

Credit

I thank Prof. Bahman Kalantari of Rutgers University,
the opportunity to hold this talk.⁽¹⁾

⁽¹⁾ I thank Bahman Kalantari for the opportunity to pronounce these words
recognition.⁽²⁾

⁽²⁾ I thank Bahman Kalantari for the opportunity to pronounce these words

⁽³⁾ I thank Bahman Kalantari for the opportunity to pronounce these words

...

⁽ⁿ⁾ I thank Bahman Kalantari for the opportunity to pronounce these words

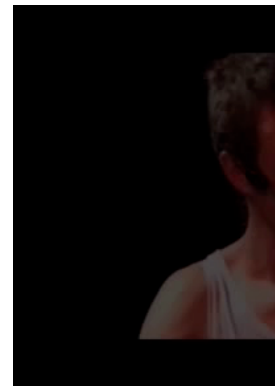
...

*The art of thanking is infinite, but one can get out of the
'thanking loop' by introducing the n^{th} thanking.*

‘Unusual’ Methods of Mathematics Visualization

Dirk Huylebrouck

Sint-Lucas School for Architecture, Brussels BELGIUM

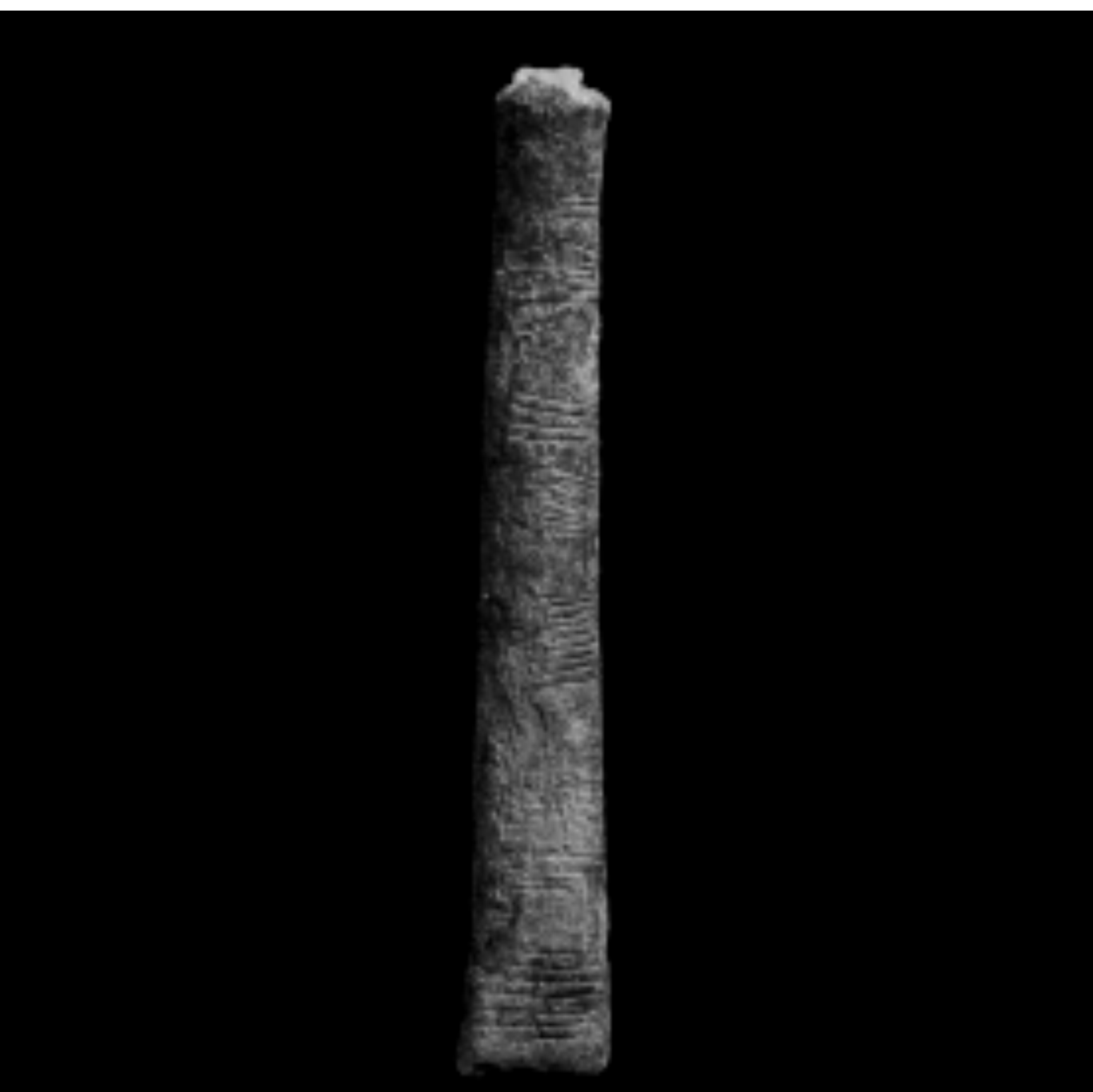


Theater s
'Africa +
Sand dra
math wit
shells, ...

(?) Unusual presentation of the author in zero-g

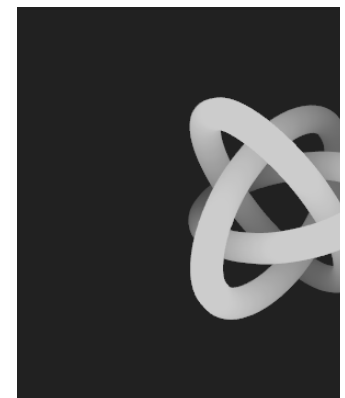
Engraving t
weightless z
decimals of





(?) unusual?
stereograms

→ knot theory

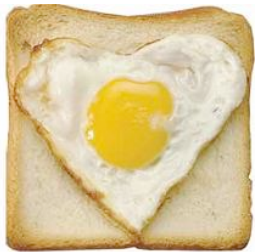


How To Make
Stereogram
Kapil Hari
Paranjape

‘Unusual’ Methods of Mathematical Visualization

Some conditions though:

- The ‘unusual method’ must ‘add’ something to the material
- 3D stereogram is important for knots
- the zero-g was a metaphor as in “2001, A Space Odyssey”
- Avoid gadget-type approach, waste of time, or out of focus
- however, the “surprise effect ” is useful to a teacher



← Does this help to learn about the cardioid

- Not: “anything goes”, but even “mathematical art” can be “avant-garde”(?!)

‘Unusual’ Methods of Mathematical Visualization



Must math art be “aesthetic” ?

← Marcel Broodthaers.

It is "art": it was sold at Christie's NY:
355000\$.

3 main examples:

- Black light: it allows emphasizing the mathematical shape & adds mystery.
- Laser: verifying theorems “at laser precision” & adds a modern feature.
- Art of gastronomy: not just “the π symbol in chocolate” some mathematical property should be stressed.

