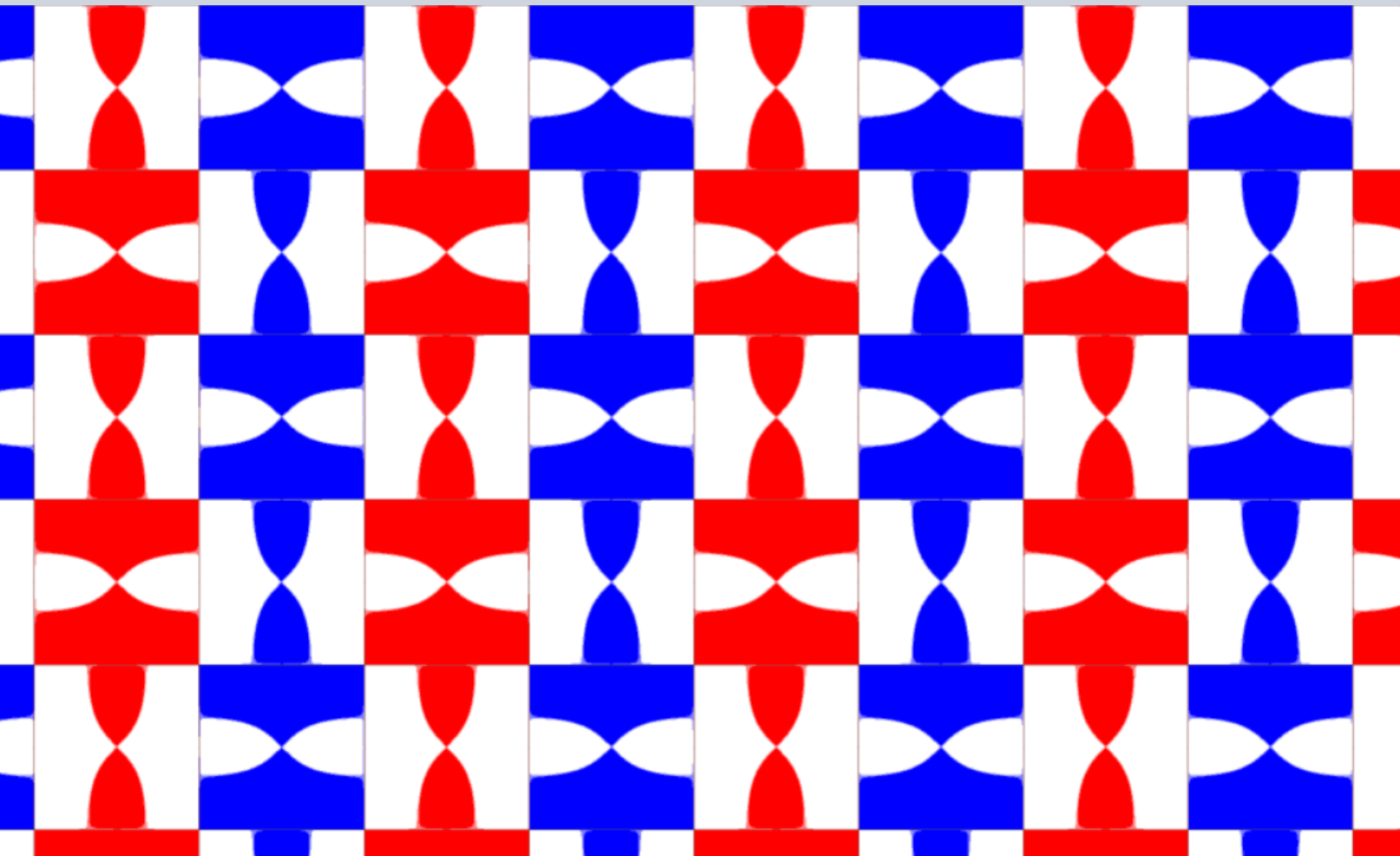




**Mondo Islamico**  
**El Hueso (l'osso)**

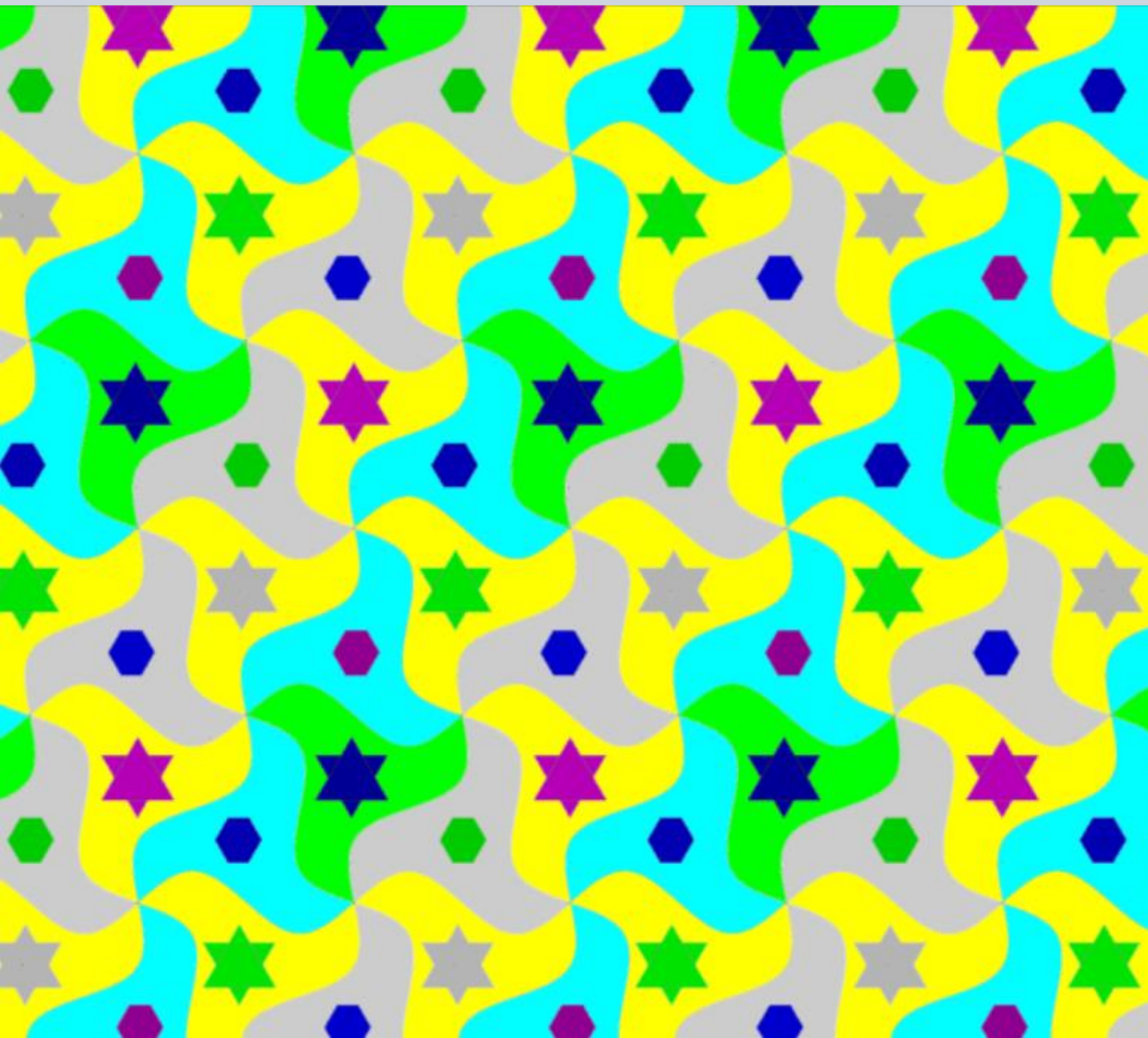


**Mondo Islamico**  
**El Avion (l'aereo)**





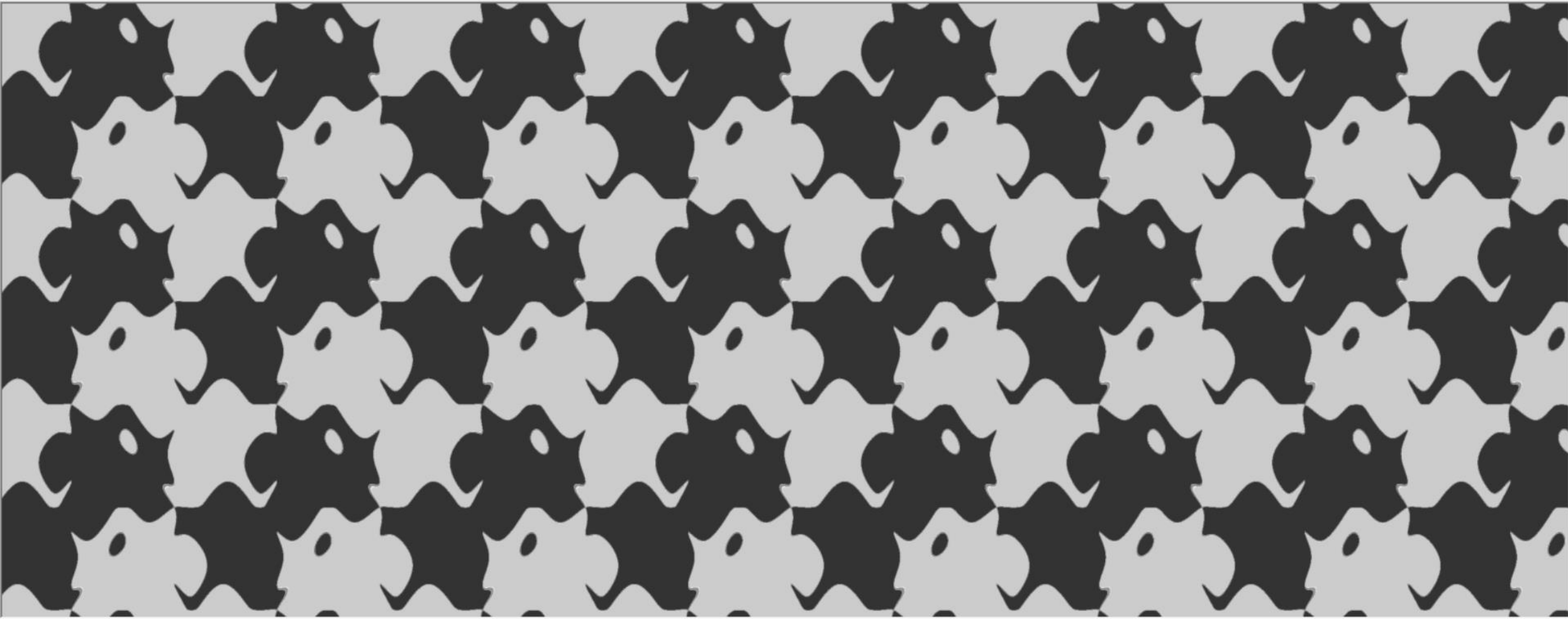
**Mondo Islamico**  
**Pajarita (cravatta a farfalla)**



