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 of 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.

\(\ldots\)

\(^{(n)}\) I thank Bahman Kalantari for the opportunity to pronounce these words.

\(\ldots\)

*The art of thanking is infinite, but one can get out of the ‘thanking loop’ by introducing the \(n^{th}\) thanking.*
‘Unusual’ Methods of Mathematical Visualization

Dirk Huylebrouck
Sint-Lucas School for Architecture, Brussels BELGIUM
(?) Unusual presentation of the author in zero-g

Engraving the first weightless zero-g decimals of...
unusual?

stereograms

→ knot theory

How To Make a Stereogram
Kapil Hari Paranjape
‘Unusual’ Methods of Mathematical Visualization

Some conditions though:

• The ‘unusual method’ must ‘add’ something to the math
  - 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 “avant-garde”(?!)

‘Unusual’ Methods of Mathematical Visualization

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.

Must math art be “aesthetic”? 🔄 Marcel Broodthaers. It is "art": it was sold at Christie's NY: $355000.
During the day, 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)
A “design” inspired by math, by students Jef Pottier and Tim 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 of Sunday May 10 2009:
Anton Hanegraaf: 1970
http://www.antonhanegraaf.nl/

Model: Robert Byrnes 2005,
Alexander Heinz, Germany,
ackerland.de@web.de
ICCG conference Dresden
(or Internet…)

? Something extra to visualize it?
Pappus’ theorem: take any 3 points A, B, C on a line, and any 3 points a, b, c on another line:

\[
\begin{align*}
Bc \cap Cb &= \{1\} \\
Ac \cap Ca &= \{2\} \\
Ba \cap Ab &= \{3\}
\end{align*}
\]

\[\Rightarrow 1, 2 \text{ and } 3 \text{ are on } 1 \text{ line.}\]

Can one be “really sure”, with laser precision?
Unusual method using lasers

Pappus’ theorem by students Annelore Vercouter and Leila Lavens
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 ‘∪’ combination $\Rightarrow$ less calories!

How to make a chocolate Pringle?

Marie-Anne Grillet, Margot Lefever, Lien Nauwelaerts
Realization: Nele Boel Katrien Vandenhoeck Veerle Hoede
Method 3: the art of gastronomy

3) Irrationality of $\pi$ and of $\pi^2$

If surface circle = $\pi r^2$

= surface rectangle

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

If volume torus = $\pi^2 \times \text{fraction}$

= volume rectangular prism

$\rightarrow \pi^2$ would be a fraction
Method 3: the art of gastronomy

4) Golden section flavour

Golden section = 1.618…
\[
\frac{1}{1.618…} = 0.618 \ldots = 61.8\%
\]

61.8% \times 61.8% for one halve
61.8% \times 61.8% = 38.2%

+ 61.8% for other halve = 50%
Method 3: the art of gastronomy

5) The theorem of Dandelin

If plane intersection with a cone is an ellipse, the foci are the tangent points of the inscribed spheres.

3D representation of the theorem (observe with colored glasses)
The ice cream version was sold in 2006 at a Belgian Casino
5) The theorem of Dandelin

The theorem is also valid for a cylinder.
Are the decimals of $\pi$ random?

Method 3: the art of gastronomy

6) Randomness of pi

Are the decimals of $\pi$ random?

? = orange; 1 = red; 4 = yellow;
6) Randomness of $\pi$

Corneel Baert: $0 = \text{C (or do)}, 1 = \text{C#}, 2 = \text{D, etcetera}$

3. 14159 26535 89793 23846 26433
   83279 50288 41971 69399 37510
   58209 74944 59230 78164 06286
   20899 86260 34825 34217 0679

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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 …