Unusual method black light

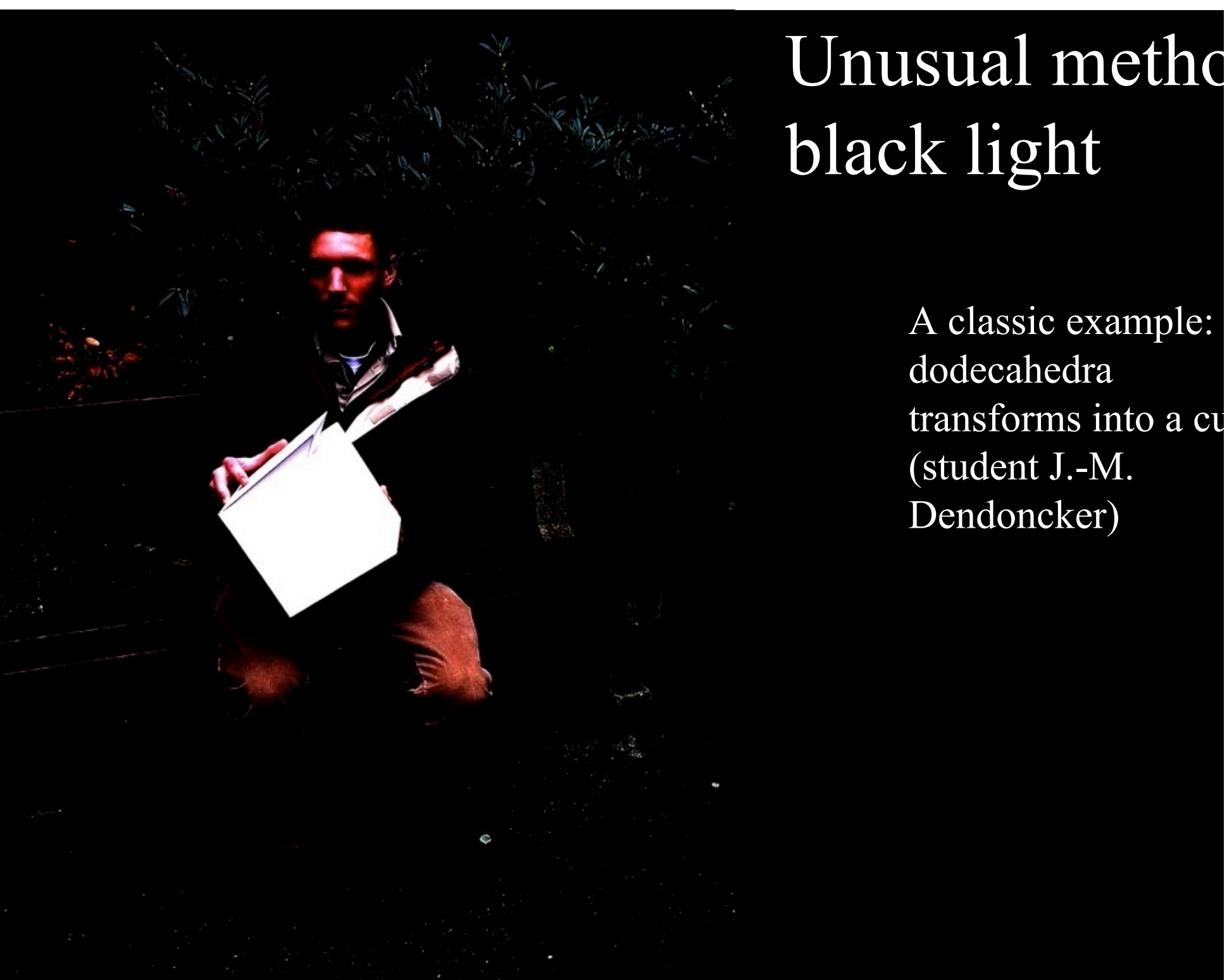
During the day, students study
math: the history of
numbers...

... switch off the
light and see Africa
by night.
The brightest star is
Ishango.

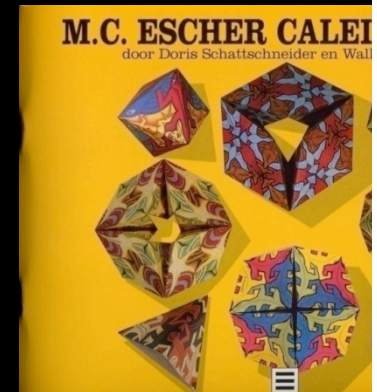
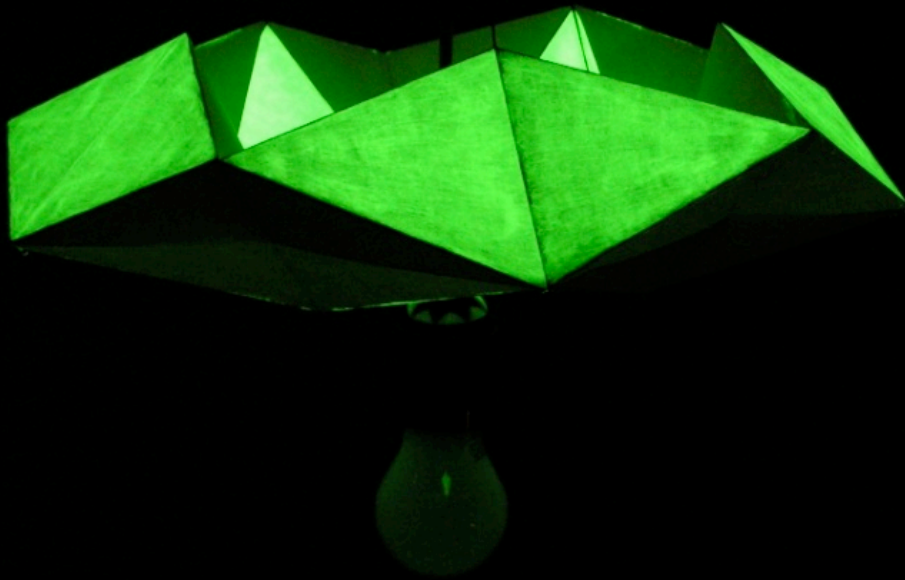


Unusual method black light

A classic example:
dodecahedra
transforms into a cube
(student J.-M.
Dendoncker)

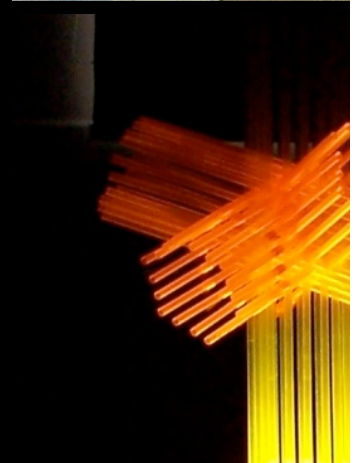
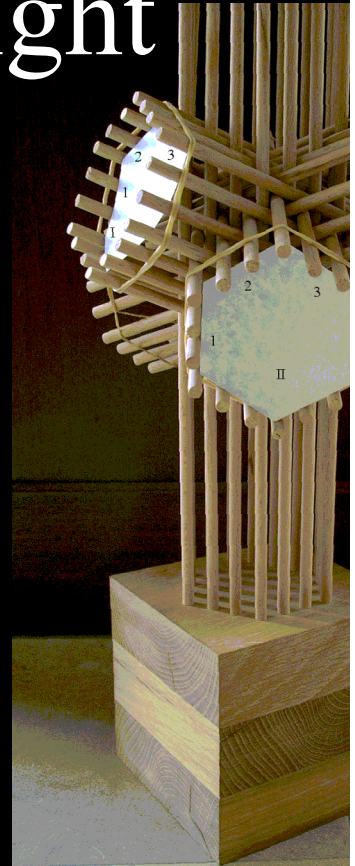
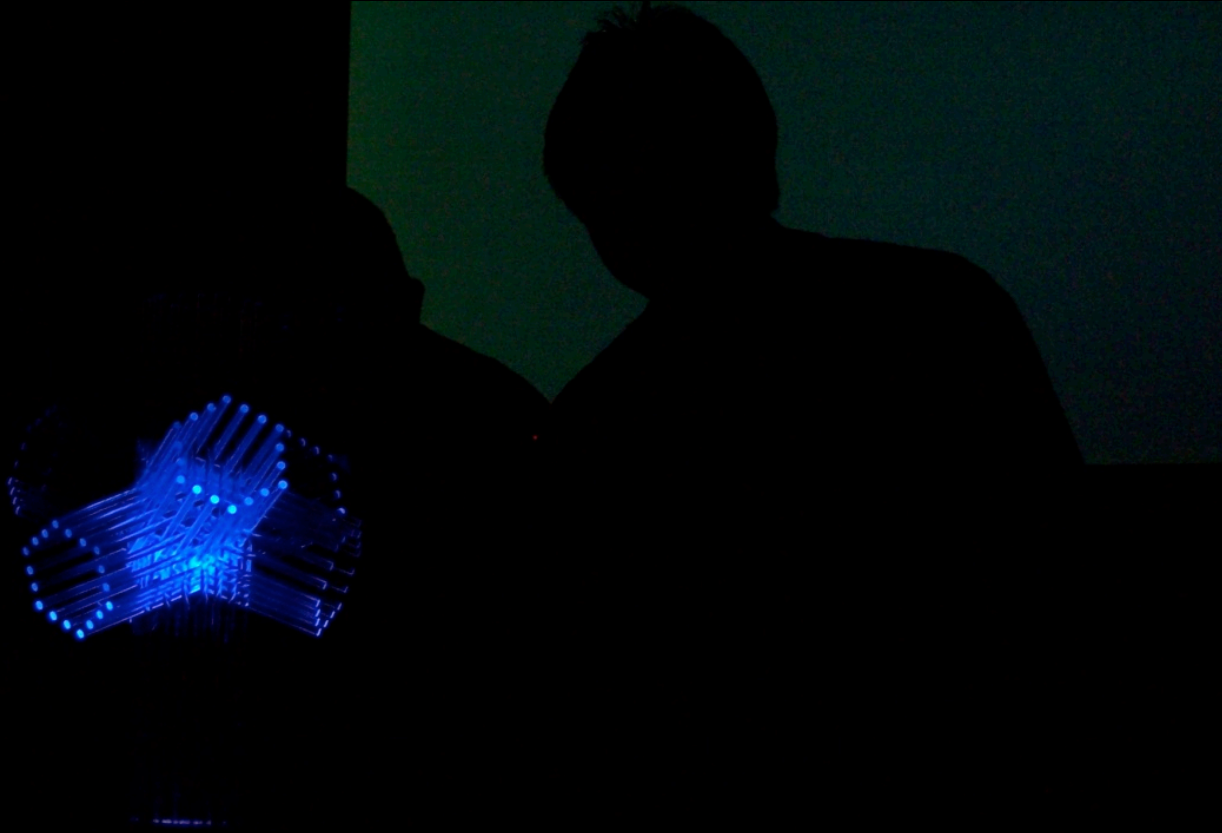