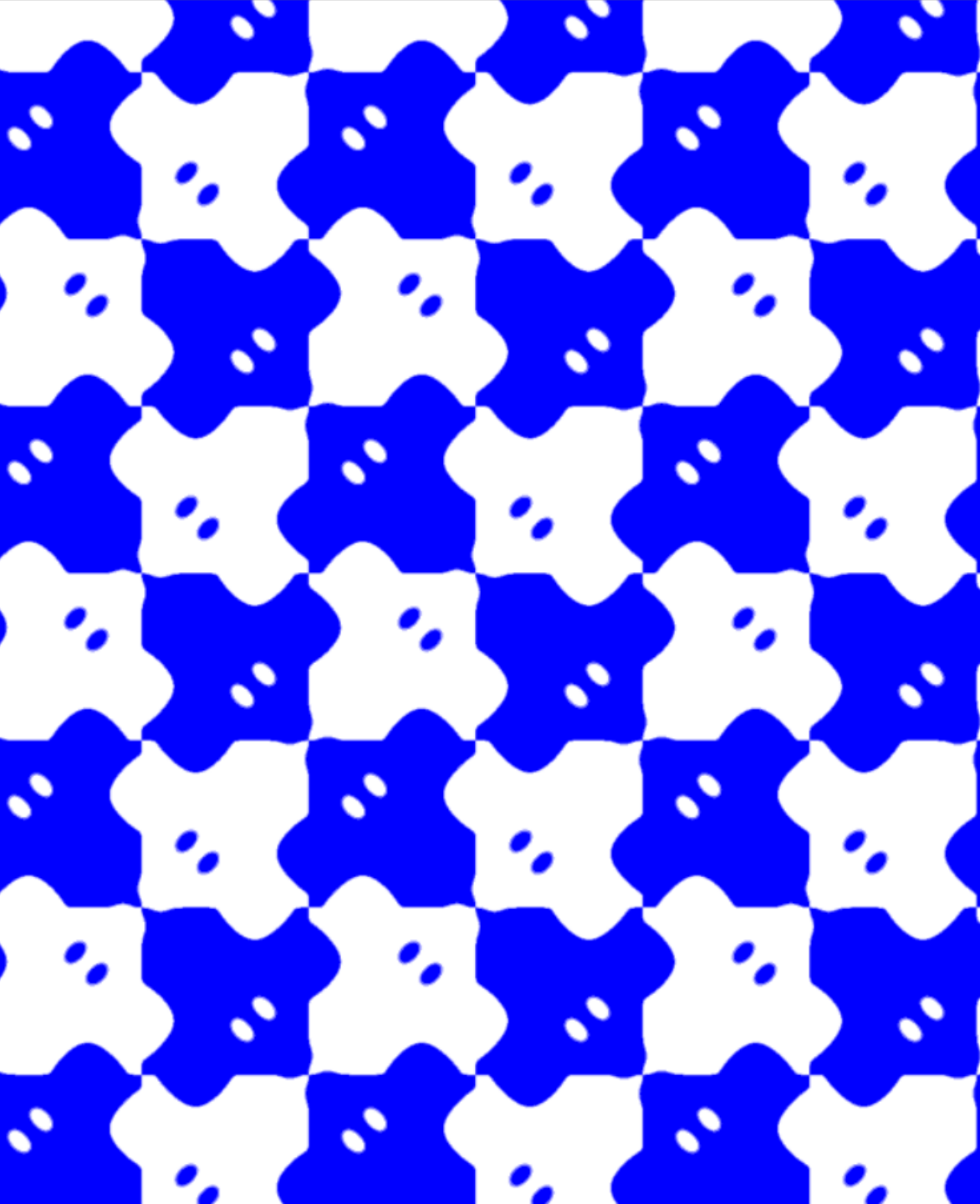


# Maurits Cornelius Escher

- $\cos x \cdot \cos y > (\cos 3x + \cos 2y)^2 (\sin x + \sin y)$
- $\cos x \cdot \cos y < (\cos 3x + \cos 2y)^2 (\sin x + \sin y)$

