Title: Mathematics and Art

Date: May 27, 2006 03:00 PM

URL: http://pirsa.org/06050022

Abstract: <kw> Perspective, anamorph, anamorphic picture, mathematics, \'The ambassadors by Holbein\',\'A dog by Marolois\', Anamorphs by Erhard Schon\' </kw>

Mathematics and art

-BEING A RANDOM EXCURSION INTO THE CONNECTION BETWEEN SOME FORMS OF ART AND SIMPLE MATHEMATICS

J. L. Hunt
OAPT
May 27, 2006

- The Ambassadors by Holbein

- The Ambassadors by Holbein

A virtual textbook on artistic perspective.

- The Ambassadors by Holbein

Questions:

1. Why is the anamorph placed where it is in the painting?
2. Why is it tilted at 26° to the horizontal?
3. How is a person expected to view this anamorph?

The Ambassadors by Holbein

- The Ambassadors by Holbein

The correct observation angle

- The Ambassadors by Holbein

The correct observation angle

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The correct observation angle

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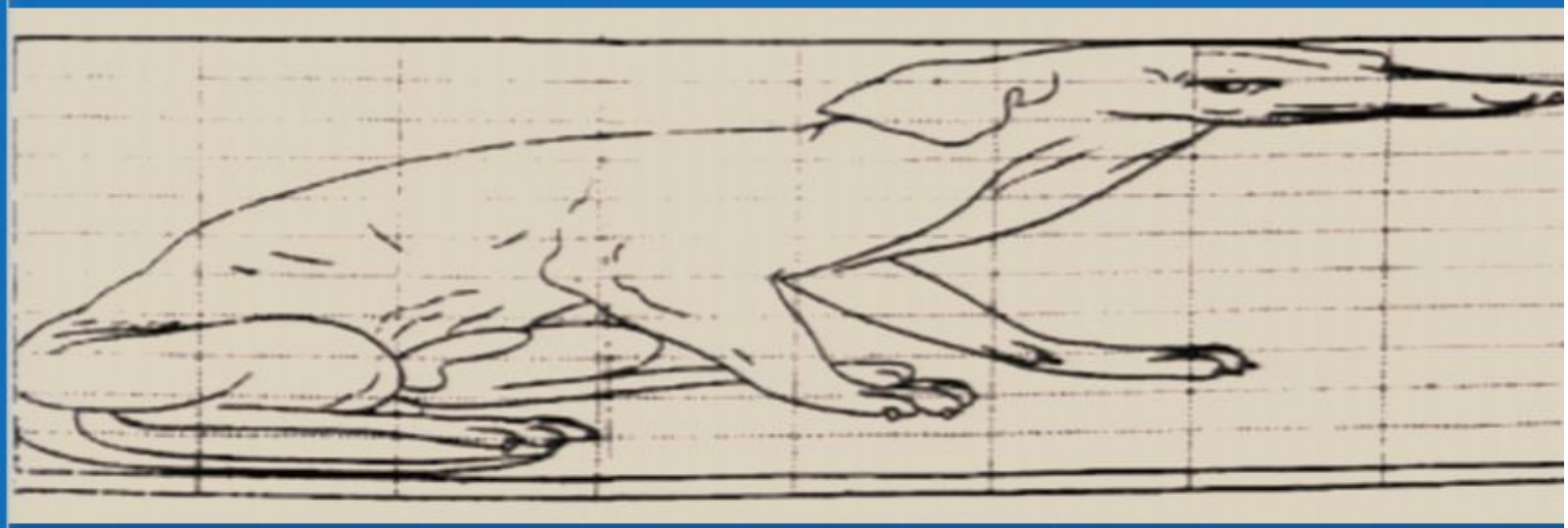
- The Ambassadors by Holbein

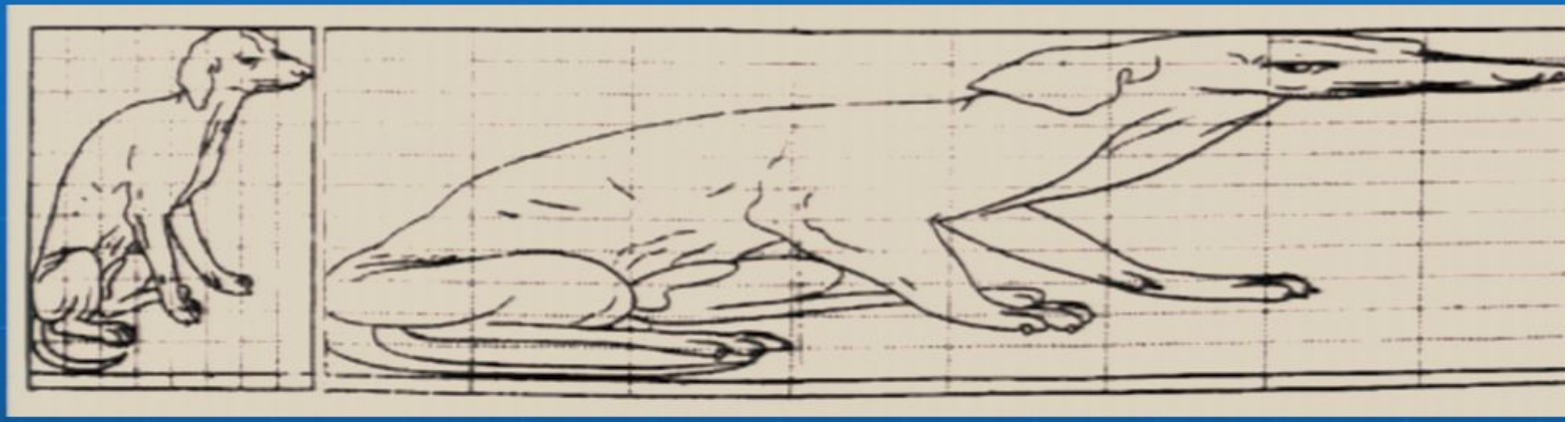
The correct observation angle

- A Dog by Marolois



A simple one-dimensional transformation that gives an anamorph that is assumed to be tilted and viewed from infinity

- A Dog by Marolois



A simple one-dimensional transformation that gives an anamorph that is assumed to be tilted and viewed from infinity

- Anamorphs by Erhard Schön

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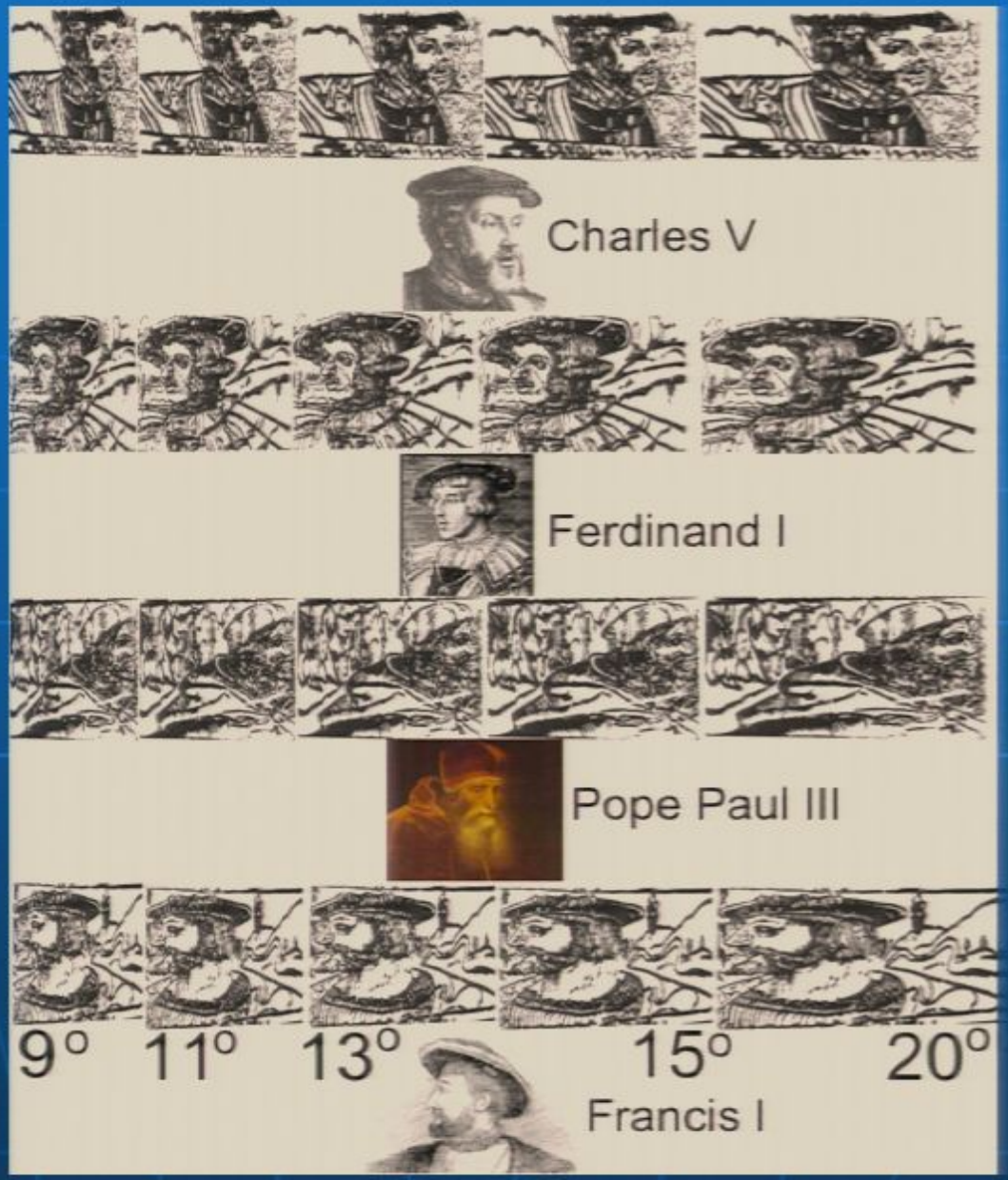
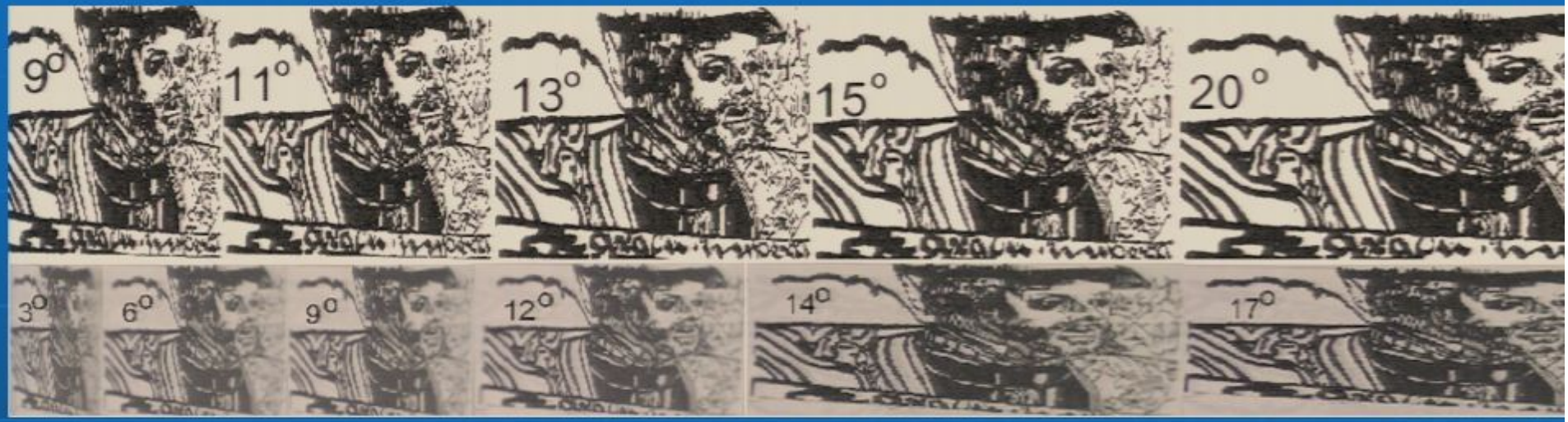
ANAMORPHS BY ERHARD SCHÖN