Unusual method black light



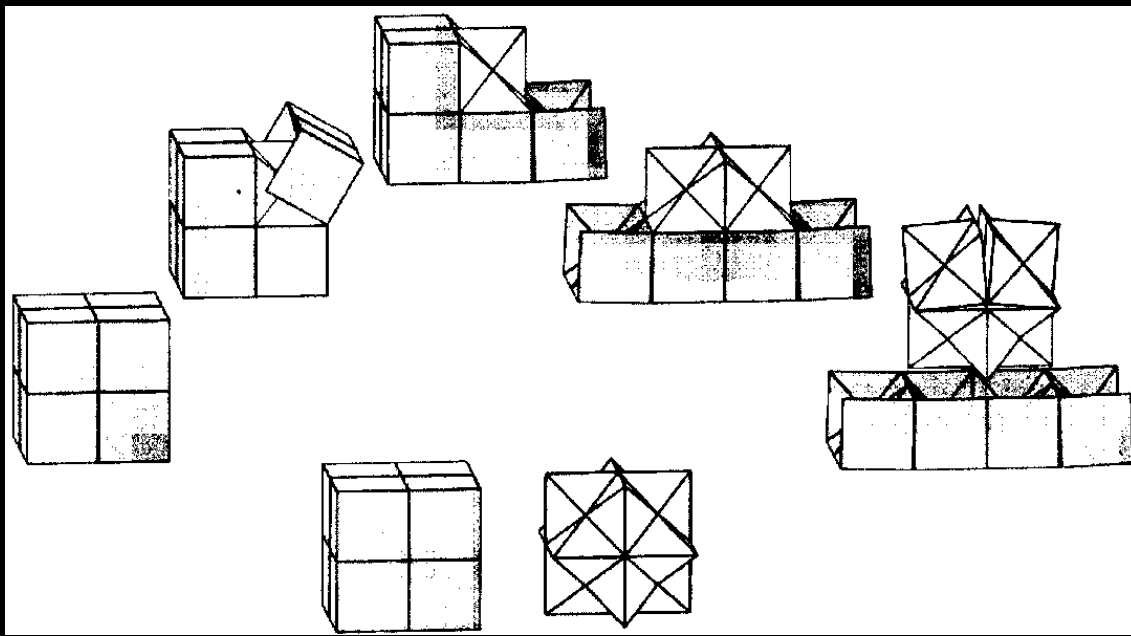
A “design” in
by math, by science
*Jef Pottier and
Smits*

Unusual method black light



Model by Jean-Marie Dendoncker; question “for the artist”:
how to make the intersection visible?

Solution: *Ngo Ba Dat, Rammelaere Ruben*



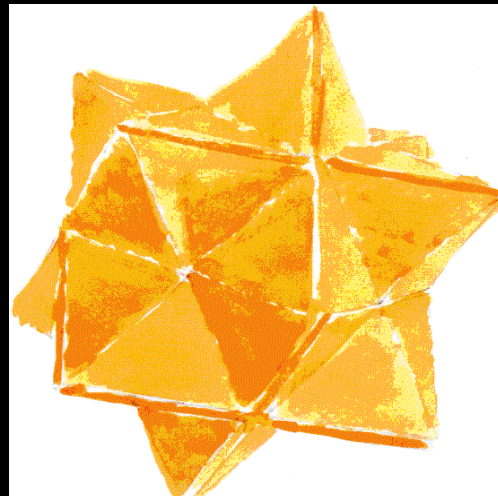
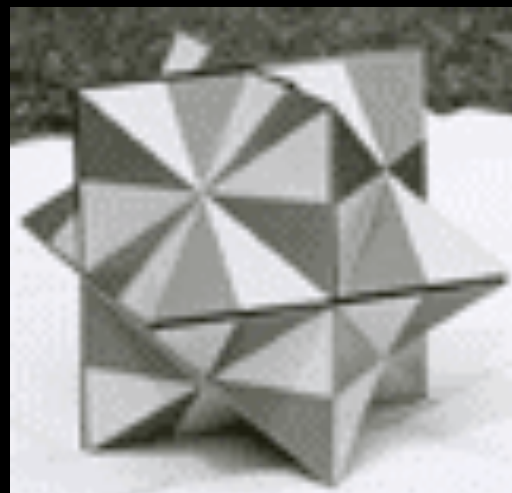
Unusual method black light

Yoshimoto Cube (Naoki Yoshimoto): 1971

→ Moma New York

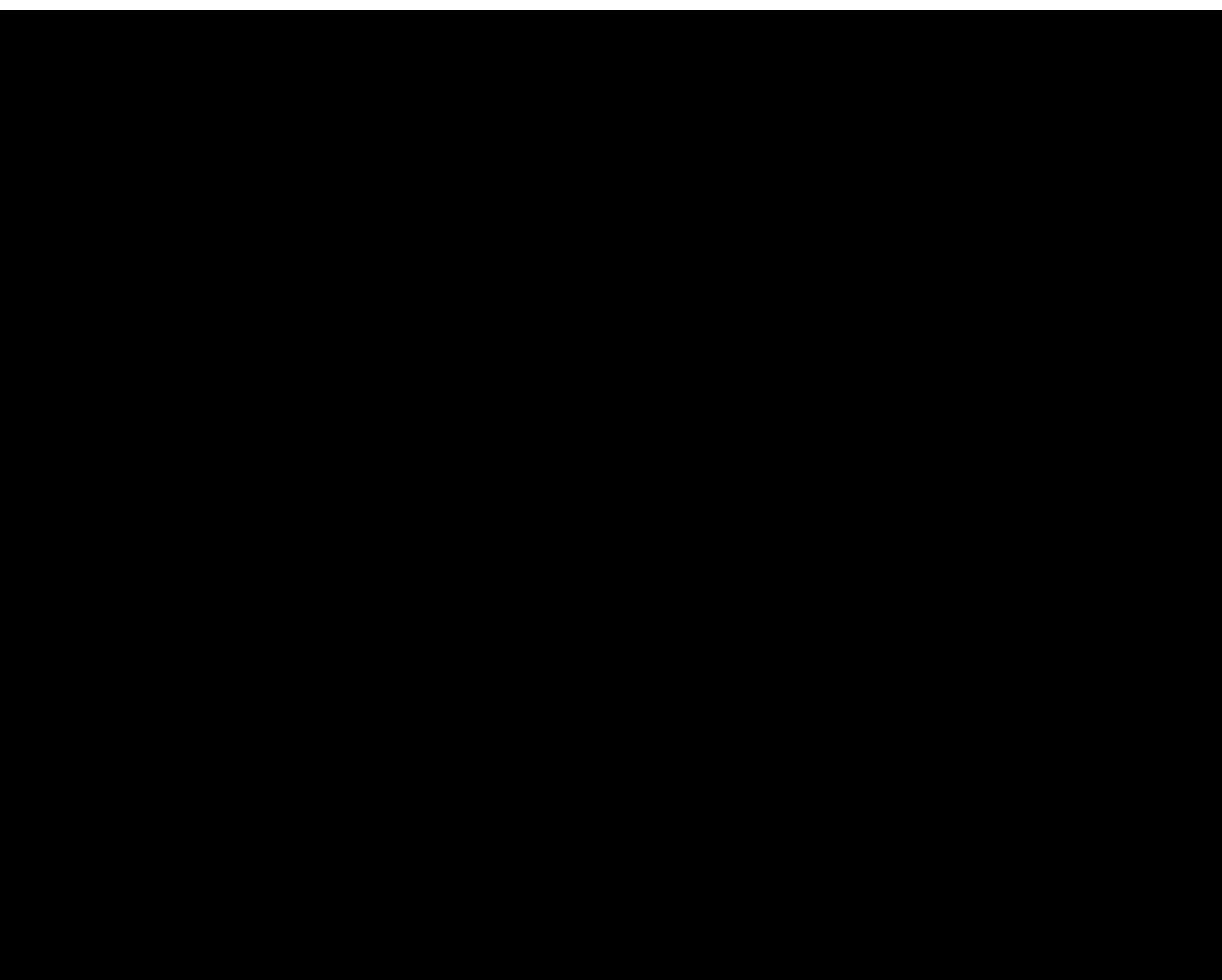


“Ruby Tuesday” conference
Sunday May 10 2009:
Anton Hanegraaf: 1970
<http://www.antonhanegraaf.nl>



Model: Robert Byrnes 2000
Alexander Heinz, Germany
ackerland.de@web.de
ICCG conference Dresden
(or Internet...)