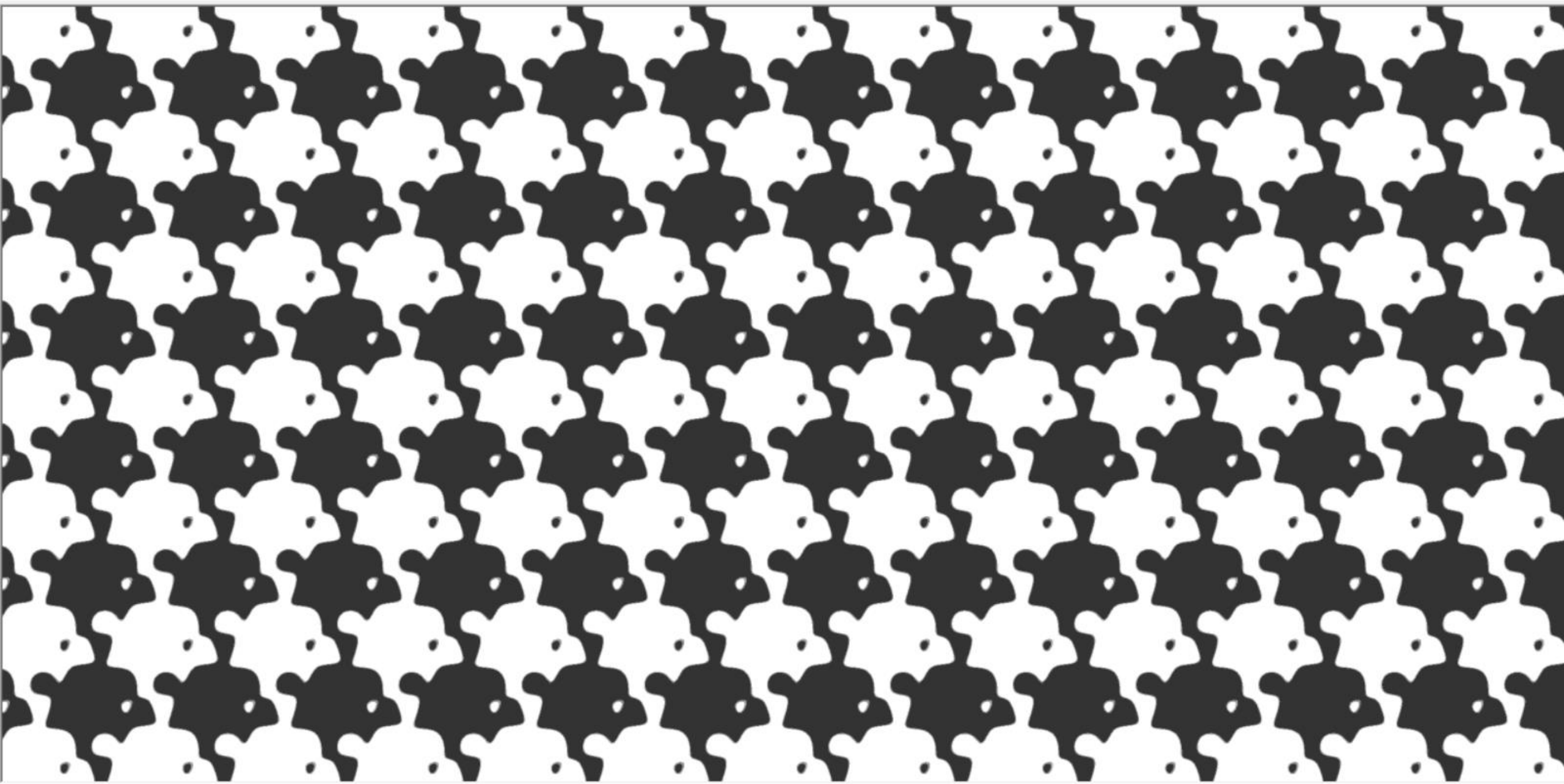








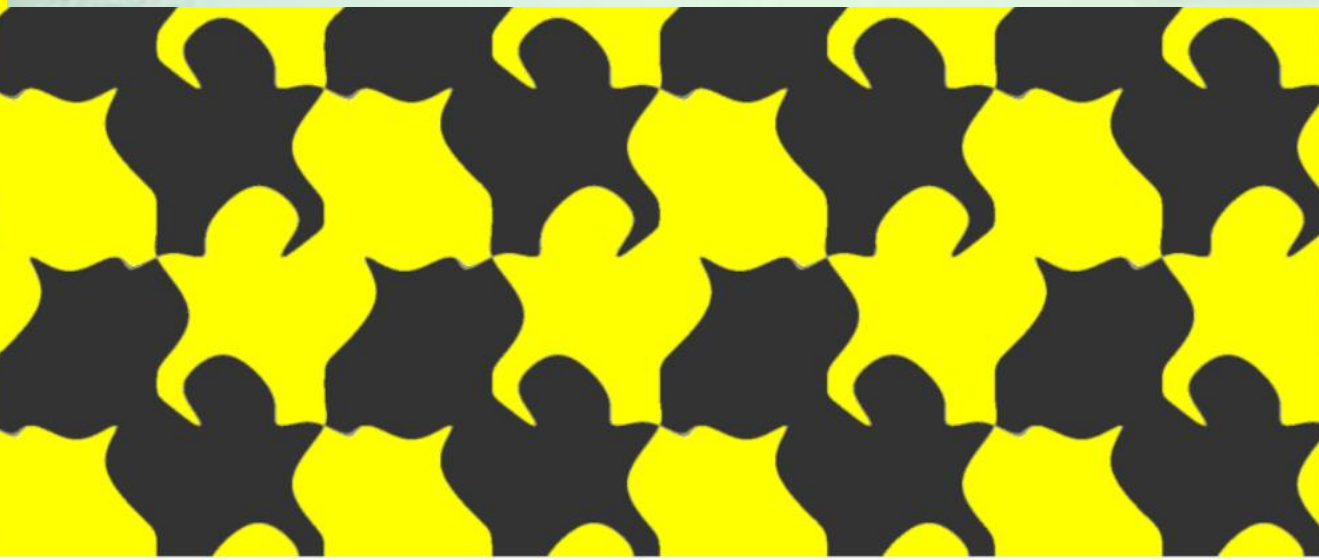
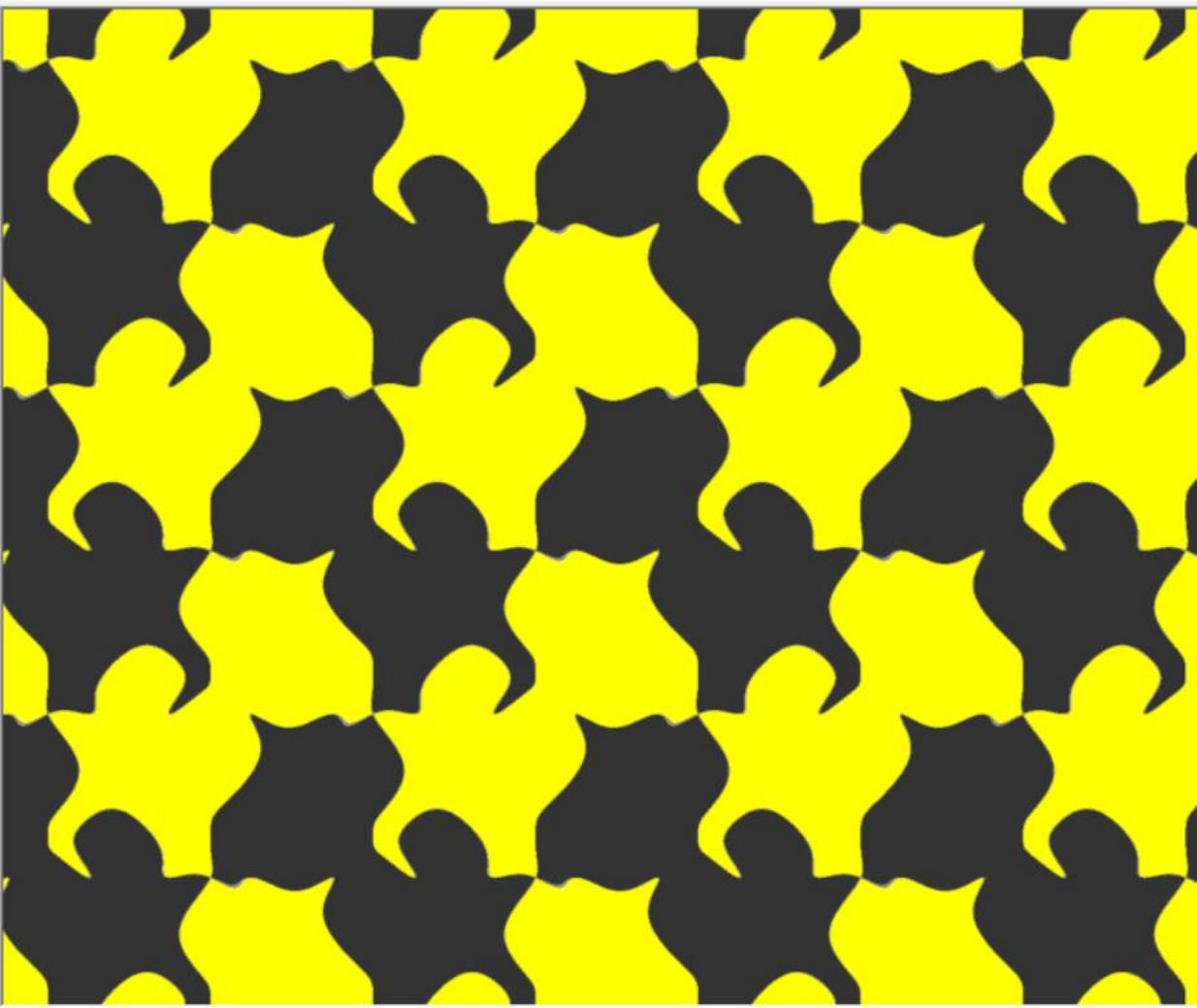
■  $\cos 2y \cdot (\cos y + \cos 3x) < \sin y + \sin x$





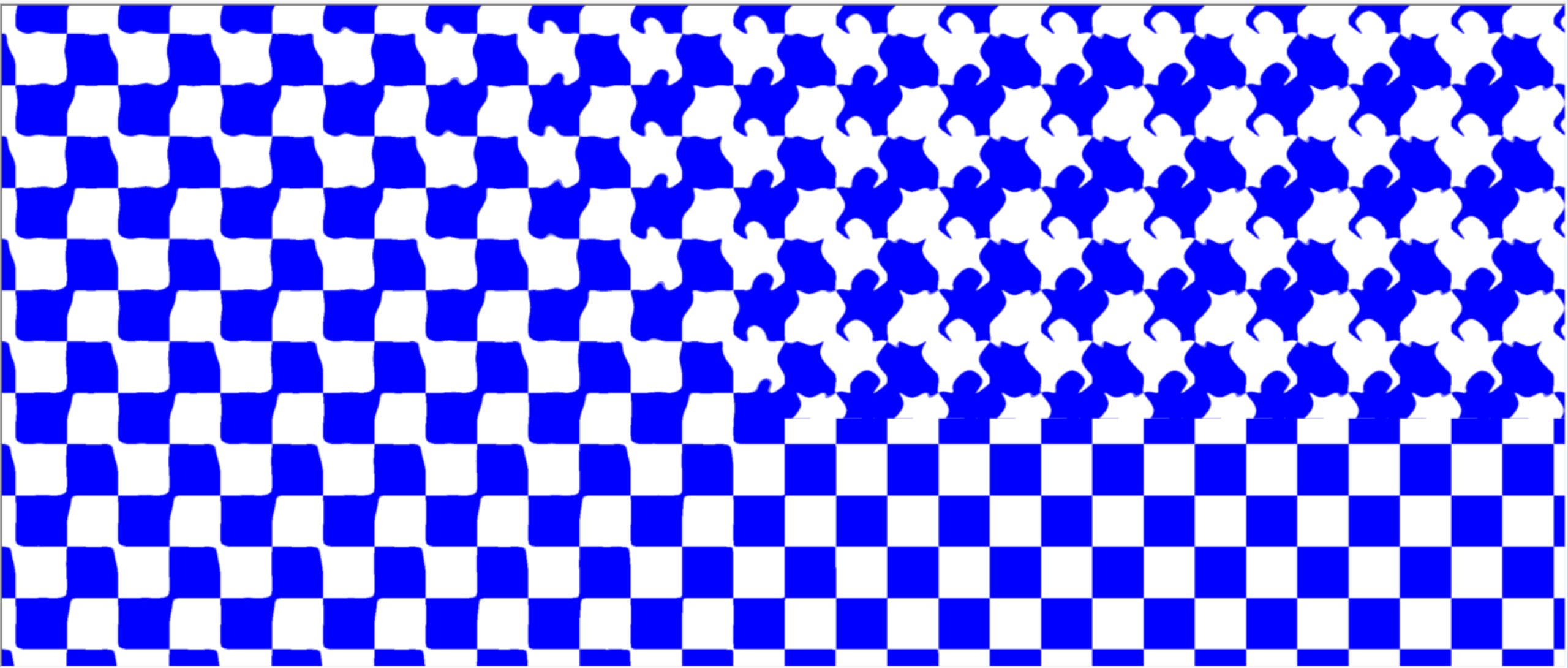
■  $\sin x \cdot \cos y > (\cos 2x + \sin 2y)^2 (\cos x + \sin y)$