- Anamorphs by Erhard Schon



Anamorphs by Erhard Schön

Computer generated



Photographed

- Anamorphs by Erhard Schön

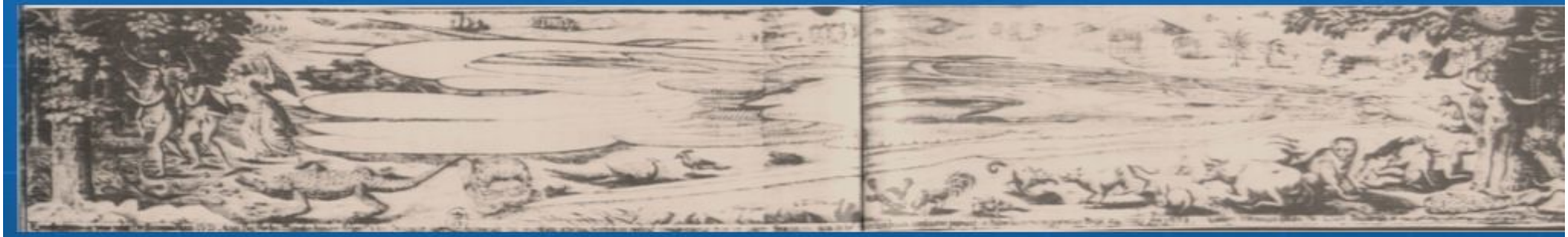
Aus, du alter Tor (Go away you old fool)

- Anamorphs by Erhard Schön

Aus, du alter Tor (Go away you old fool)

- Anamorphs by Others

The Fall; J.H. Glaser (1638)



- Anamorphs by Others

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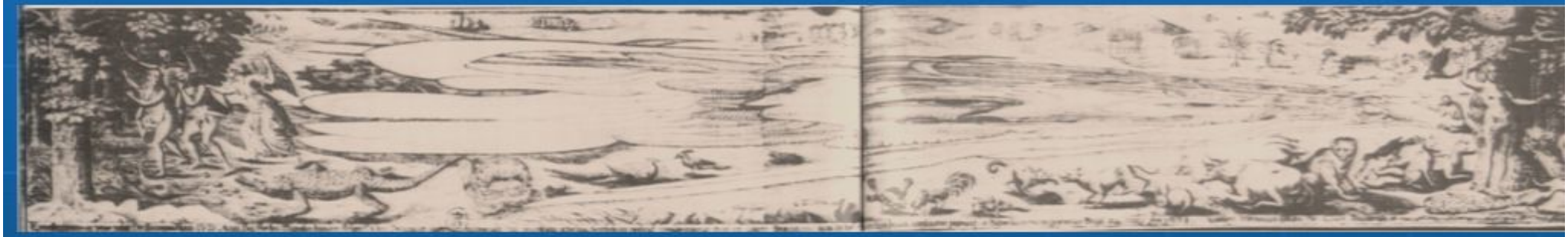

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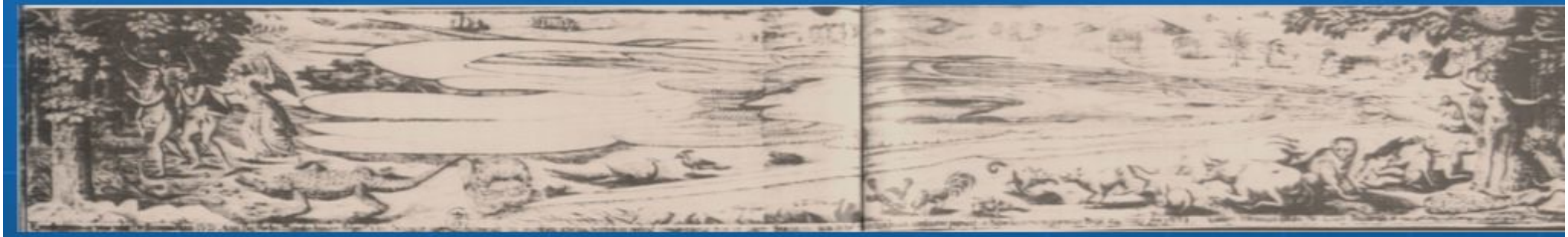
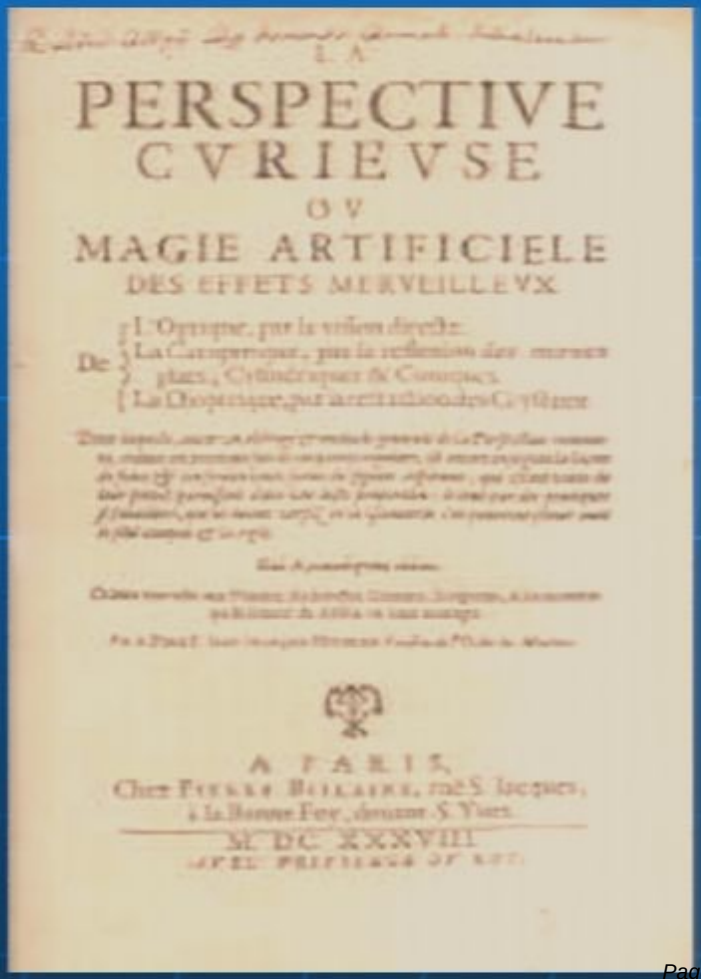