2 Something extra to visualize



Unusual method 2: using lasers

Pappus' theorem: take any
points A, B, C on a line, and
3 points a, b, c on another

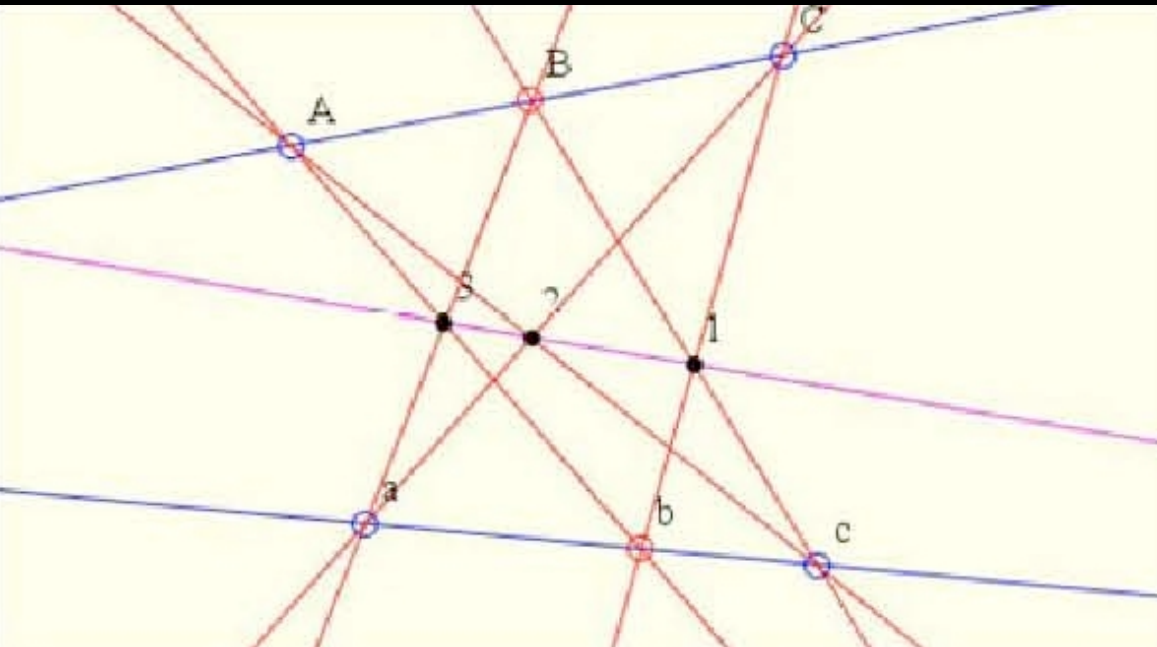
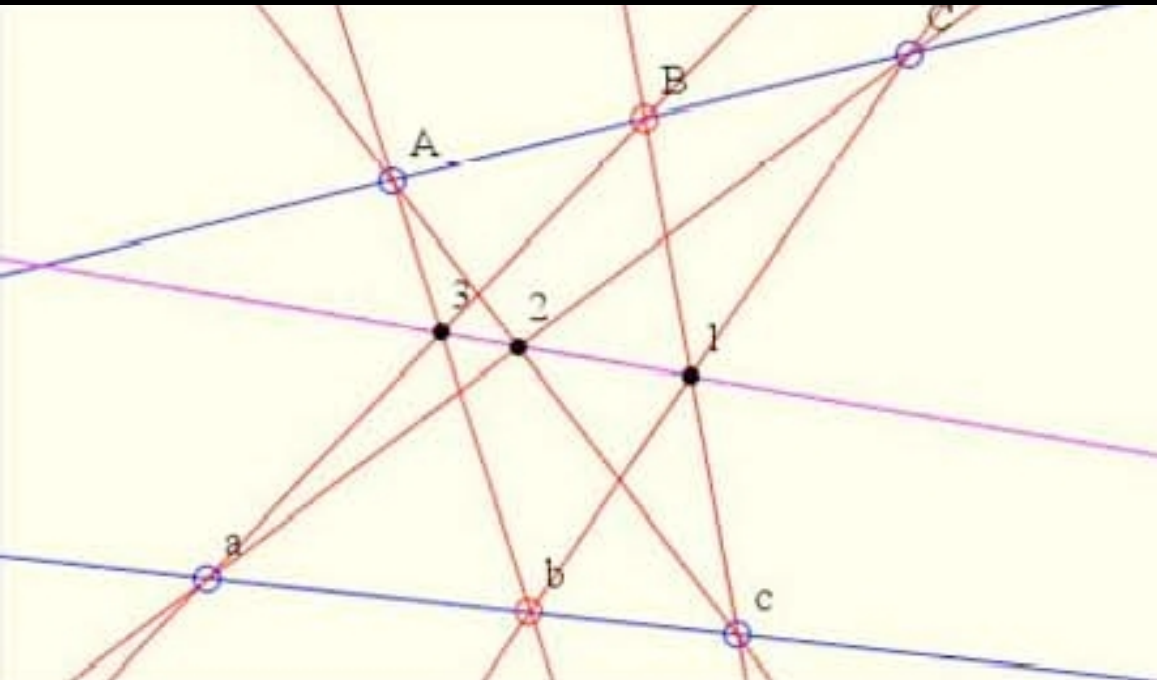
$$Bc \cap Cb = \{1\}$$

$$Ac \cap Ca = \{2\}$$

$$Ba \cap Ab = \{3\}$$

→ 1, 2 and 3 are on 1 line.

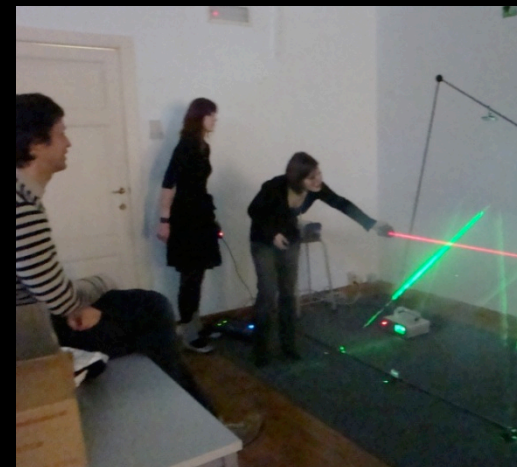
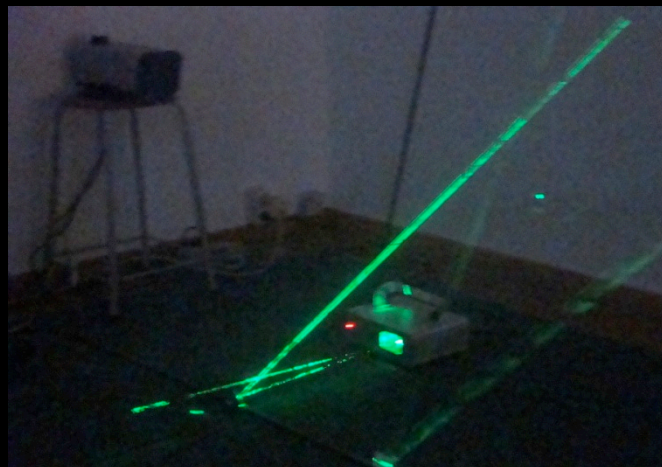
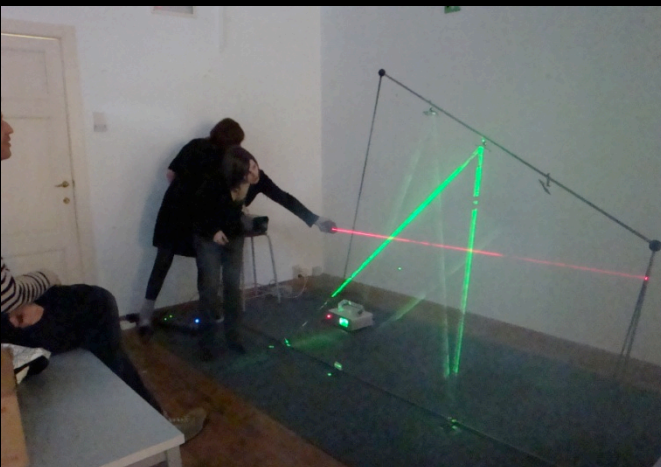
Can one be “really sure”, with
laser precision?