■  $\sin x \cdot \cos y < (\cos 2x + \sin 2y)^2 (\cos x + \sin y)$

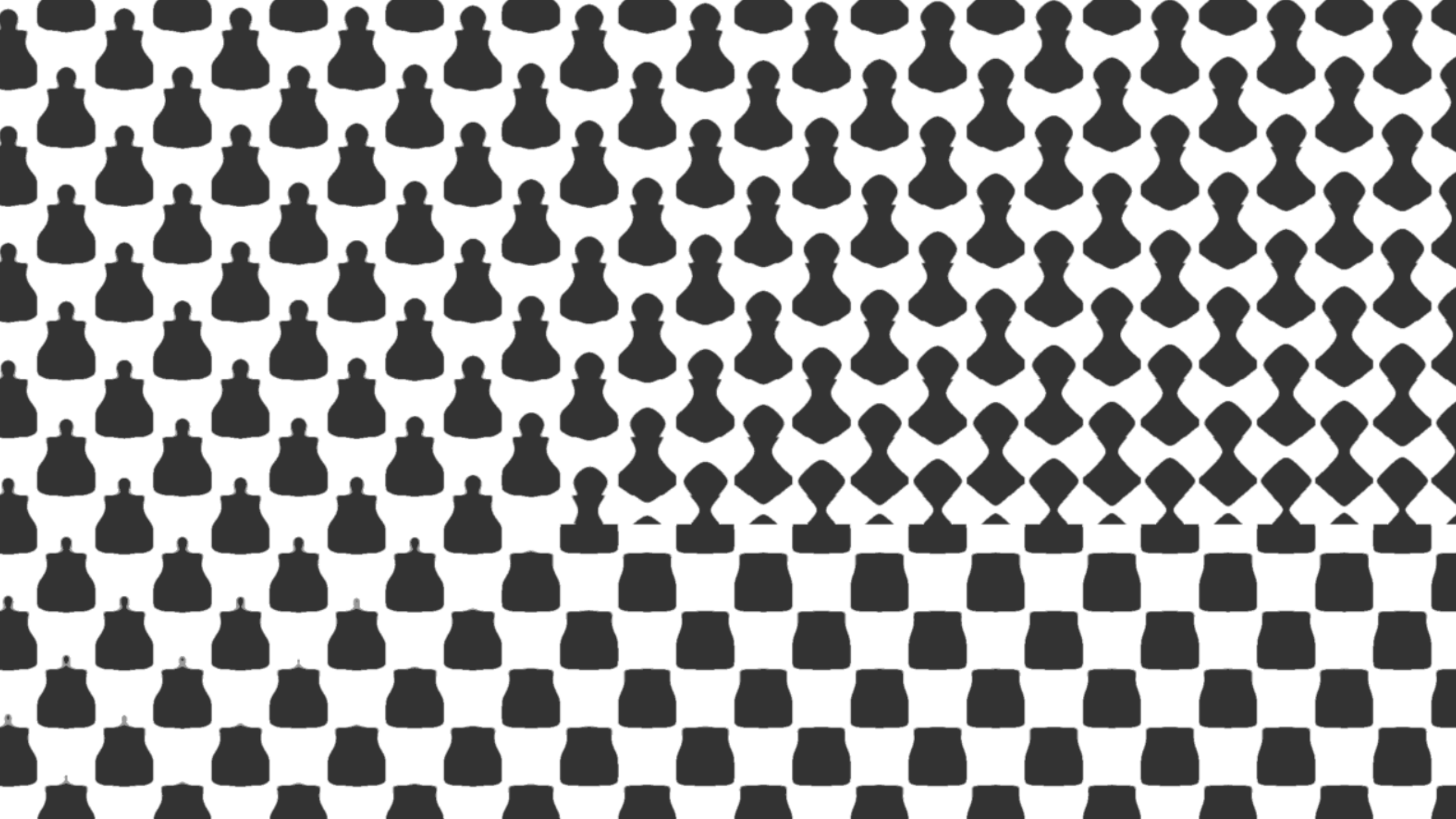


# Metamorfosi

■  $(\cos 2x + \sin 2y)^2 (\cos x + \sin y) > (\theta^\theta (\sin x \cdot \cos y))$



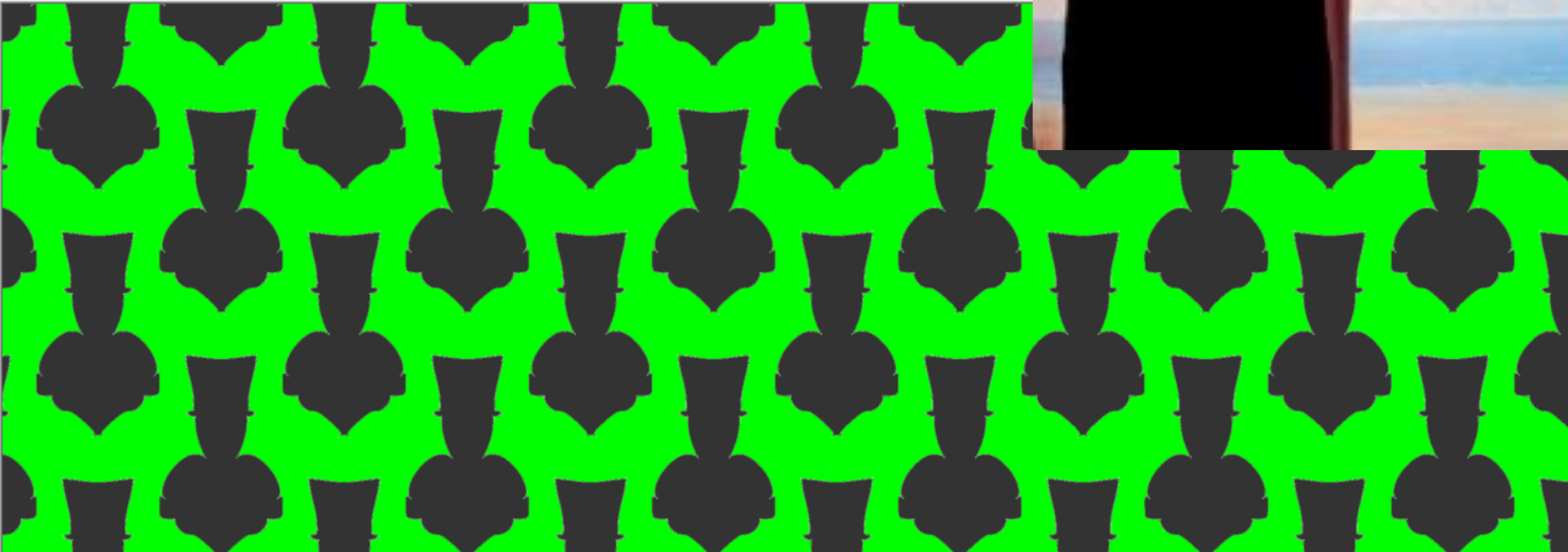




# Magritte

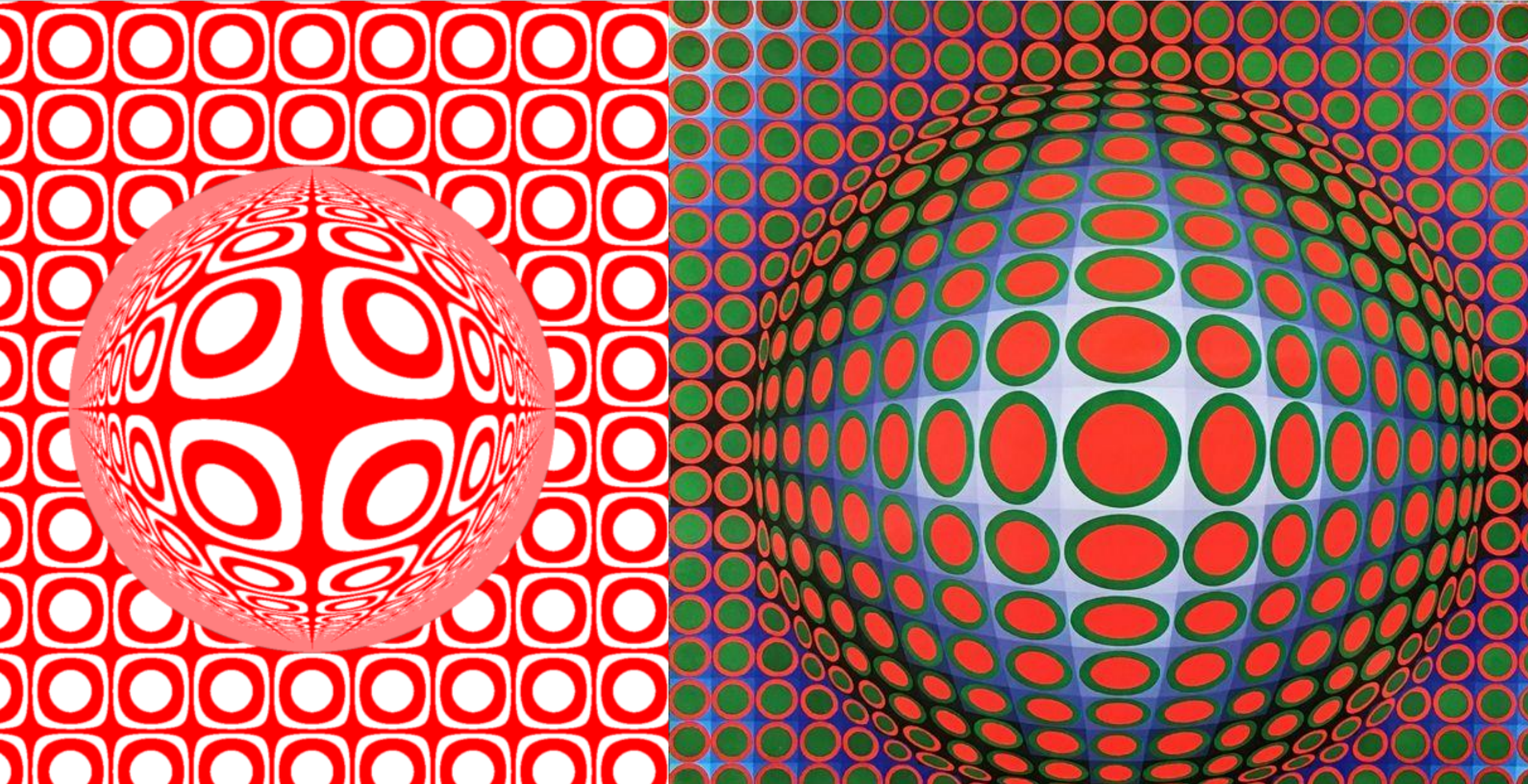
■  $\sin x \cdot \cos y > \frac{(\cos 2x + \sin 2y)^3}{(\sin 3x + \cos 3y)^2}$