Jean Francois Niceron
and
La Perspective Curieuse



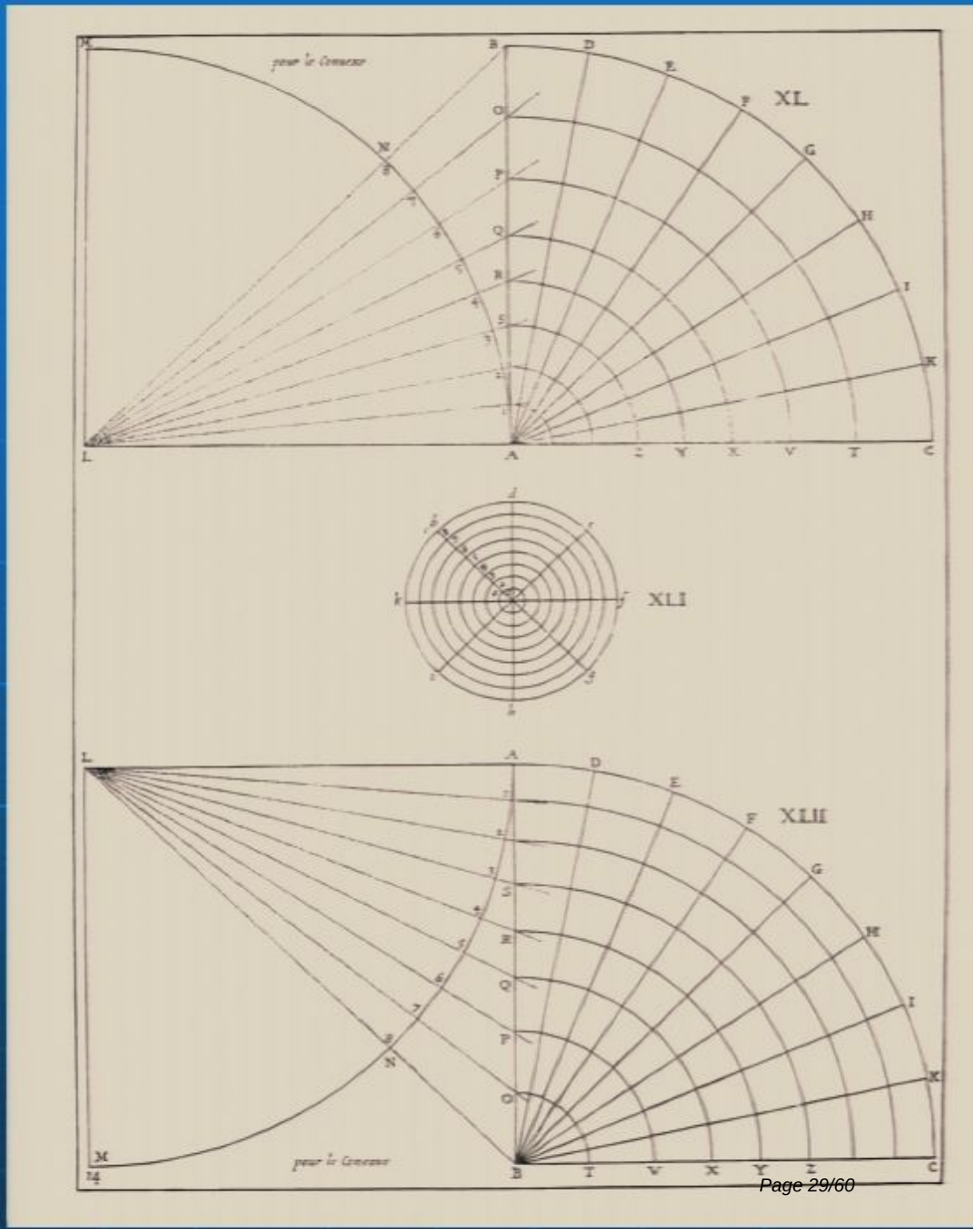
LA

PERSPECTIVE
CVRIEVSE
OV
MAGIE ARTIFICIELE
DES EFFETS MERVEILLEVX

De { L'Optique, par la vision directe.
La Catoptrique, par la reflexion des miroirs plats, Cylindriques & Coniques.
La Dioptrique, par la refraction des Cristaux

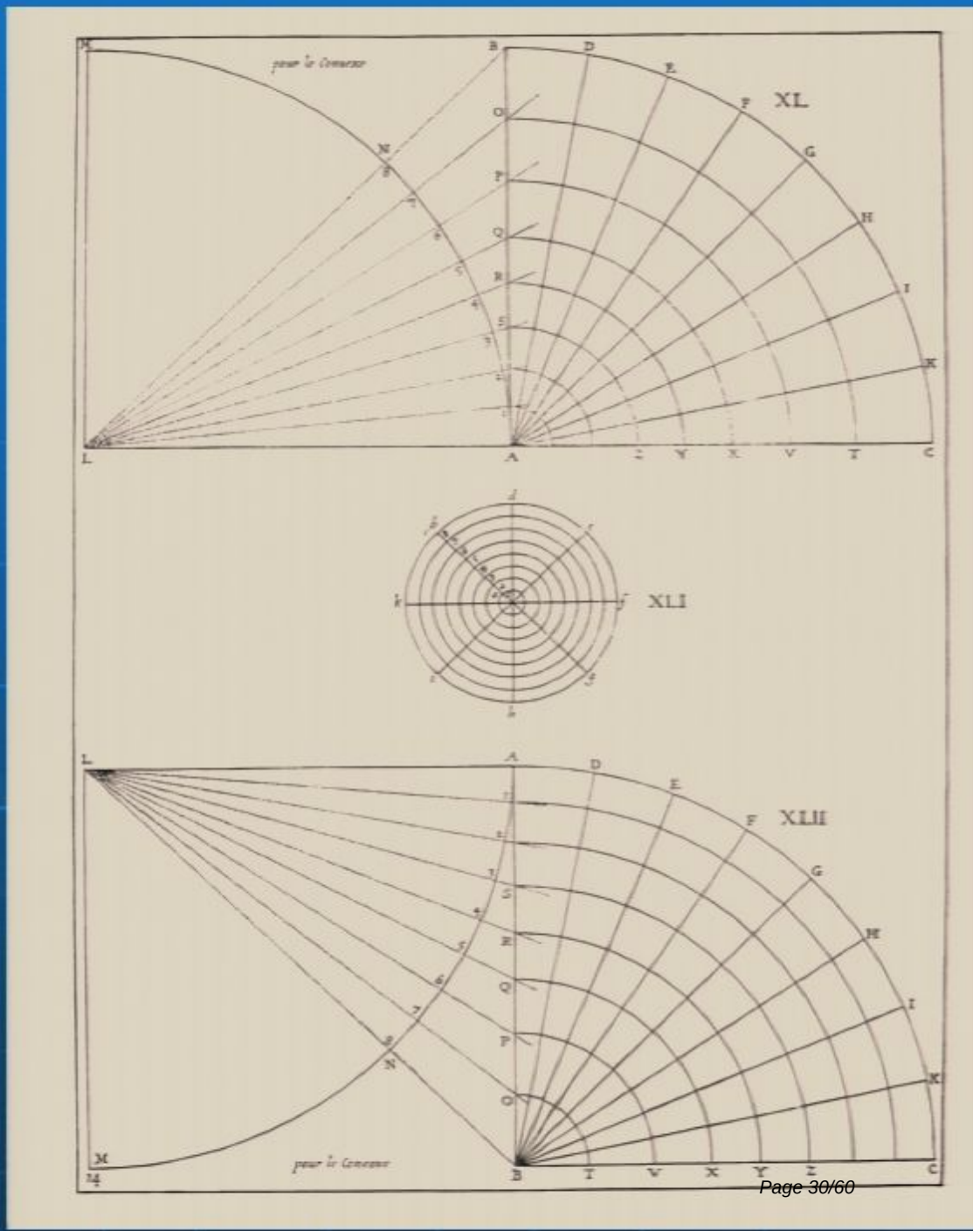
A PARIS,
Chez PIERRE BILLAINE, rue S. Jacques,
à la Bonne Foy, devant S. Yves.
M. DC. XXXVIII.

Jean Francois Niceron and La Perspective Curieuse



Jean Francois Niceron and La Perspective Curieuse

Niceron proposes this elegant scheme for constructing an anamorphic image on the surface of a cone.

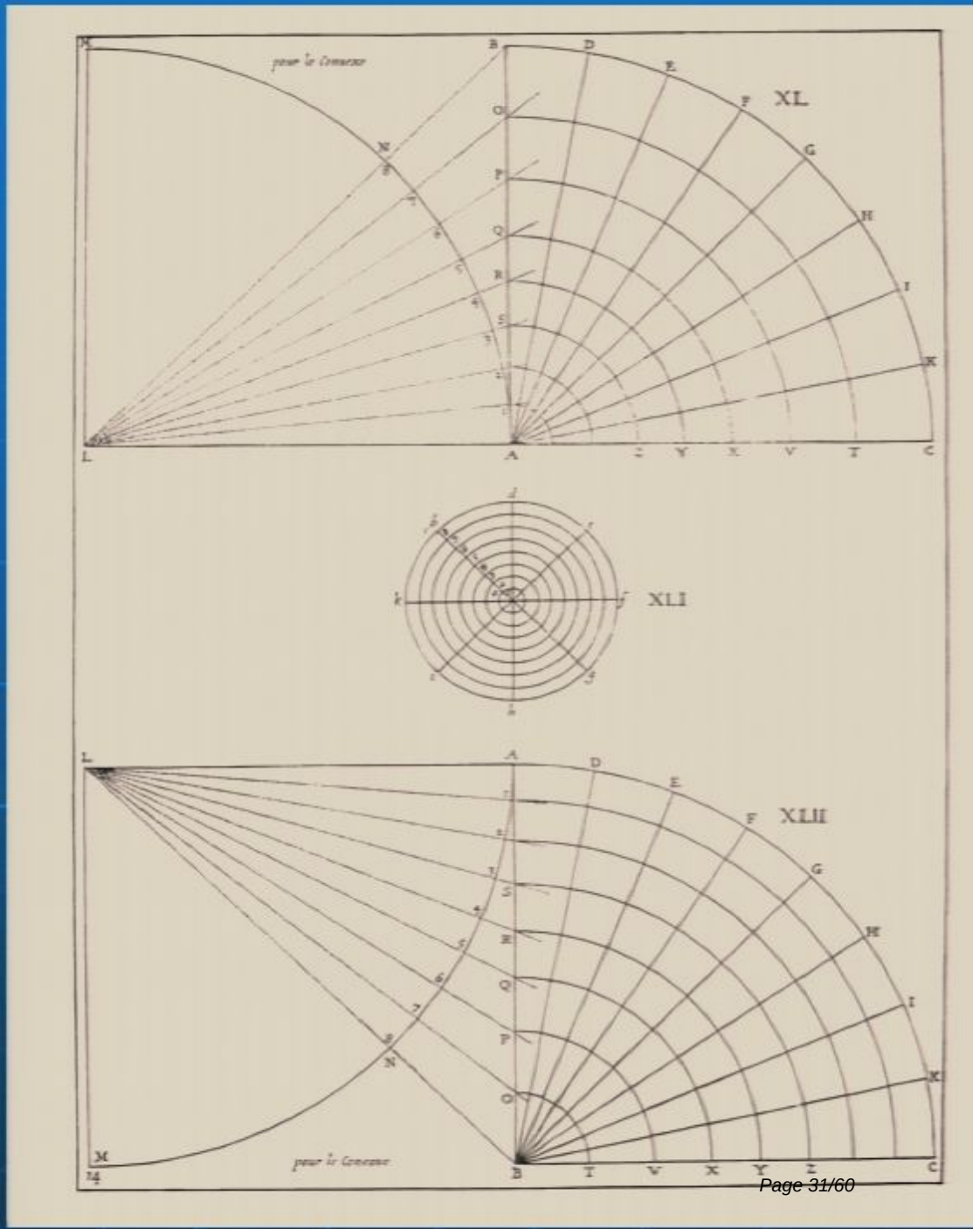


Jean Francois Niceron and La Perspective Curieuse

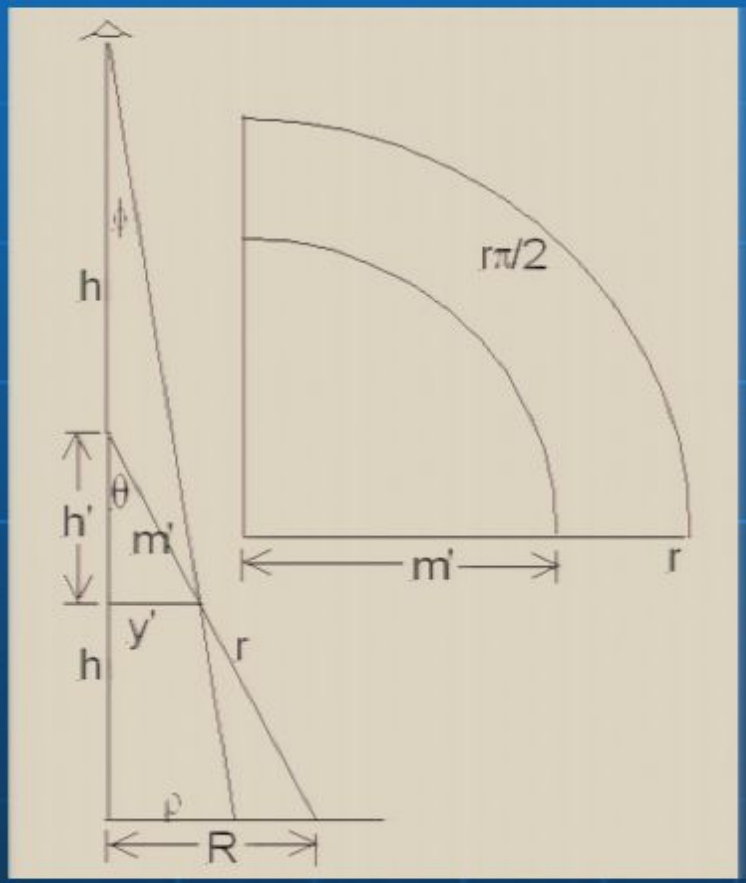
Niceron proposes this elegant scheme for constructing an anamorphic image on the surface of a cone.