Unusual method using las

STELLING VAN PAPPUS

Pappus' theorem
students Anne
Vercouter and
Lavens



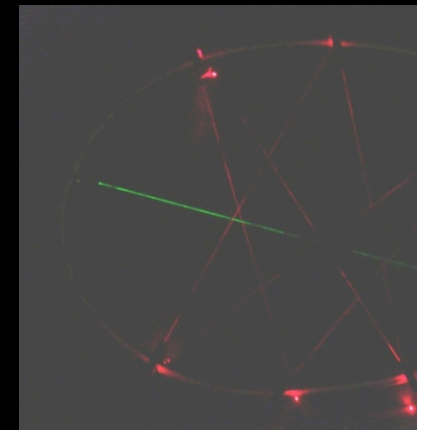
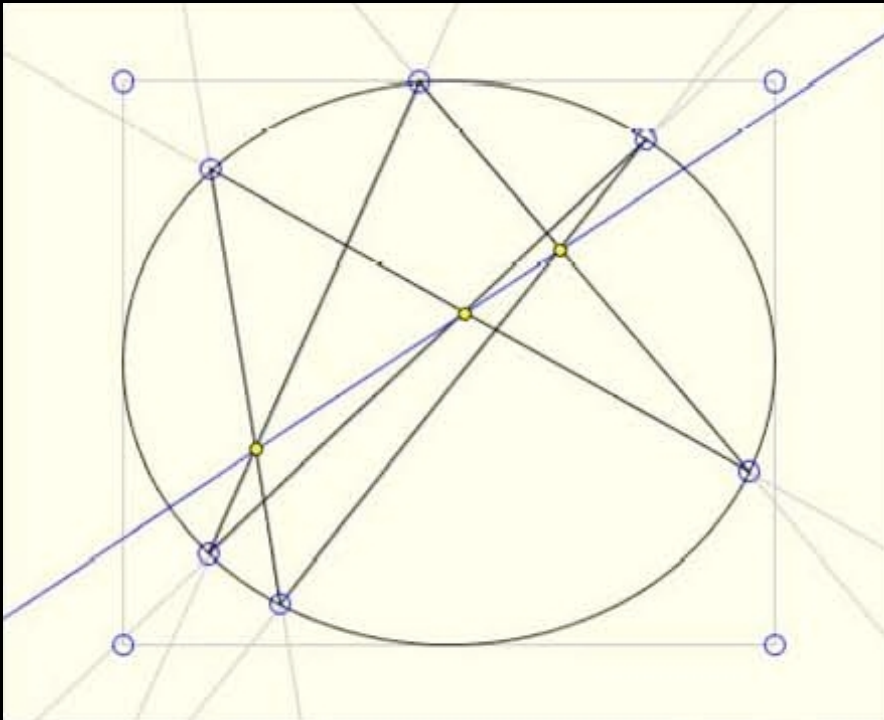
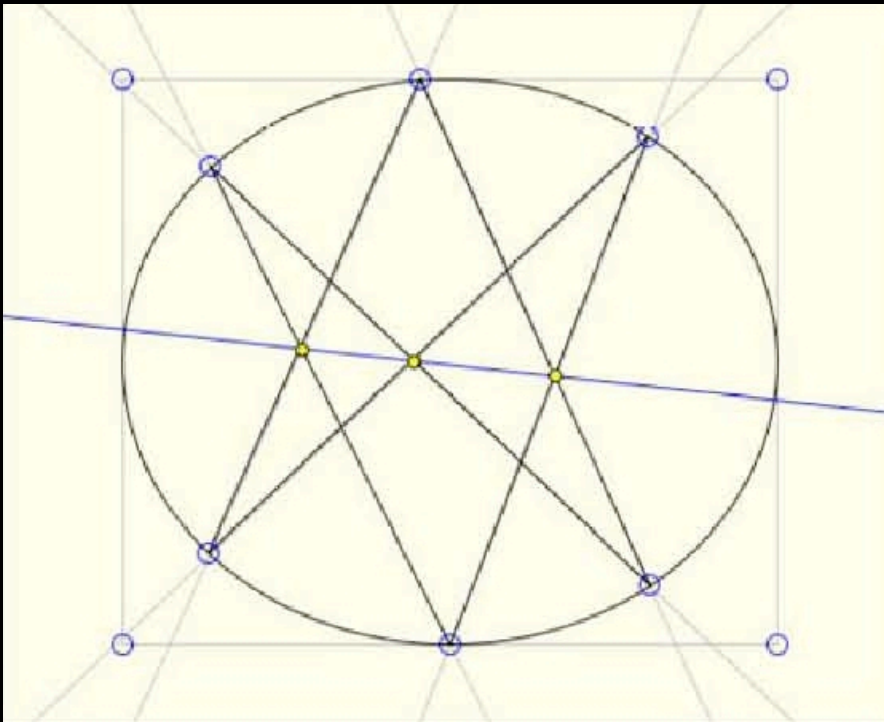
Unusual method 2: la

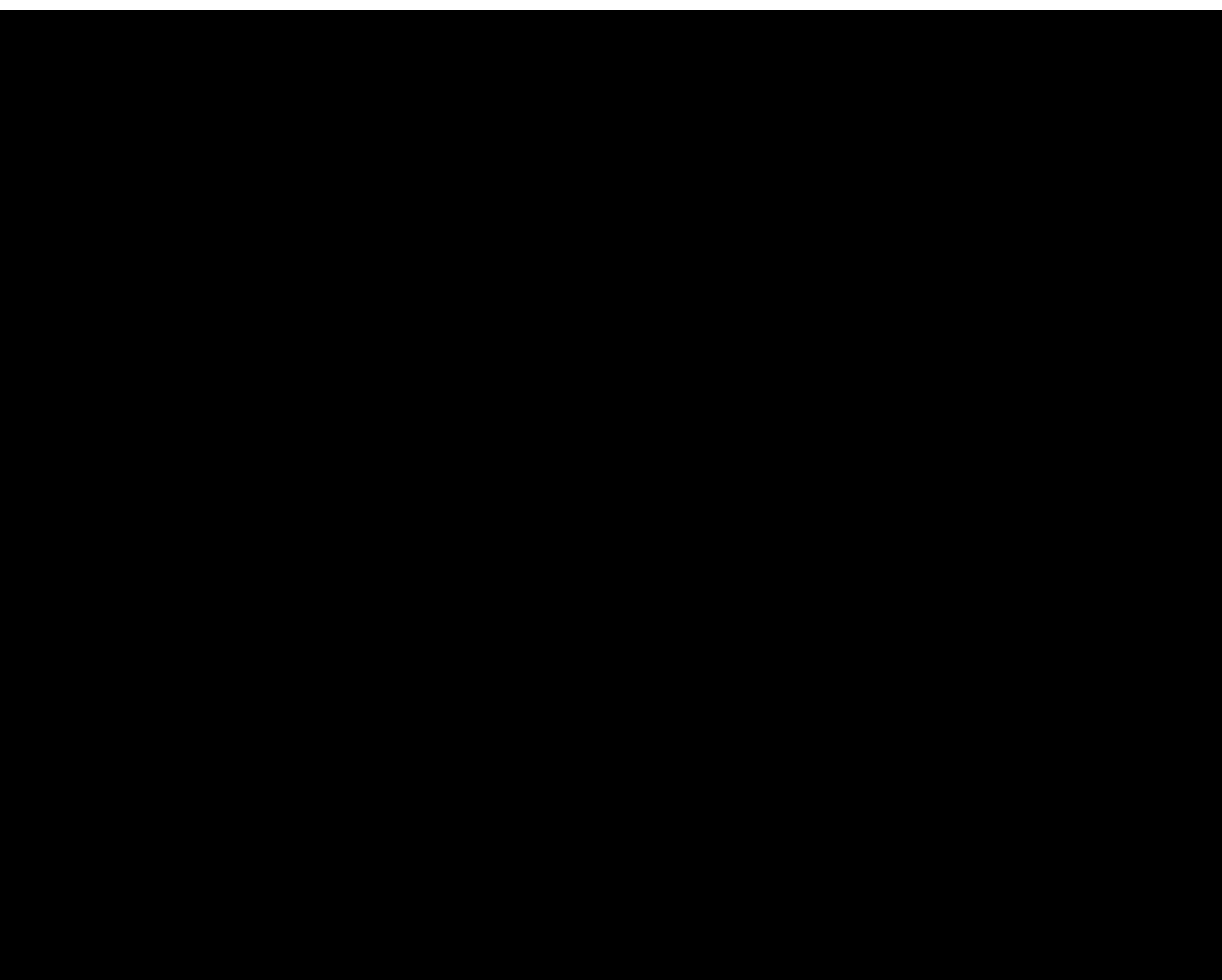
Generalization:

6 arbitrary points on an ellipse, a hyperbola
or a parabola

→ similar theorem

? Illustration with laser pointers, available to many, using “cigarette” smoke?