■  $\sin x \cdot \cos y < \frac{(\cos 2x + \sin 2y)^3}{(\sin 3x + \cos 3y)^2}$



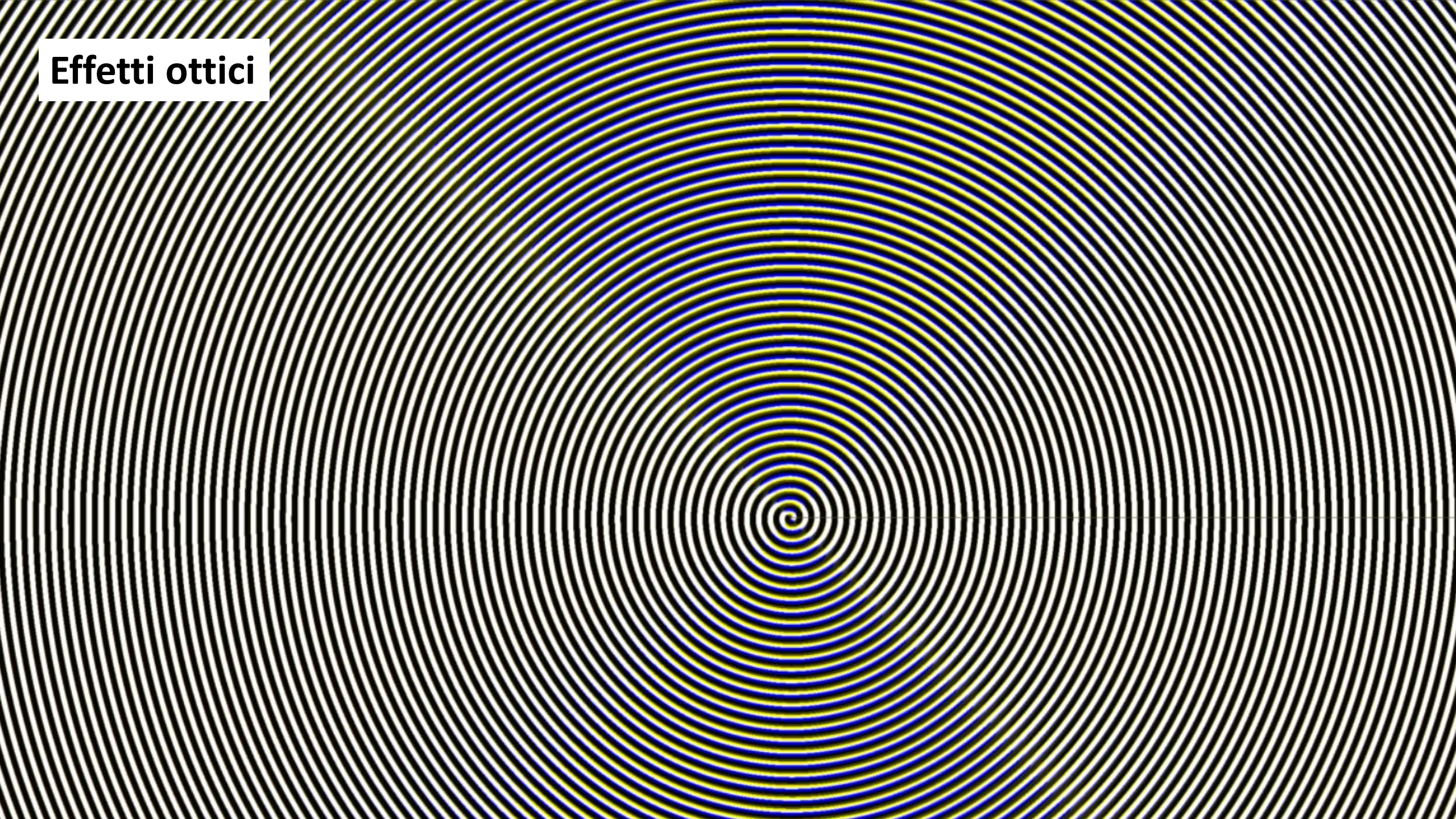


Vasarely



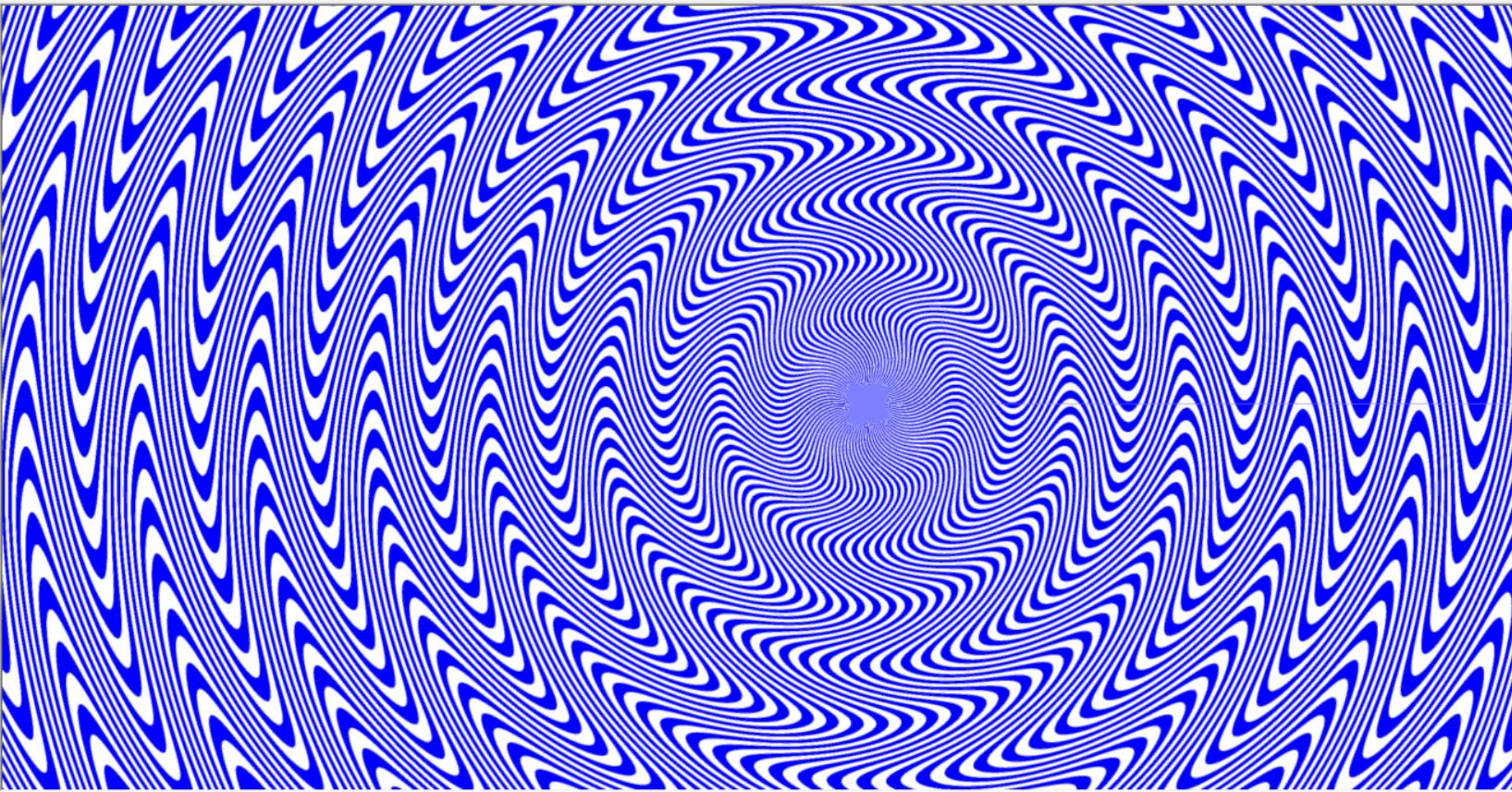


**Effetti ottici**

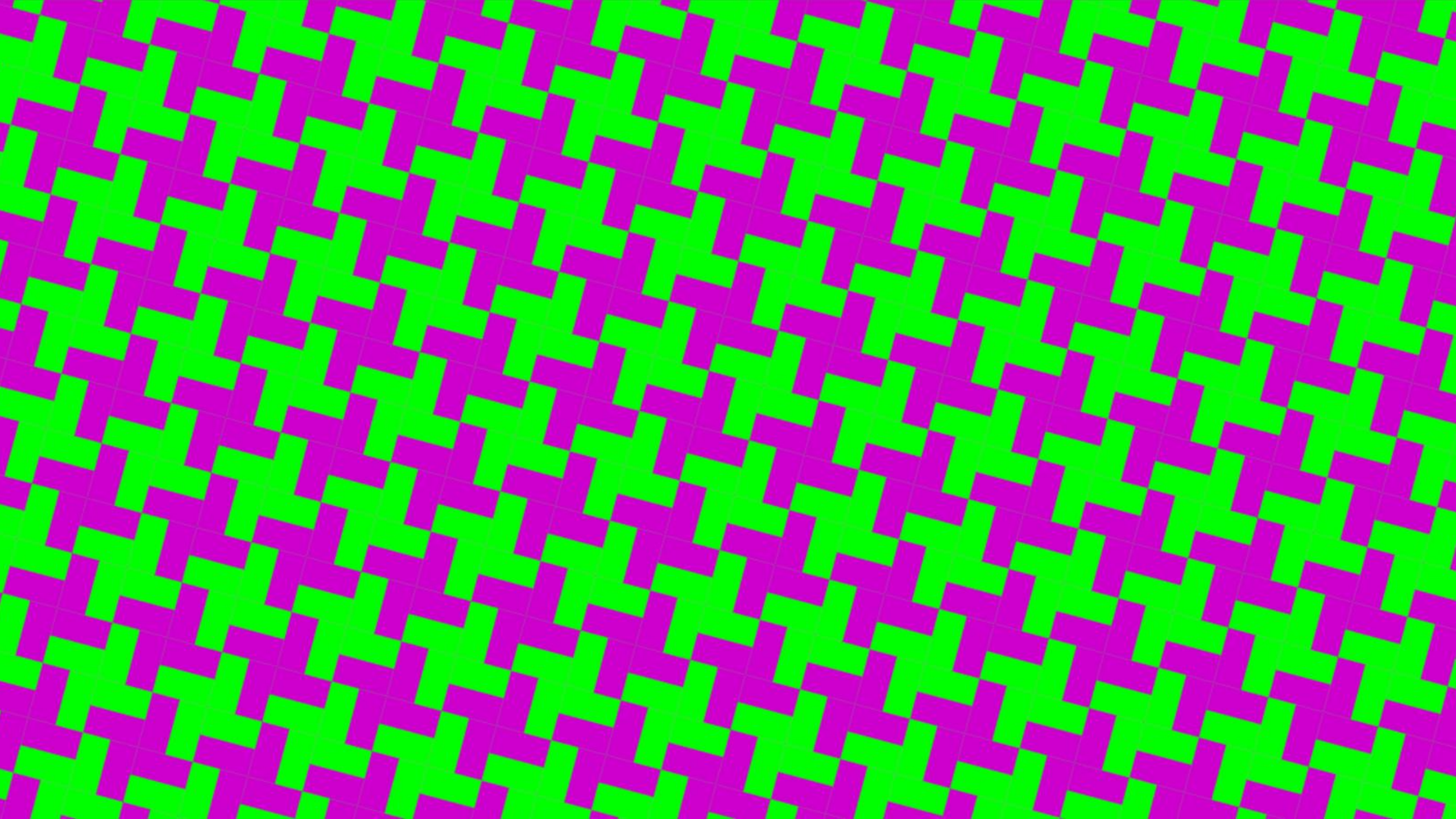




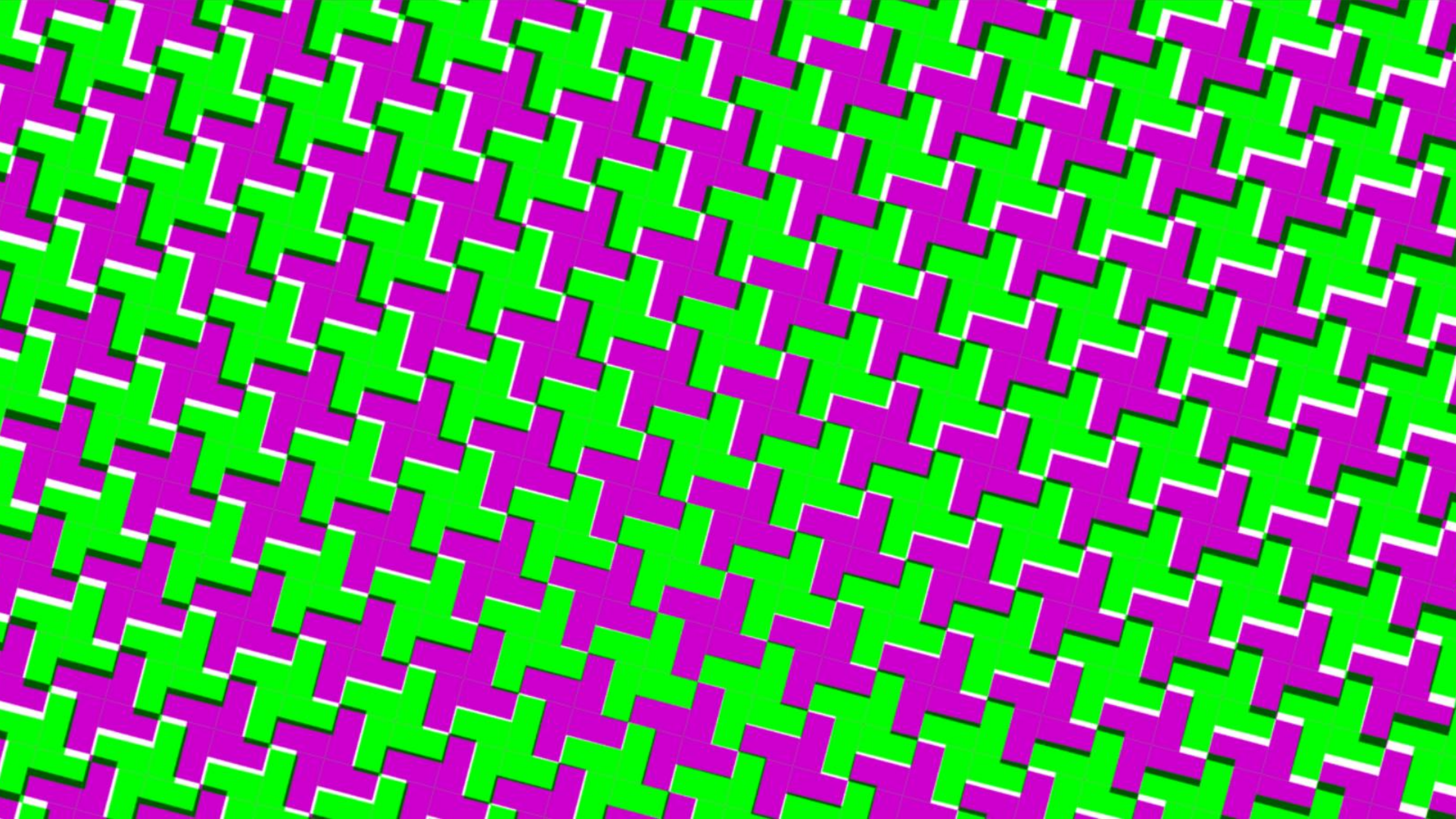
■  $|\tan(9 \sin r + 40\theta) < -0,01|$