Unfortunately

It's Wrong!



Jean Francois Niceron and La Perspective Curieuse



$$\frac{y'}{\rho} = \frac{h + h'}{2h} \text{ and } \frac{y'}{R} = \frac{m'}{r} = \frac{h'}{h}$$

$$m' = \frac{\rho}{2R - \rho} r$$

$$\text{If } f = \frac{\rho}{R}$$

$$m' = \frac{f}{2 - f} r \quad \text{the kernel}$$

Jean Francois Niceron and La Perspective Curieuse

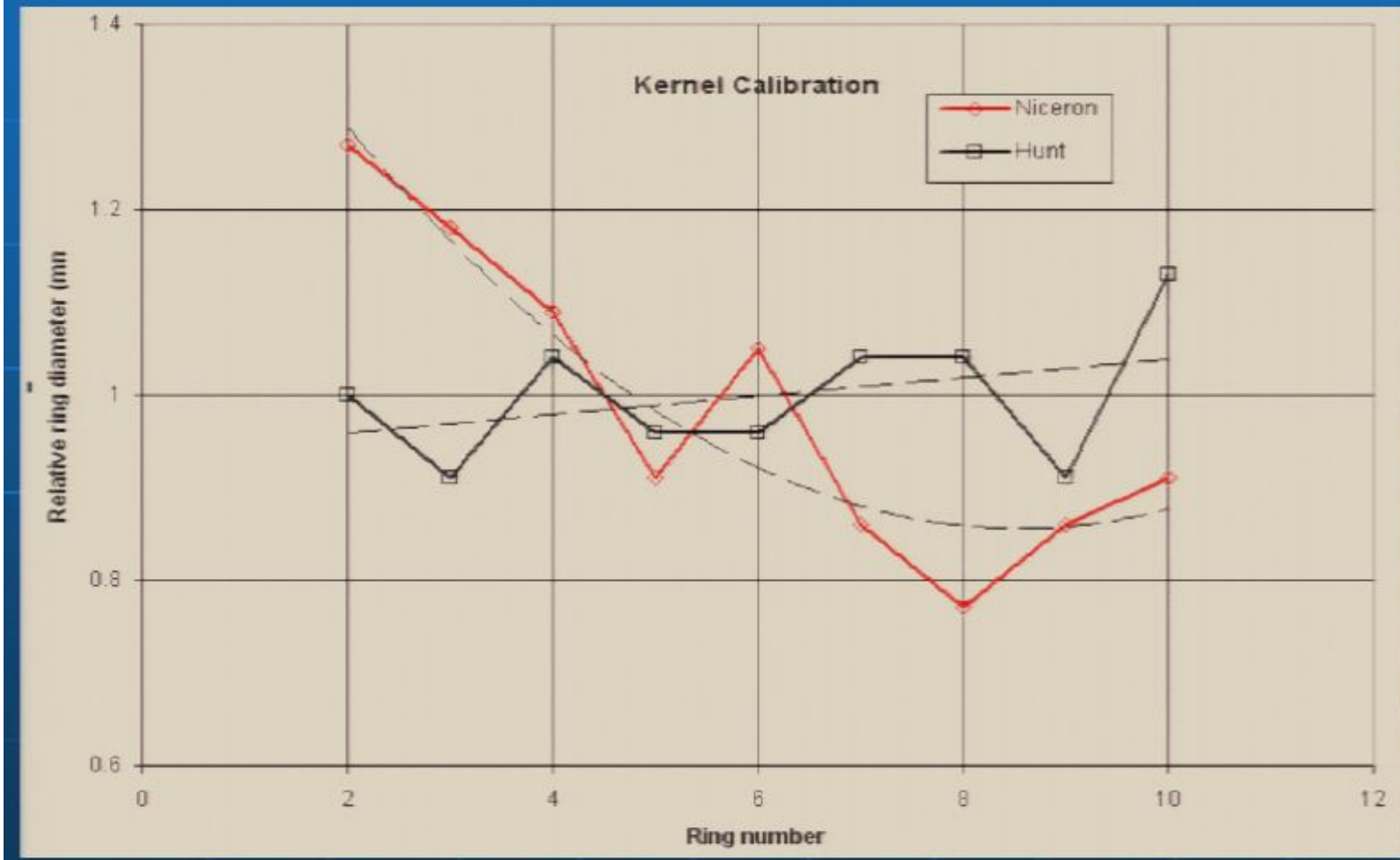
Niceron says the kernel is:

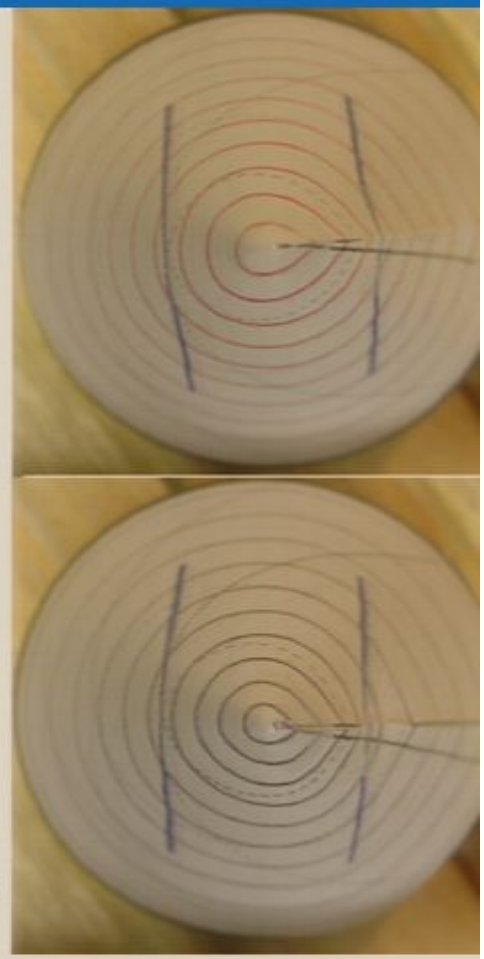
$m' = \tan (f \times 45^{o})$

Difference is subtle but his method tends to concentrate the image toward the centre.

f	f/(2-f)	tan(f45)
0.1	0.053	0.079
0.2	0.111	0.158
0.3	0.176	0.240
0.4	0.25	0.325
0.5	0.333	0.414
0.6	0.429	0.510
0.7	0.538	0.613
0.8	0.667	0.747
0.9	0.818	0.854
1	1	1

Jean Francois Niceron and La Perspective Curieuse





Jean Francois Niceron and La Perspective Curieuse

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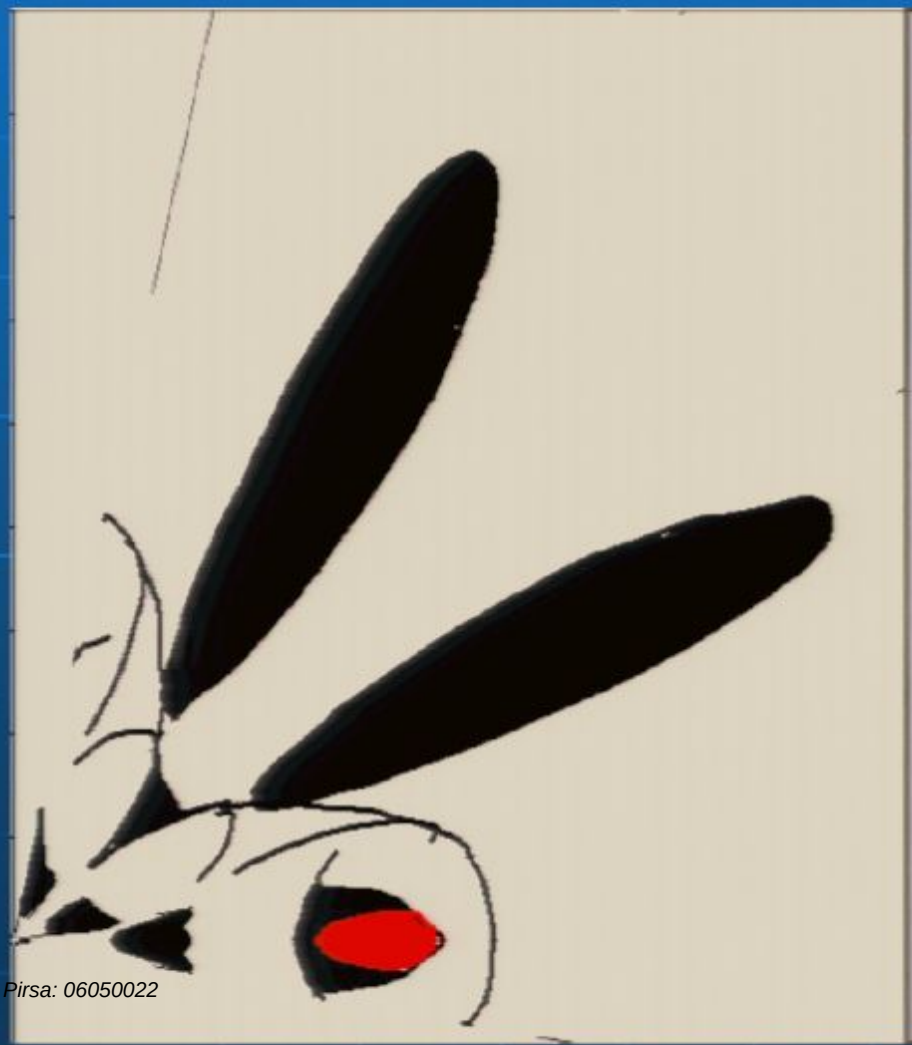