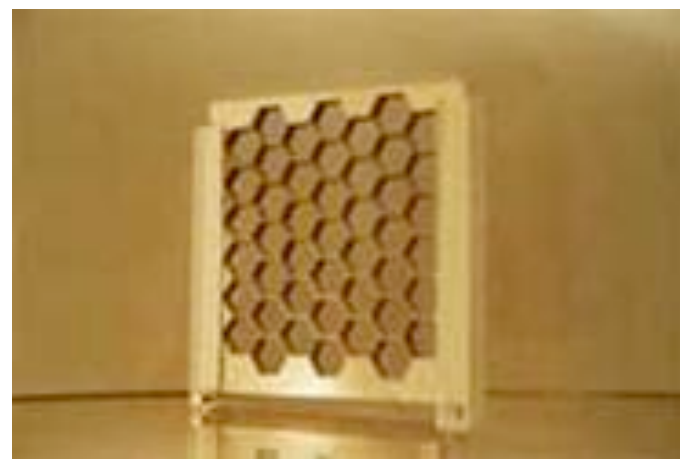


Method 3: the art of gastronomy

1) Cooking



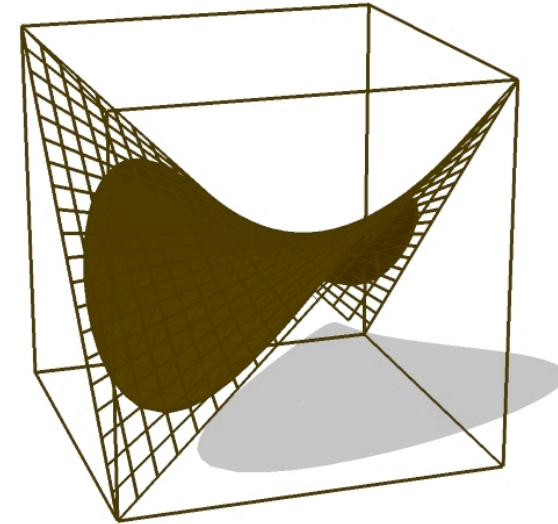
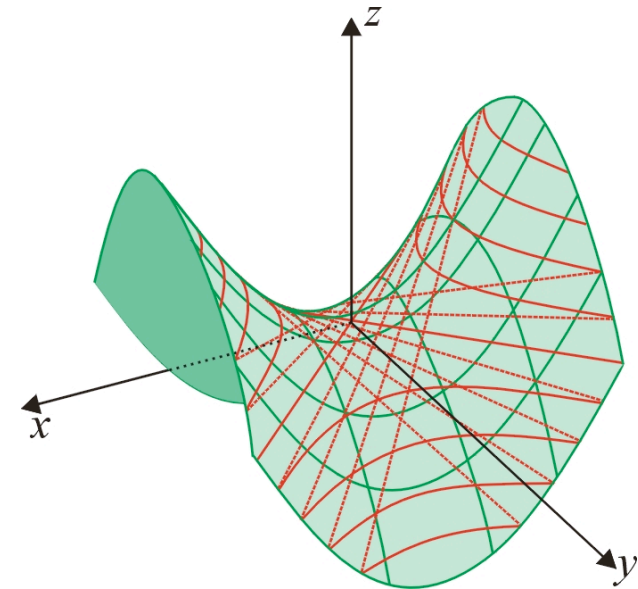
Broccoli “romanesco” = fractal



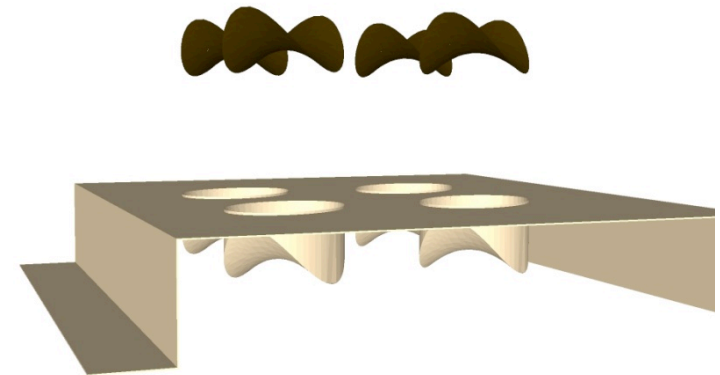
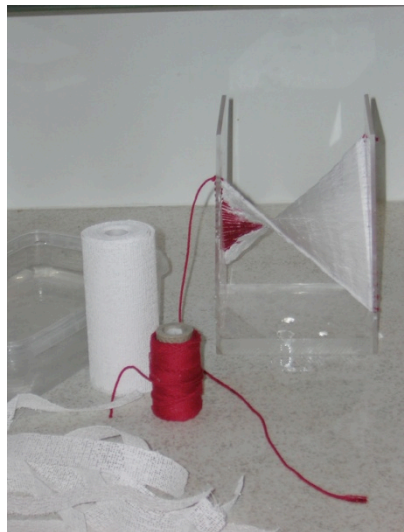
Tests show hexagonal ‘French’ fries: 10% less calories (© Bonsignori, Belg

Method 3: the art of gastronomy

1) Hyperbolic paraboloid and its structural advantages



‘∩’ and ‘U’ combination → less calories!



How to make a chocolate Pringle?