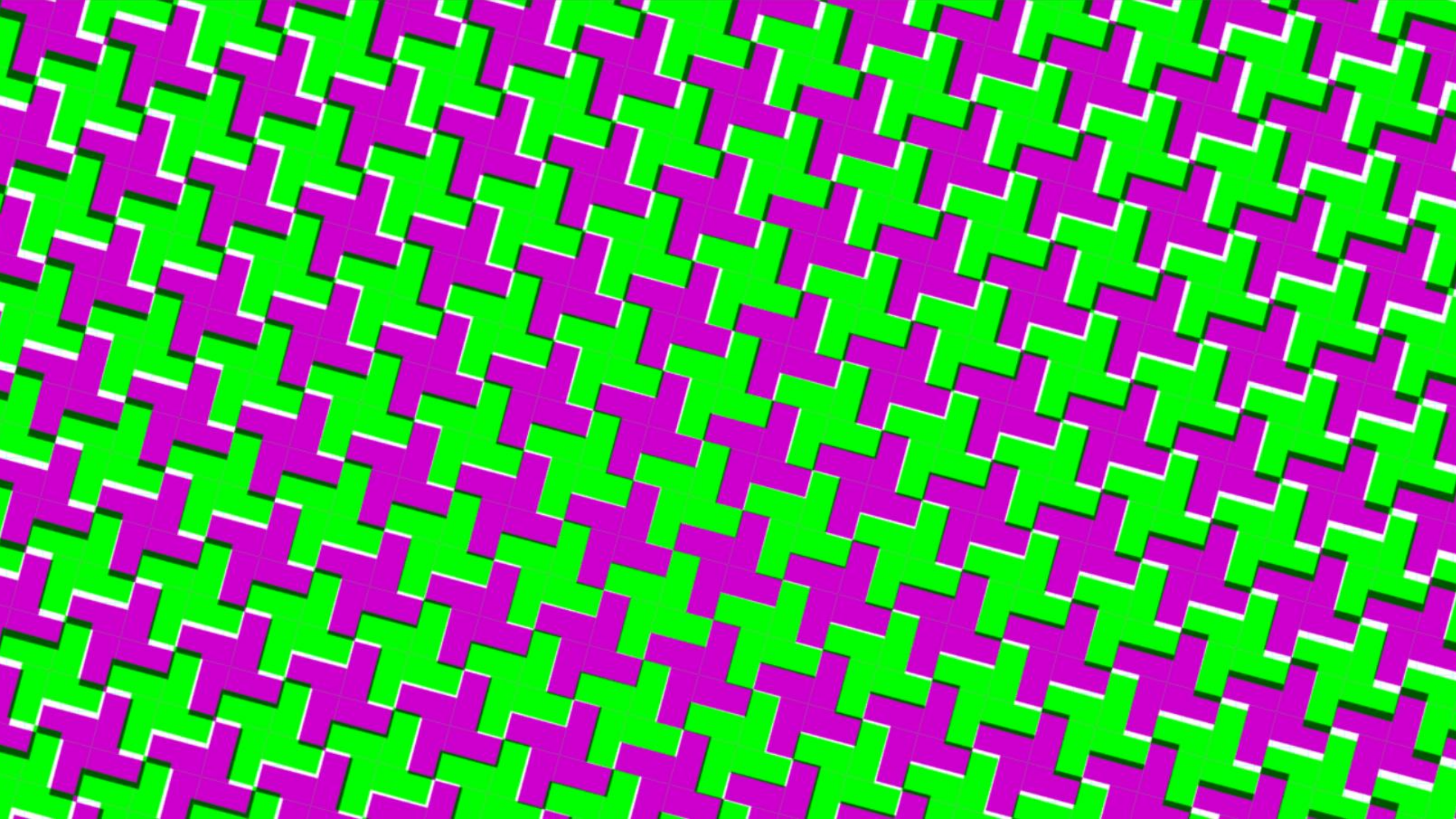






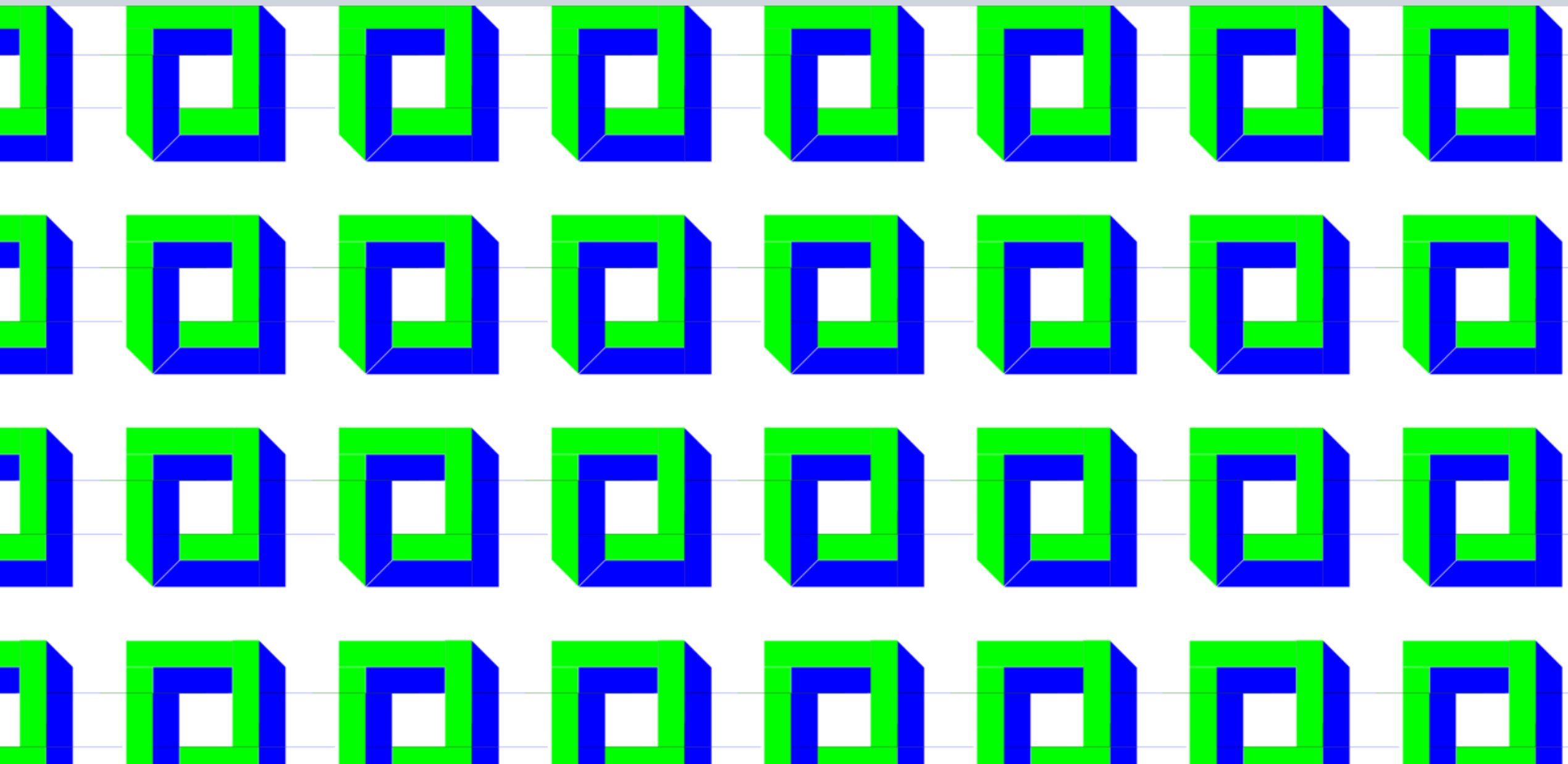




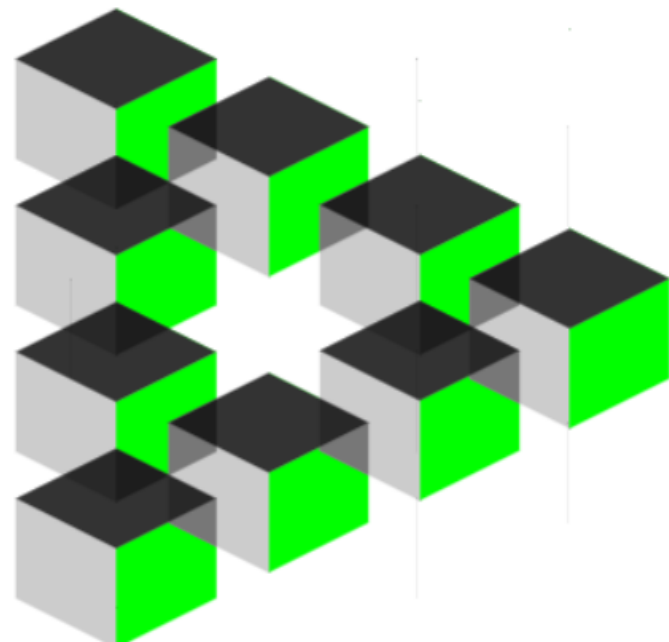
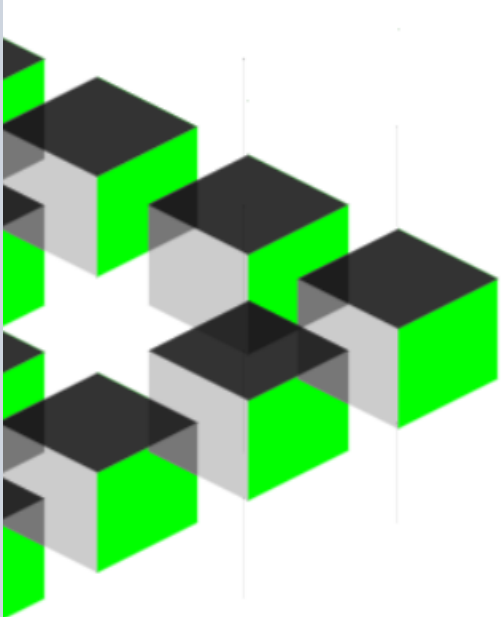
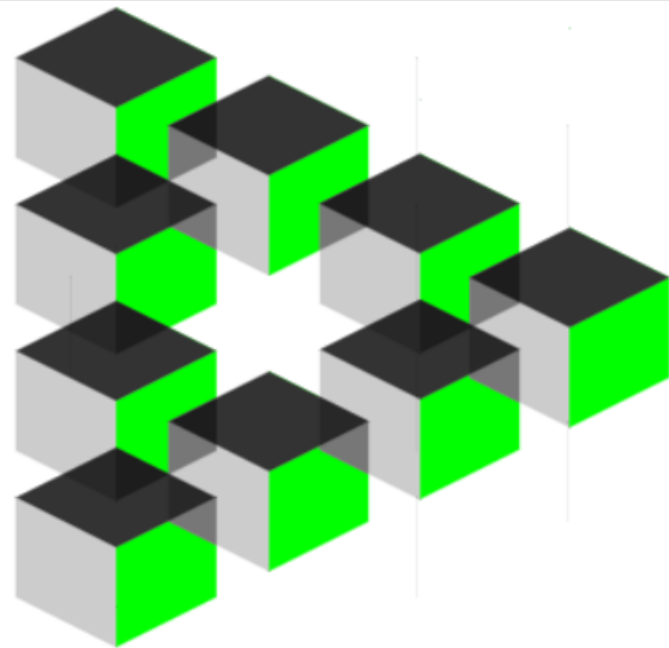