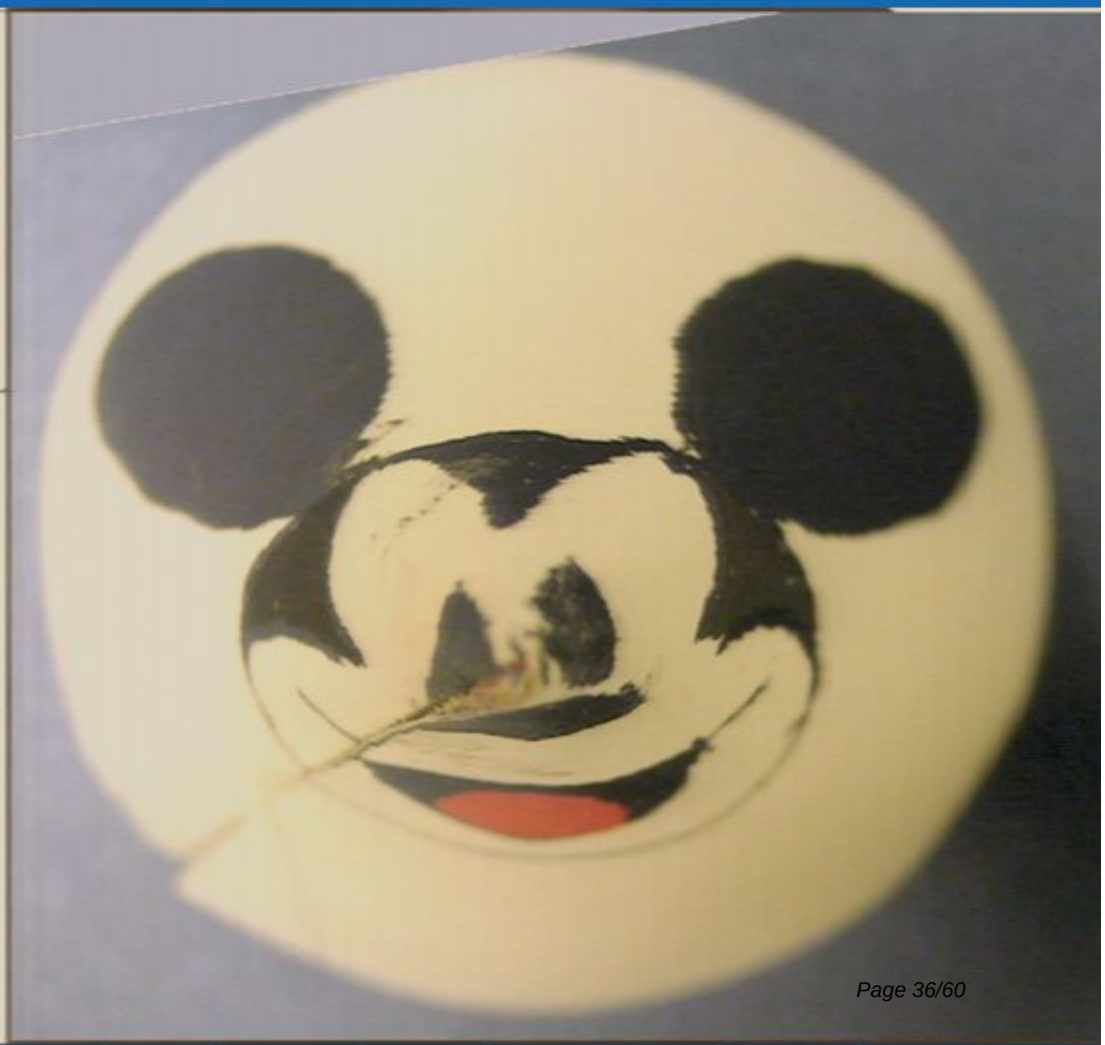

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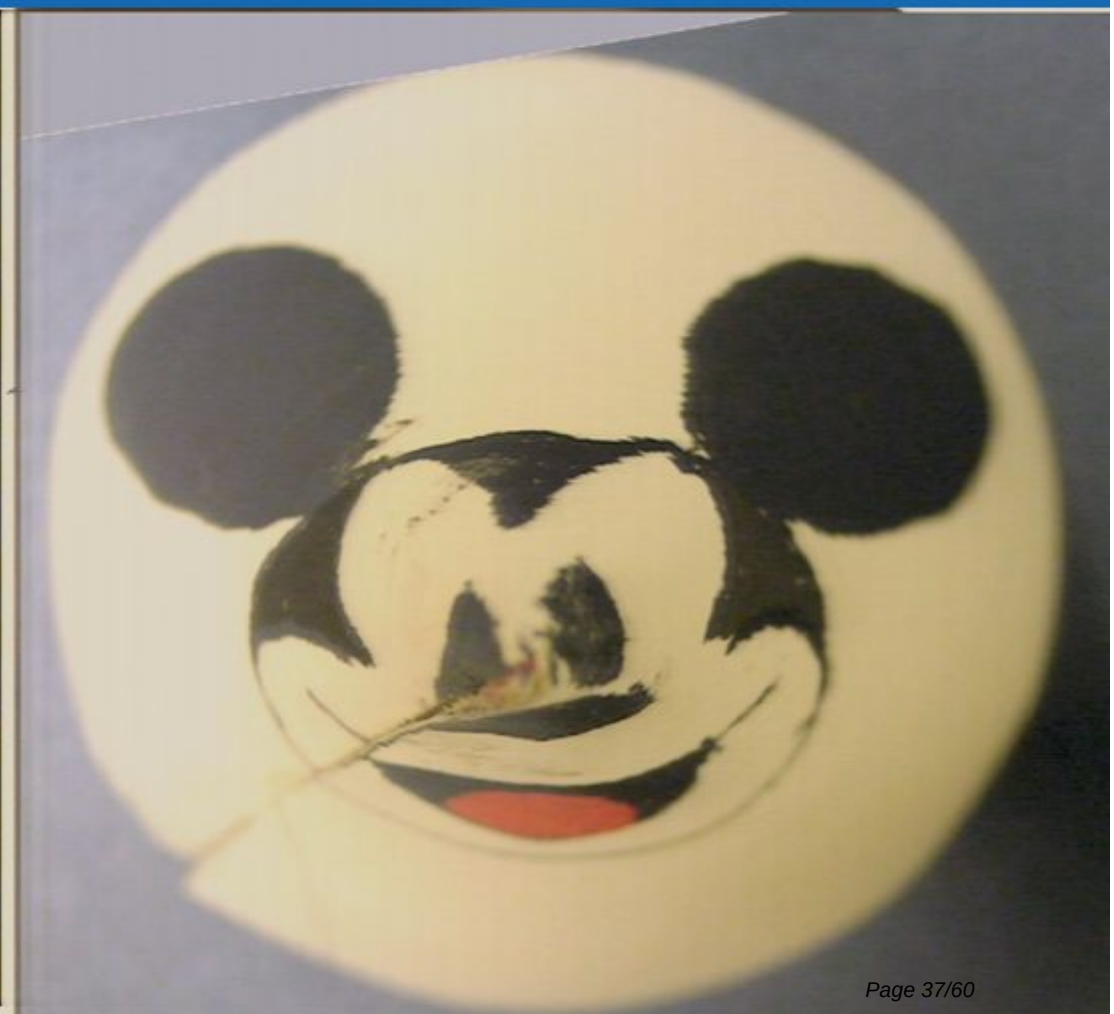

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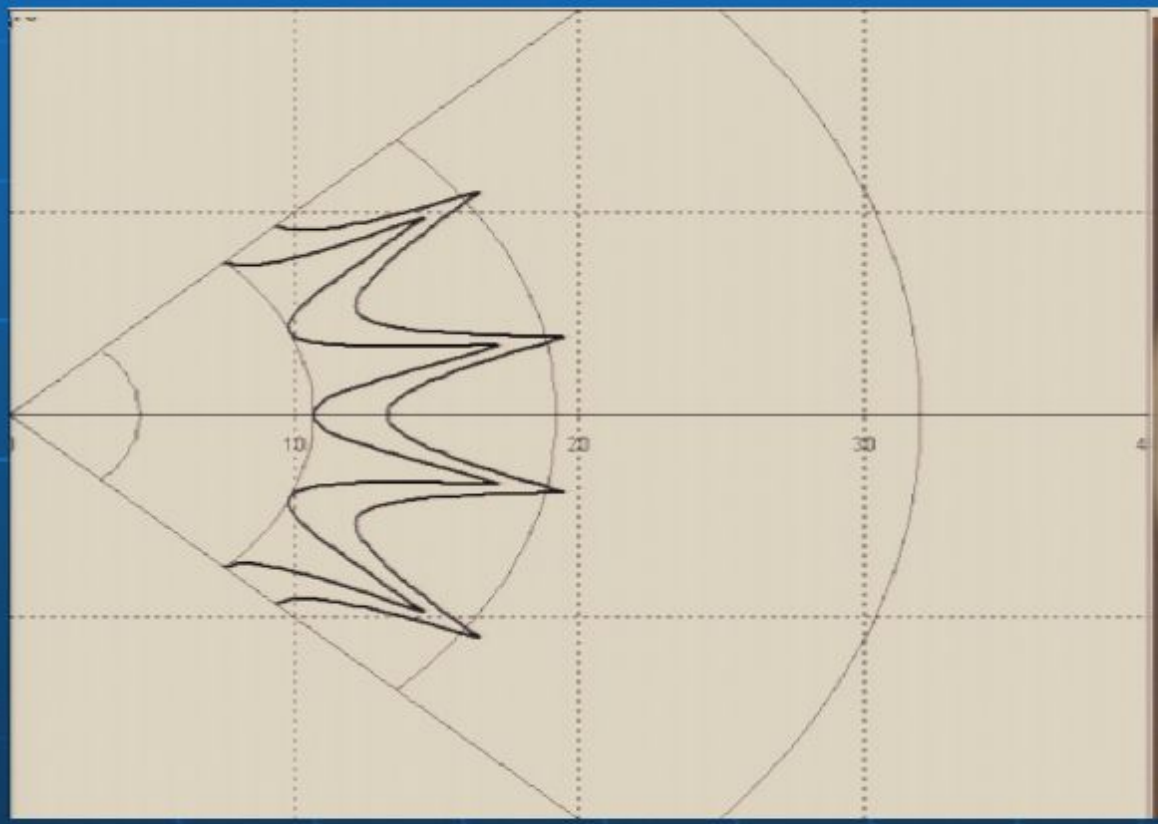