Marie-Anne Grillet, Margot



Realization:
Nele Boel
Katrien
Vandenhoeck
Veerle Hoede



Method 3: the art of gastronomy

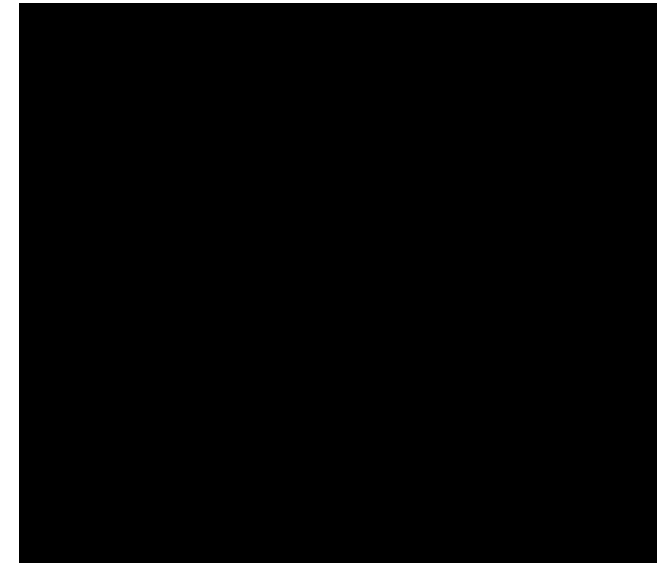
3) Irrationality of π and of π^2

If surface
circle = πr^2



= surface rectangle

If volume
torus
= $\pi^2 \times$
fraction

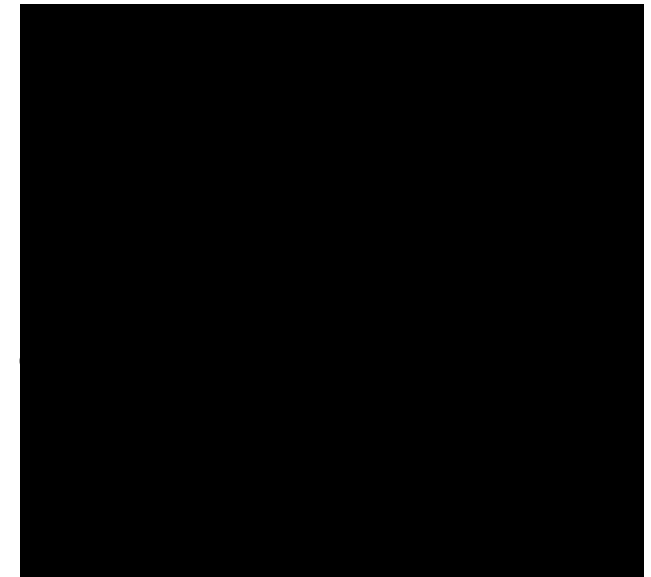


= volume rectangular pris

width

length

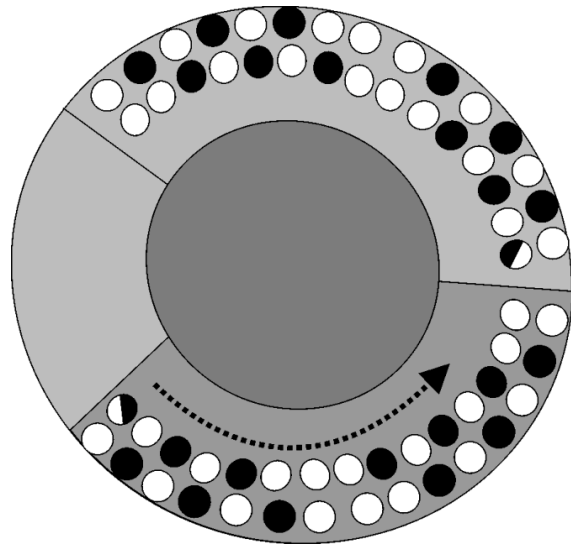
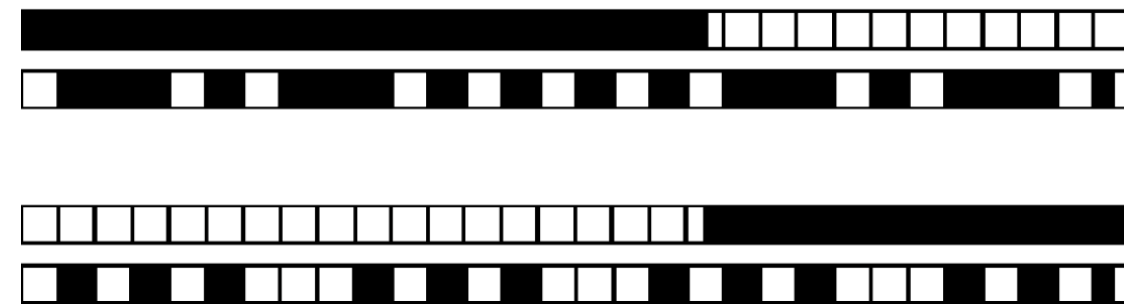
→ π would be the fraction
 $r^2 / (\text{length} \cdot \text{width})$



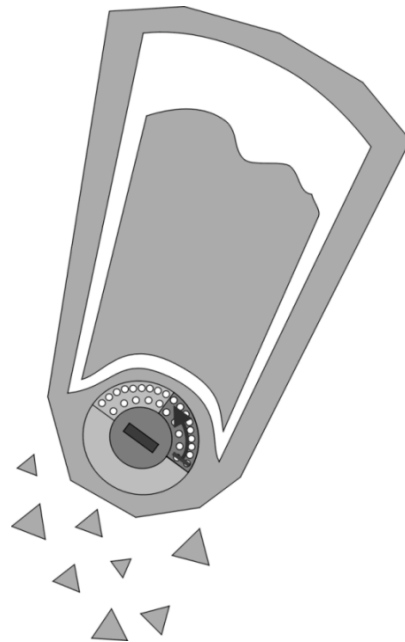
→ π^2 would be a fraction

Method 3: the art of gastronomy

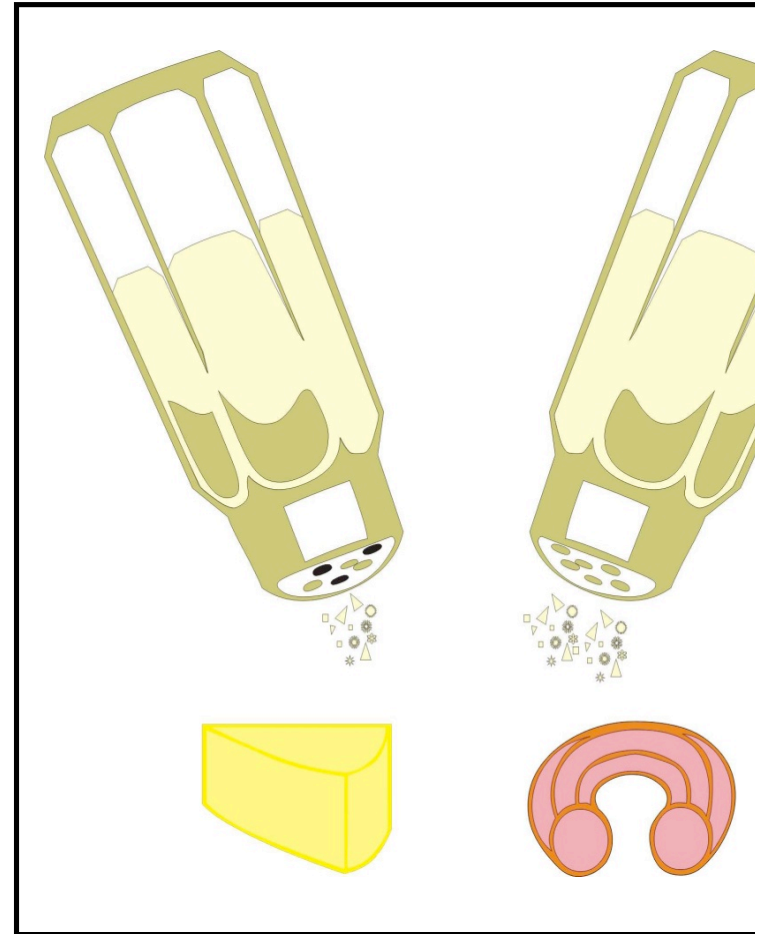
4) Golden section flavour



$$61.8\% \times 61.8\% = 38.2\%$$



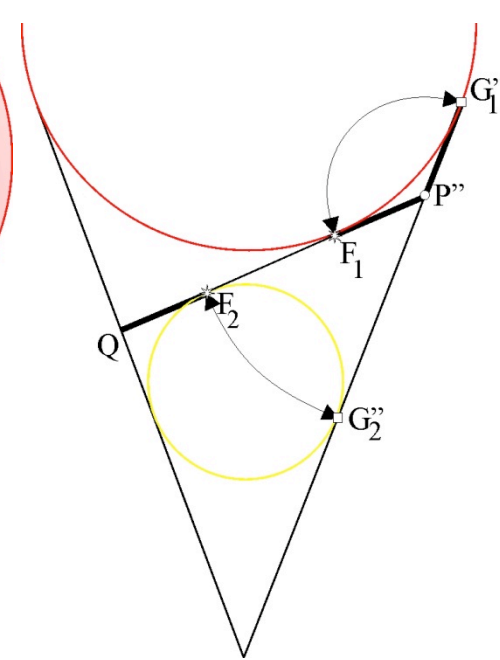
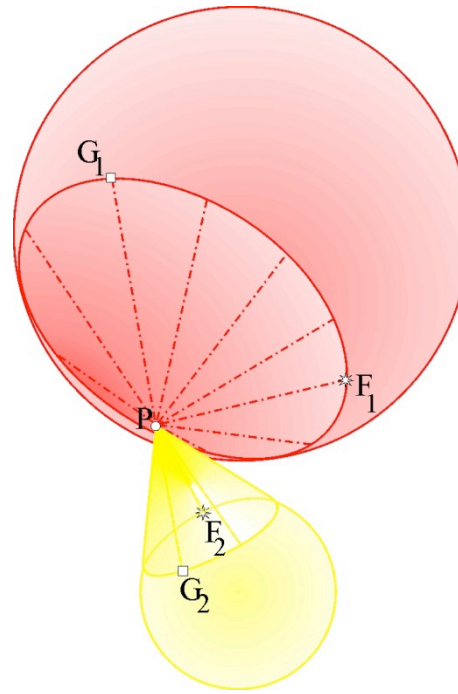
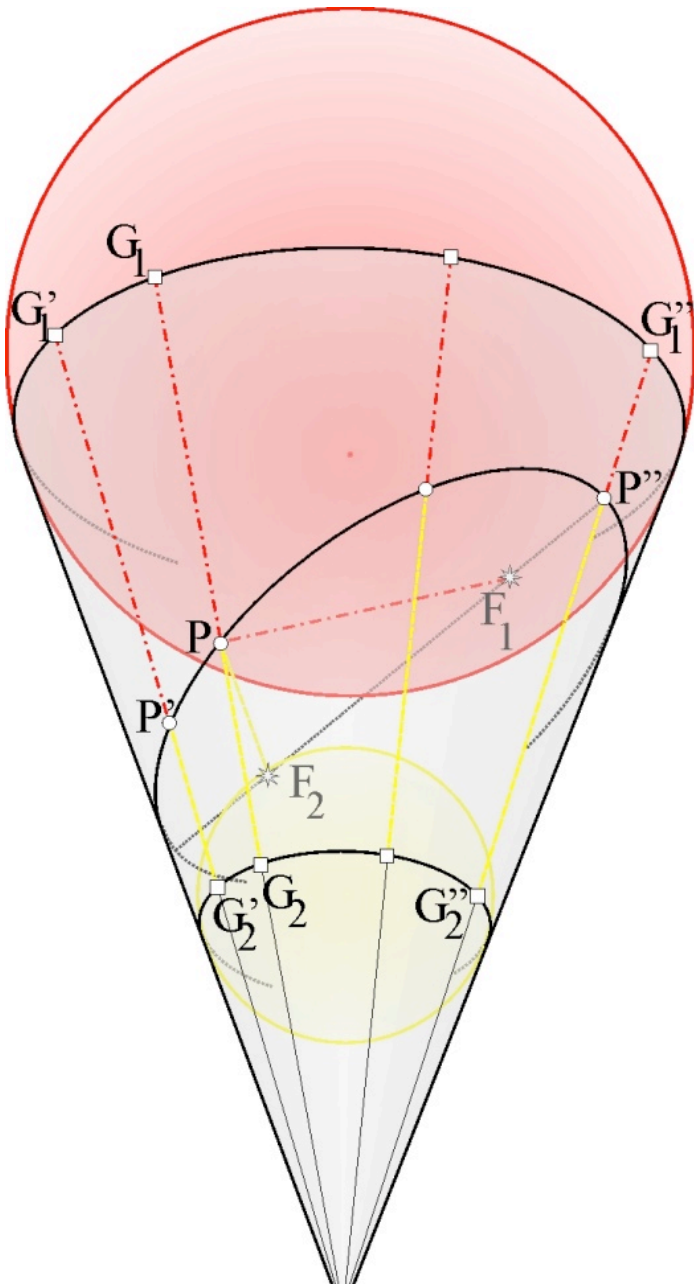
Golden section = 1.618...
 $1/1.618... = 0.618... = 61.8\%$