# Figure impossibili







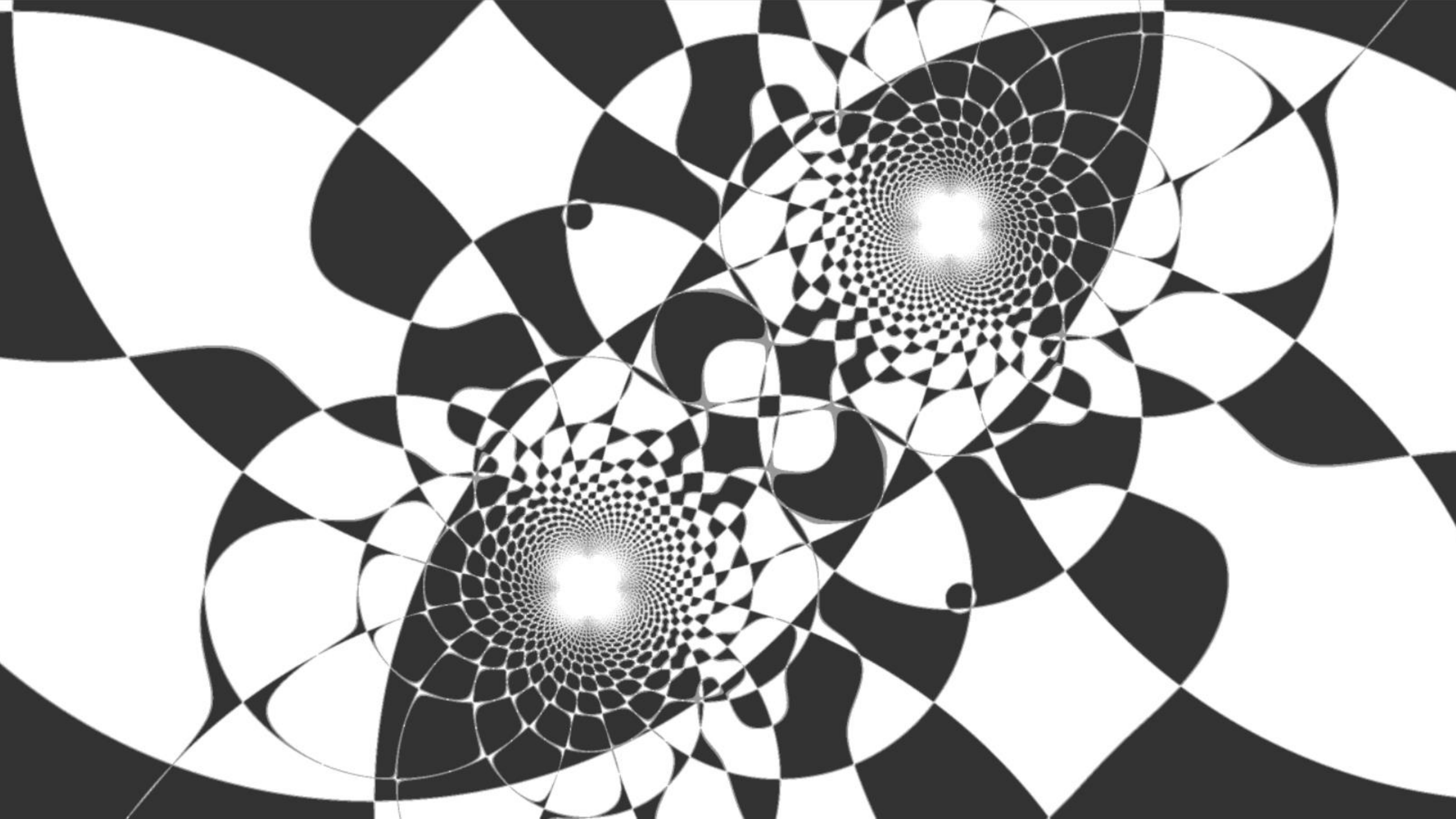


# Nell'intorno dello zero

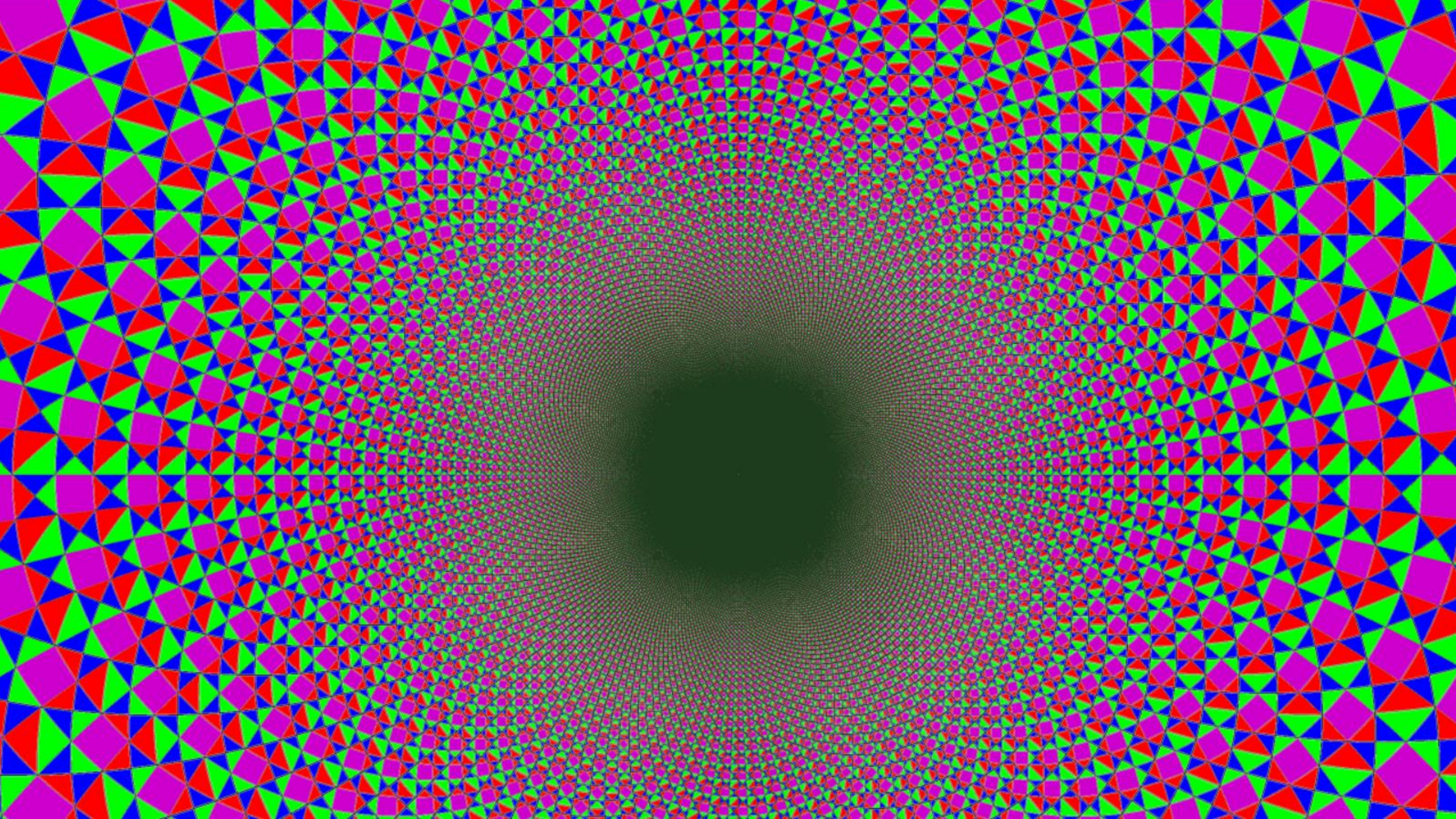
■  $\tan \frac{\sin x}{x^2 + y^2} \cdot \tan \frac{\cos y}{x^2 + y^2} > 0$



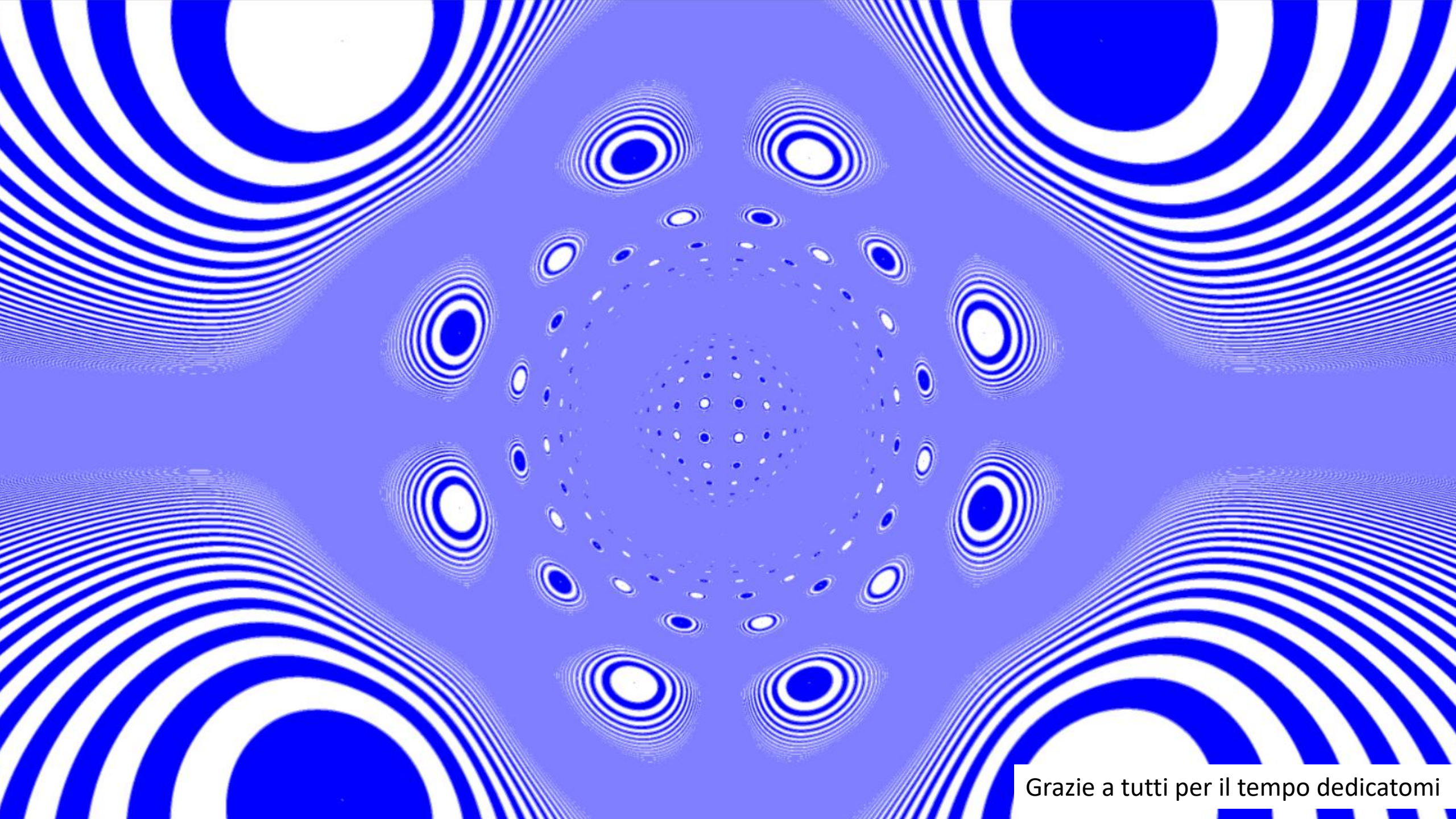












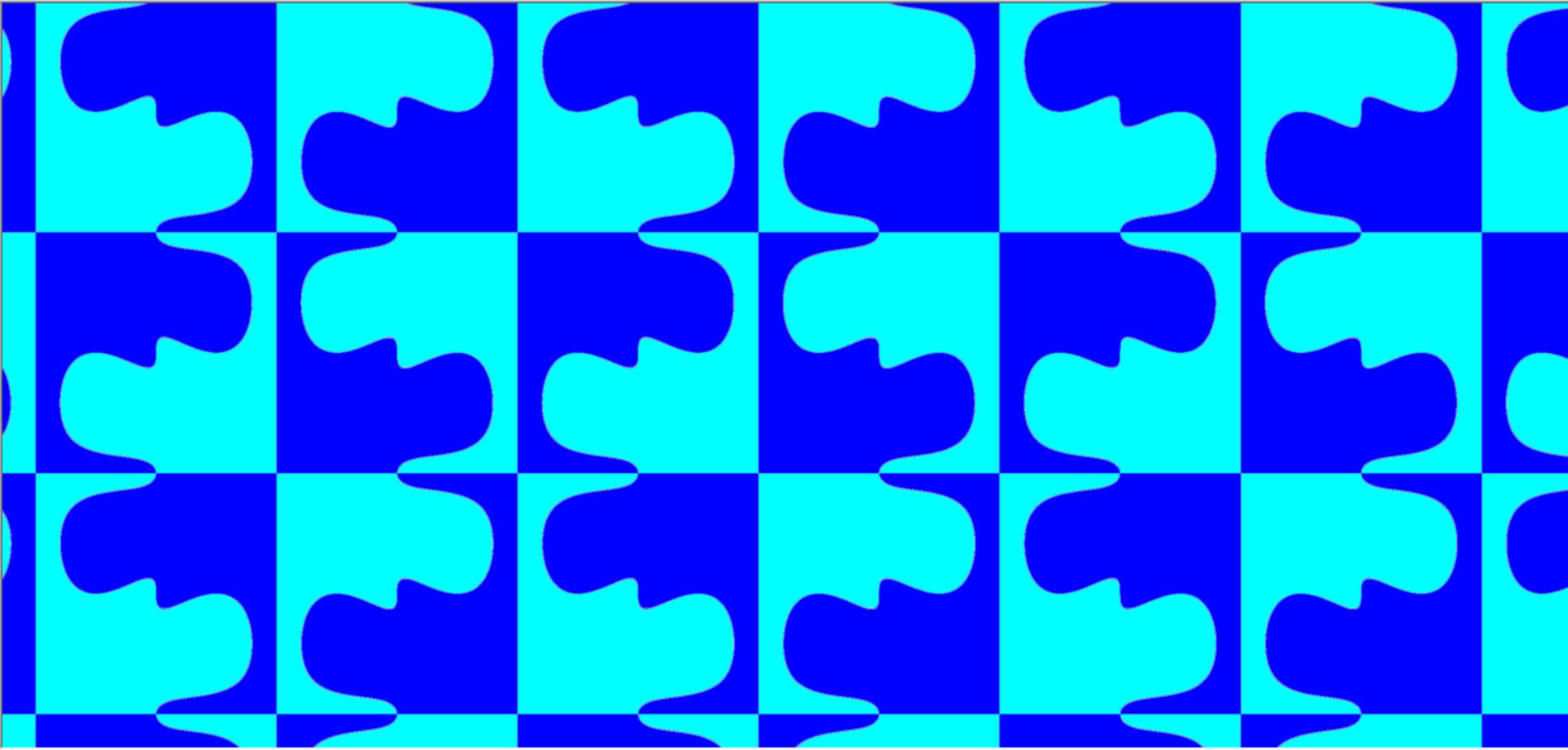
Grazie a tutti per il tempo dedicatomi



$\sin 2x \cdot \cos y < (\sin 2x \cdot \cos y - \cos x \cdot \sin 2y)^3$

$\sin 2x \cdot \cos y > (\sin 2x \cdot \cos y - \cos x \cdot \sin 2y)^3$

Domande ?





PIER FRANCESCO SCIUTO

# PATTERNLAND



■  $\sin(r \sin rx \cdot \sin ry) > 0$   
■  $\sin(r \sin rx \cdot \sin ry) < 0$

UN PICCOLO ATLANTE MATEMATICO  
DI TASSELLAZIONI

 Pendragon

Grazie a tutti per il tempo dedicatomi