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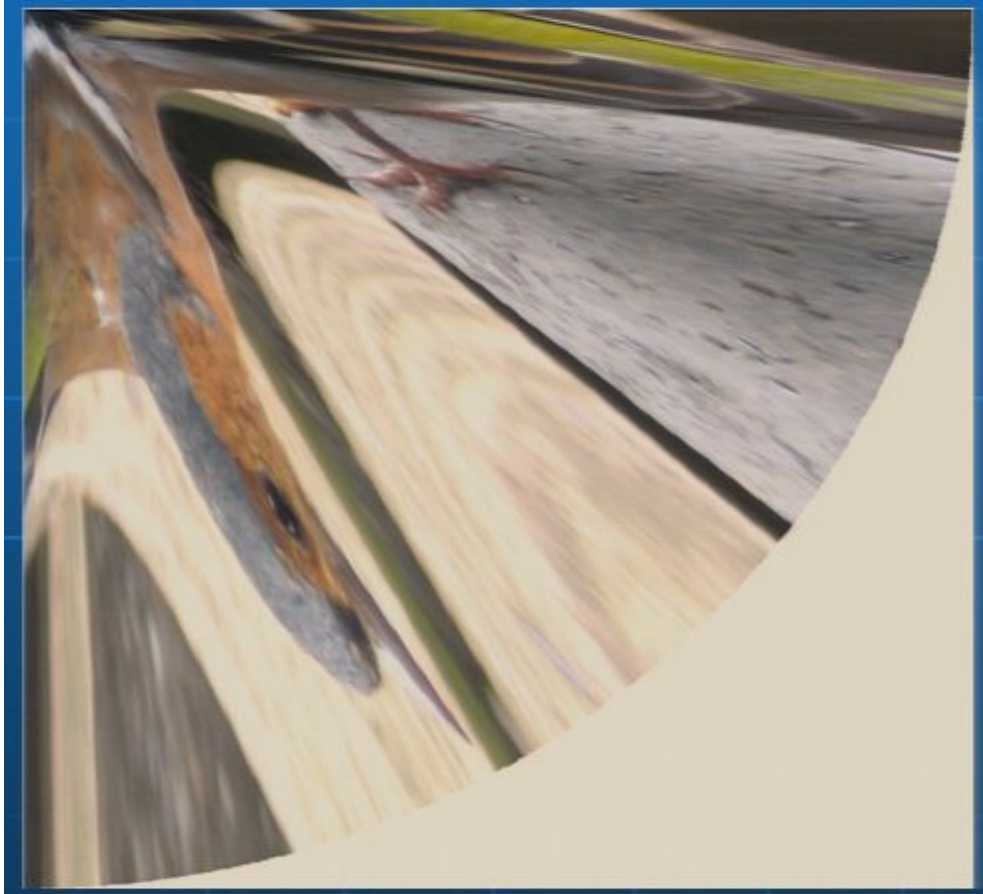
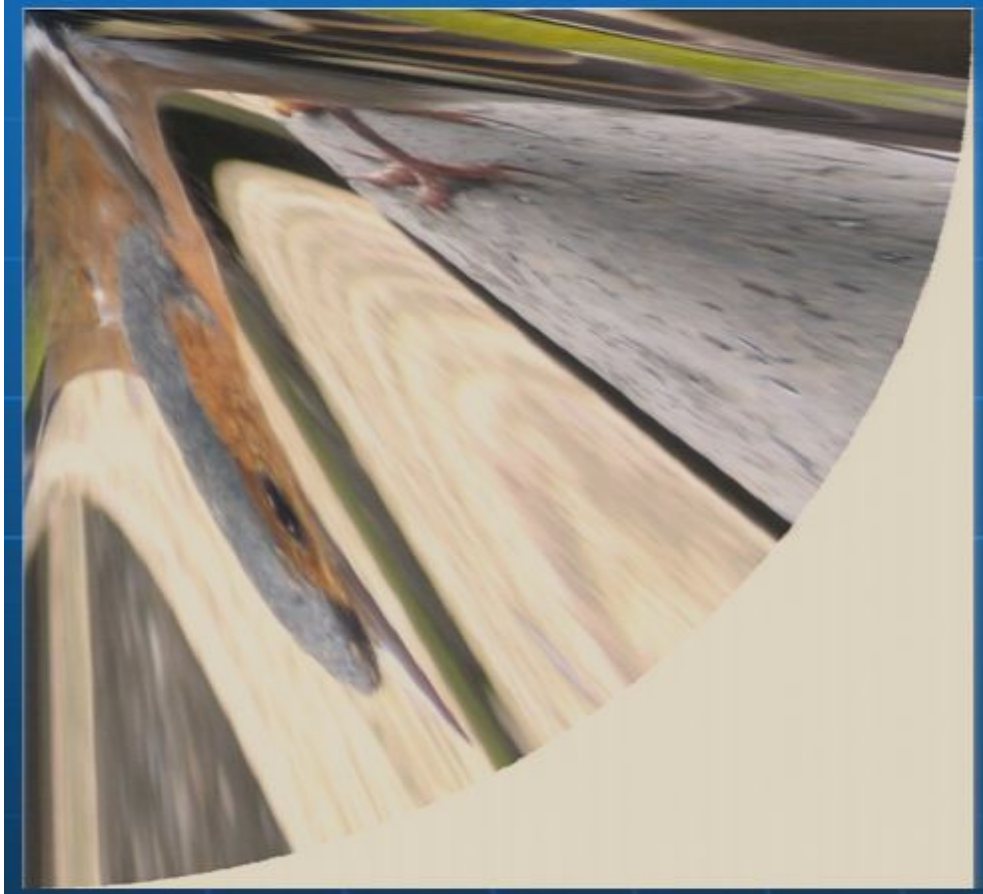
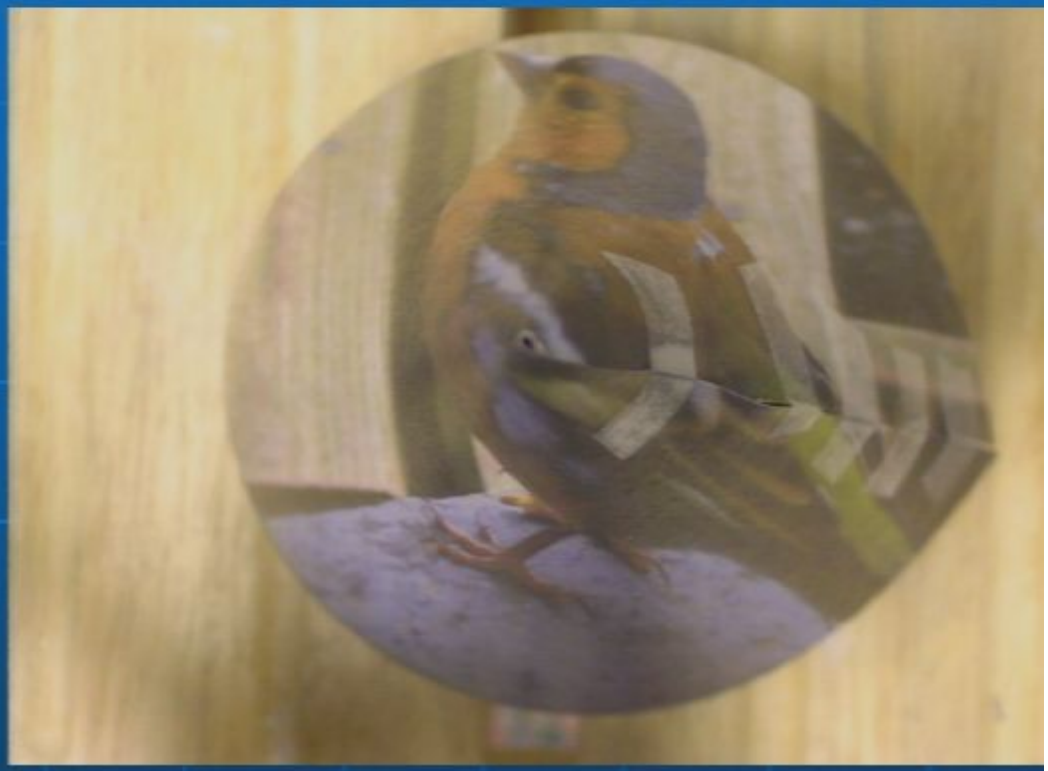