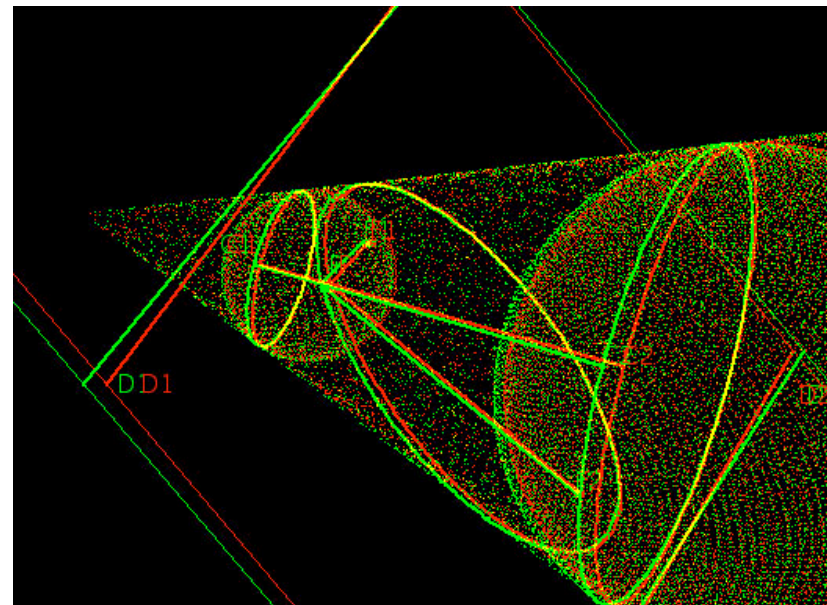
$61.8\% \times 61.8\%$ for one half
 $+ 61.8\%$ for other halve = 50

Method 3: the art of gastronomy

5) The theorem of Dandelin

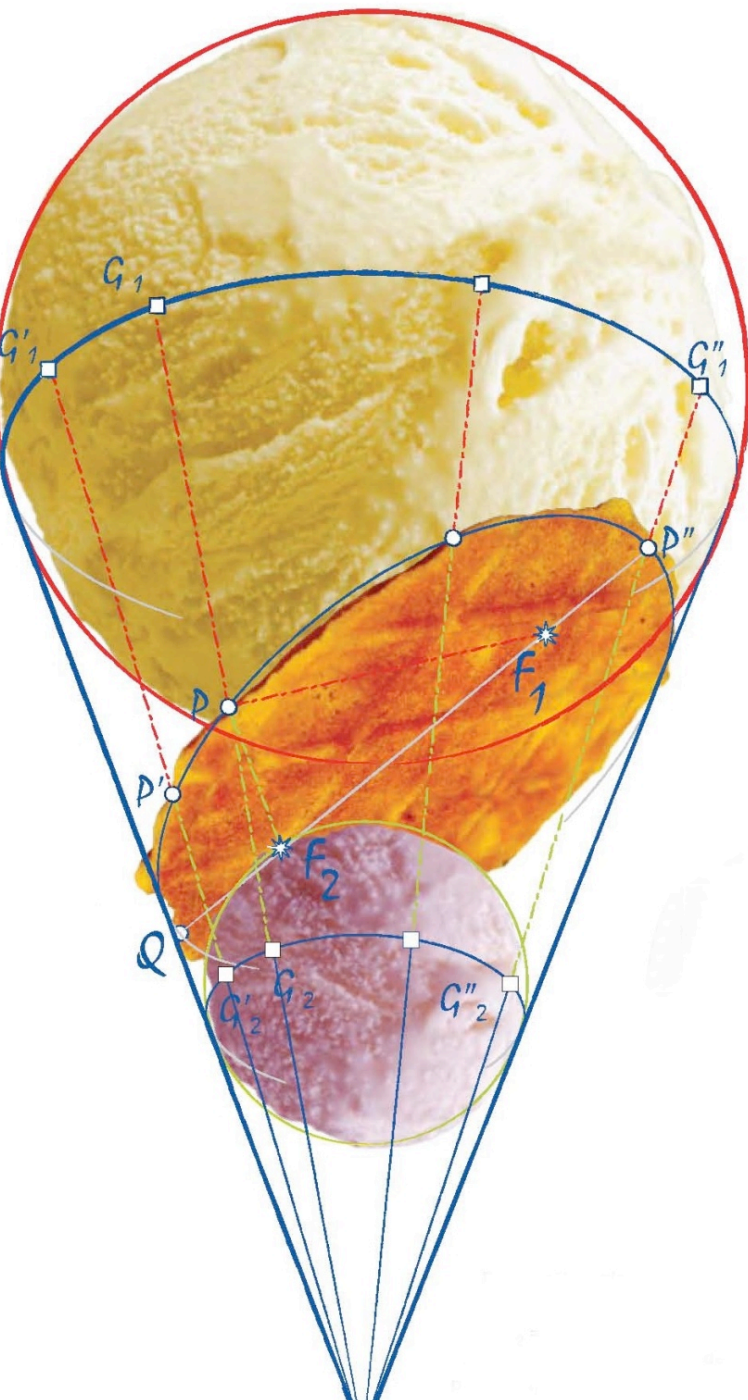


*inter
with
is an
the j
the i
point
in.*



3D
represent
of the th
(observ
colored
glasses)

5) The theorem of Dandelin



The ice cream version was sold in 2006 at a Belgian Casino

Qu'y a-t-il dans votre coupe belge?

- 1 boule moyenne, rouge – les Wallons
- 1 grande boule, jaune – les Flamands
- sauce chocolat – abondamment sur les boules jaunes et rouges – les Bruxellois
- des perles pralinées colorées – les nouveaux belges
- biscuit ovale – la frontière linguistique
- le drapeau tricolore – l'union fait le goût*

* A seulement du goût quand tous les ingrédients sont réunis.



5) The theorem of Dandelin



The theorem is also valid for a cylinder.

6) Randomness of pi

[illegible]

Are the decimals of π random?

Are the decimals of π random?

6) Randomness of pi

3, 14159 26535 89793 23846 26433
83279 50288 41971 69399 37510
58209 74944 59230 78164 06286
20899 86280 34825 34211 70679



Corneel Baert: 0 = C (or do), 1 = C#, 2 = D, etcetera

3, 14159 26535 89793 23846 26433
83279 50288 41971 69399 37510
58209 74944 59230 78164 06286
20899 86280 34825 34211 70679

3, 14159 26535 89793 23846 26433
83279 50288 41971 69399 37510
58209 74944 59230 78164 06286
20899 86280 34825 34211 70679

3, 14159 26535 89793 23846 26433
83279 50288 41971 69399 37510
58209 74944 59230 78164 06286
20899 86280 34825 34211 70679

‘Unusual’ Methods of Mathematical Visualization

Question:

What was algorithmic about the given “examples” of mathematical art?

Answer (Erik Demaine):

The algorithmic way of thinking transcends our tradition boundaries. I believe that algorithms are relevant to every discipline of study ...