Courtesy: R. Bacon

Jean Francois Niceron and La Perspective Curieuse

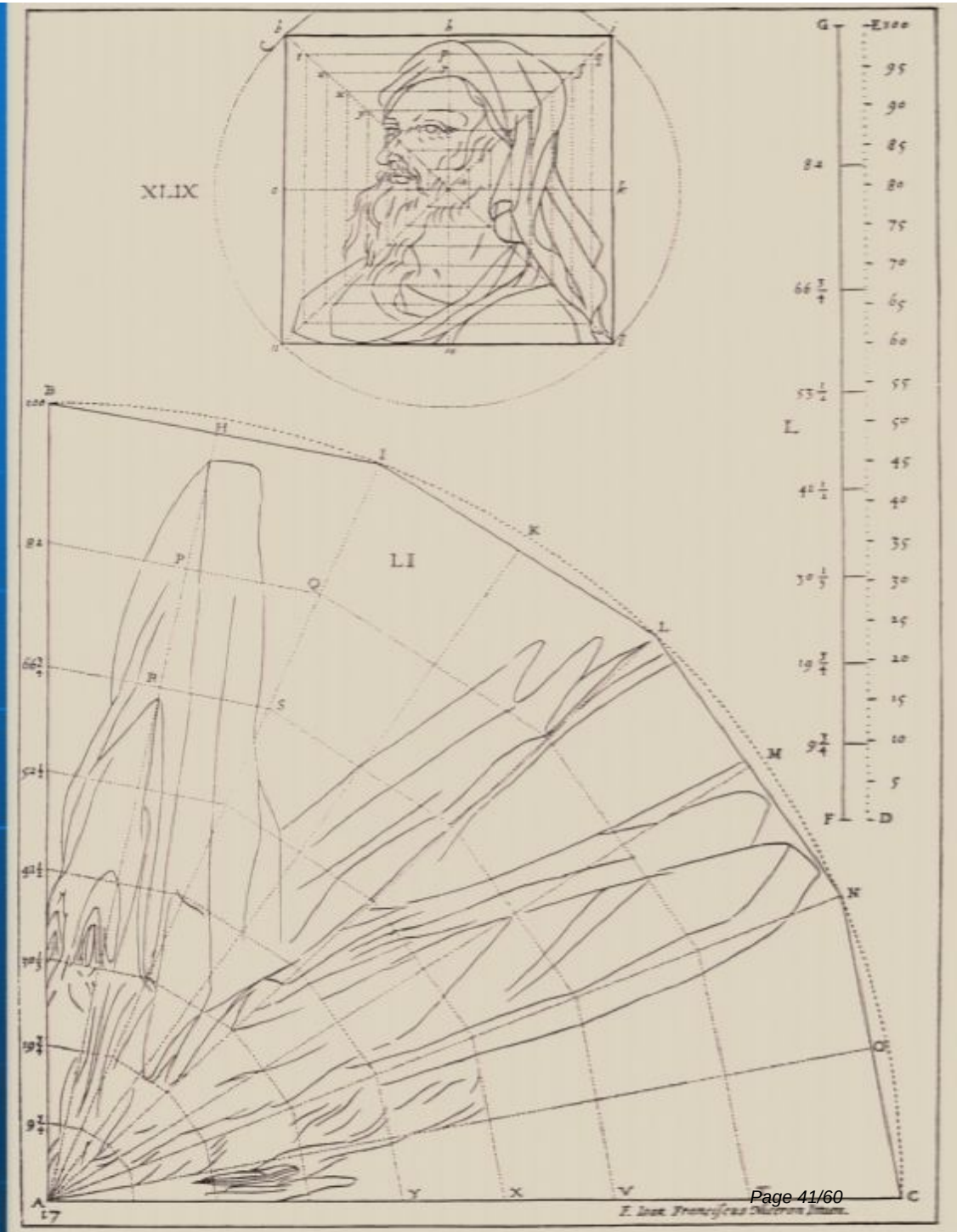




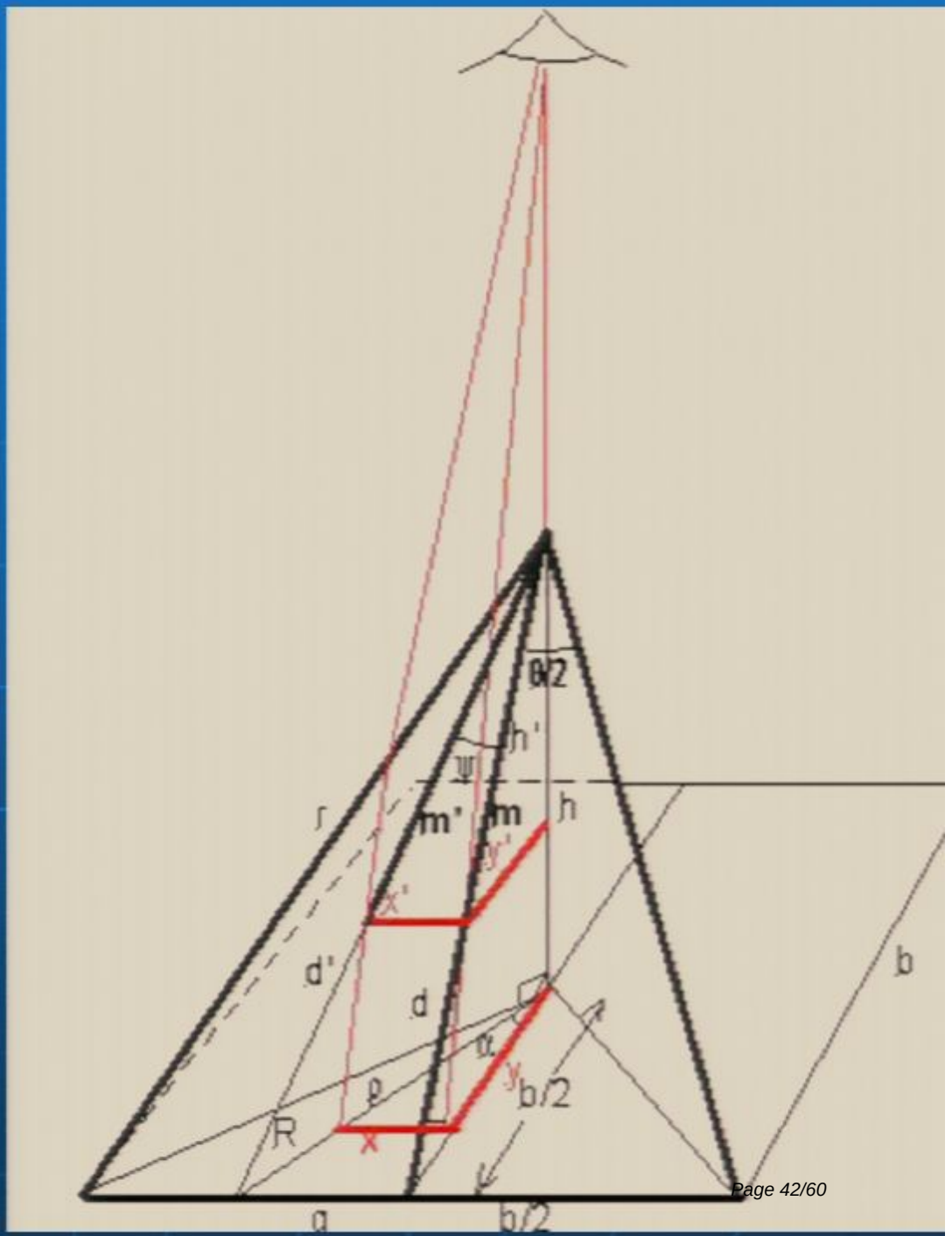
Courtesy: R. Bacon

Jean Francois Niceron and La Perspective Curieuse

Niceron proposes a similar and even more incorrect scheme for a 4-sided pyramid

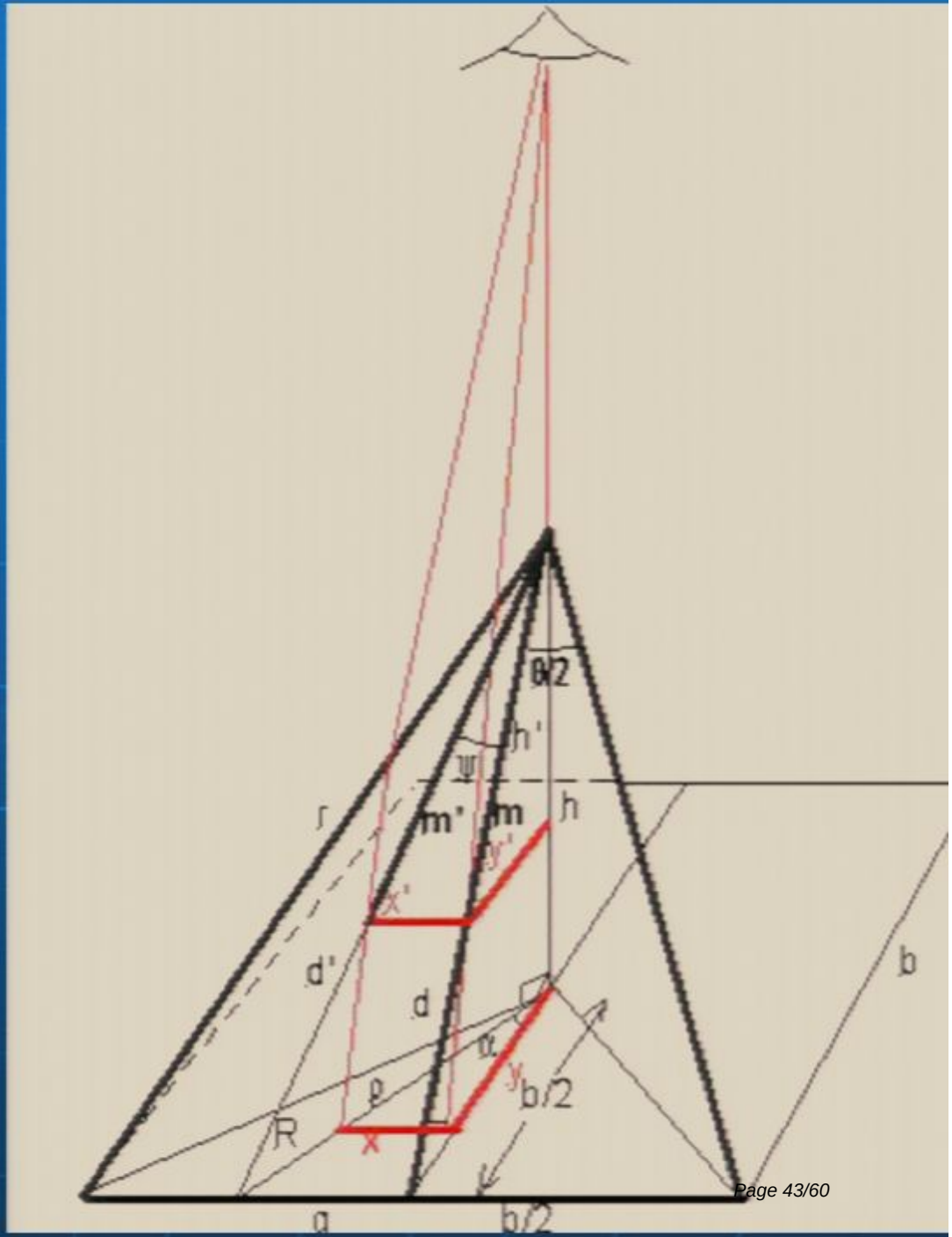


Jean Francois Niceron and La Perspective Curieuse



Jean Francois Niceron and La Perspective Curieuse

The problem can always be reduced to the same geometry as for the cone.



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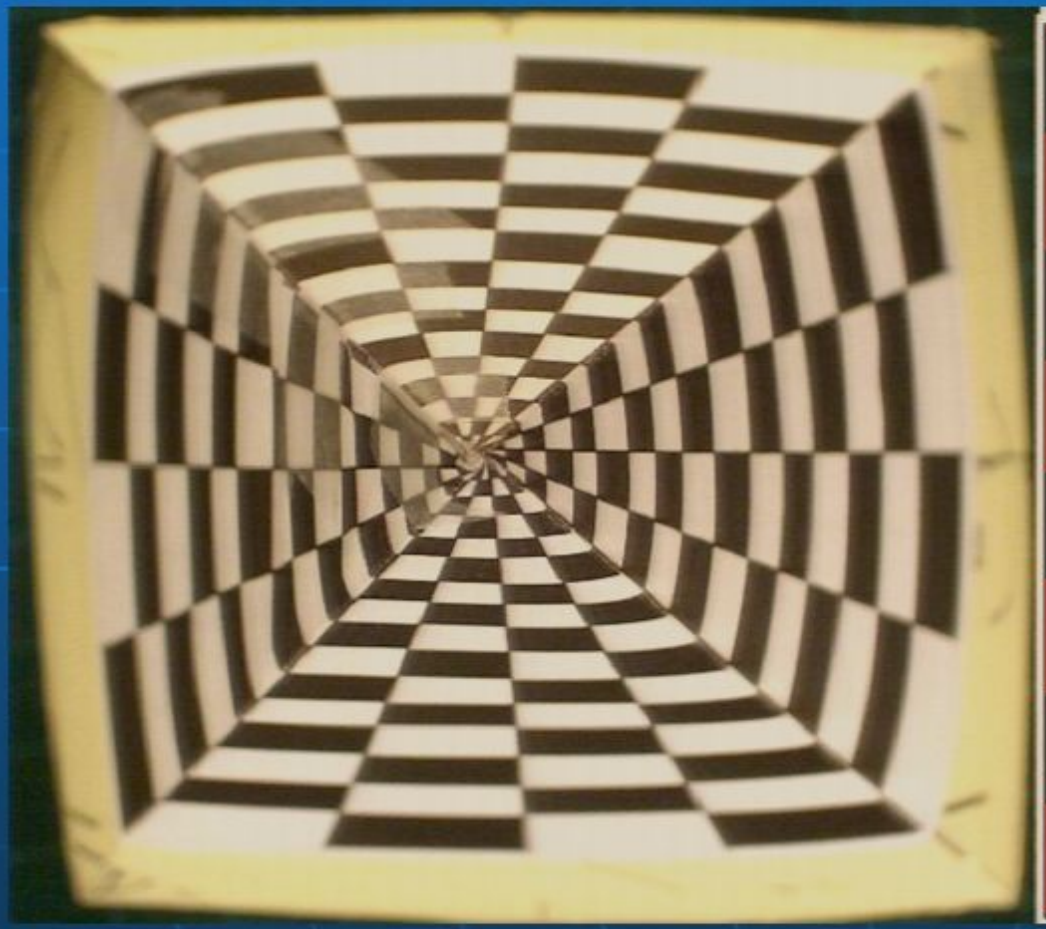
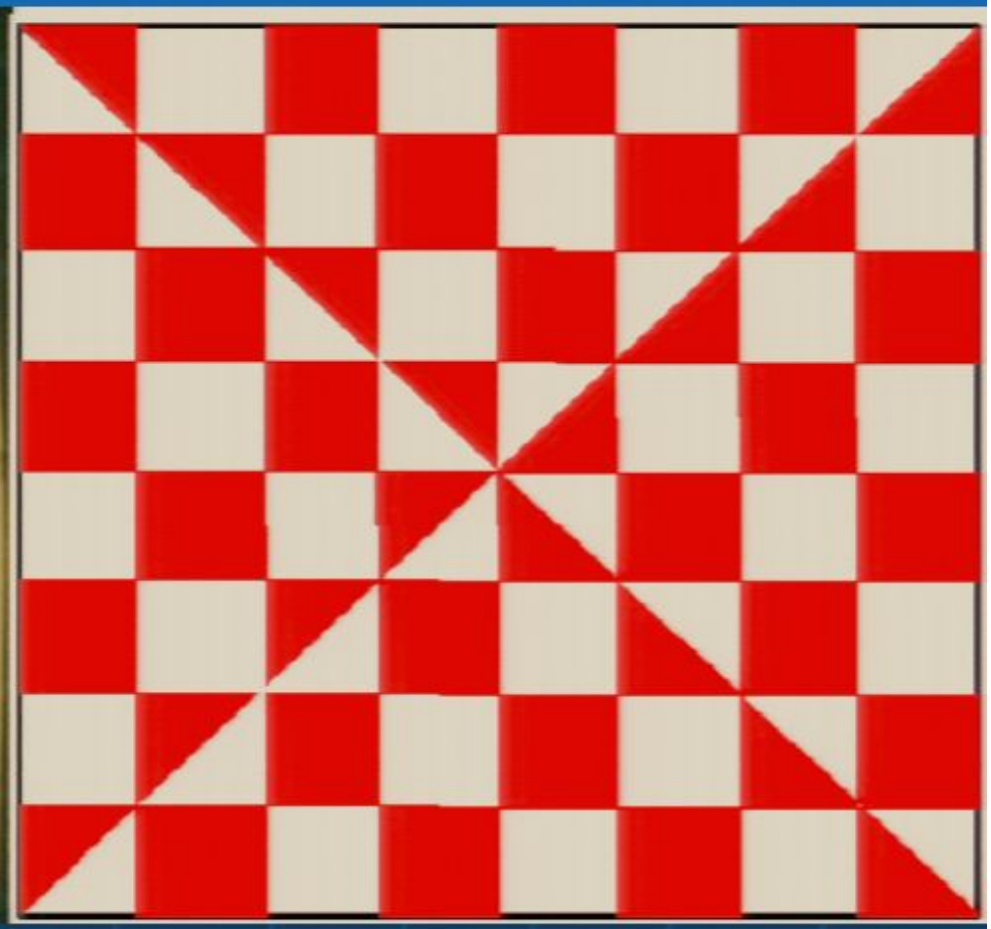
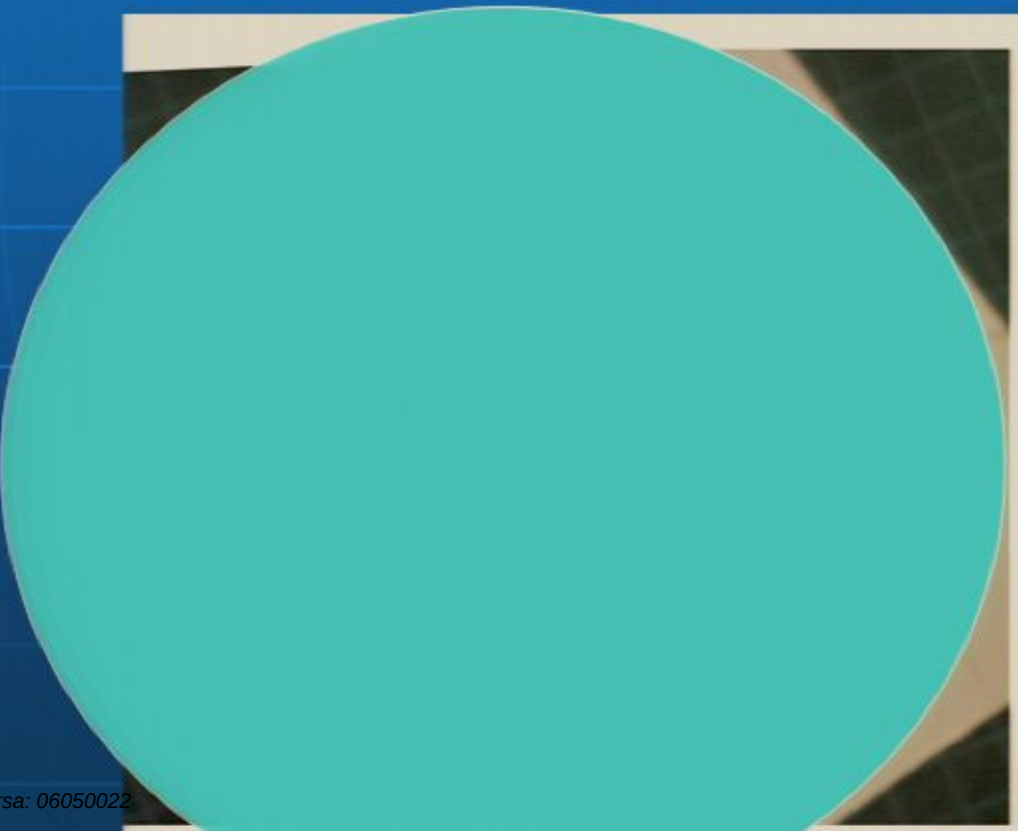
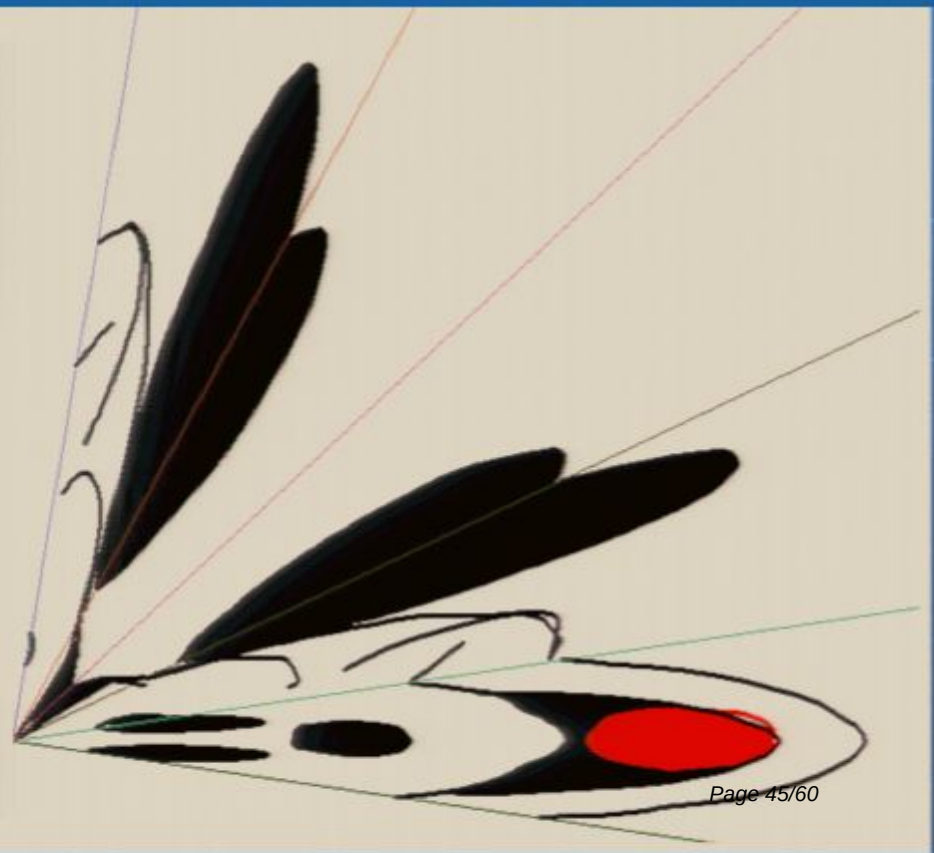




Jean Francois Niceron and La Perspective Curieuse

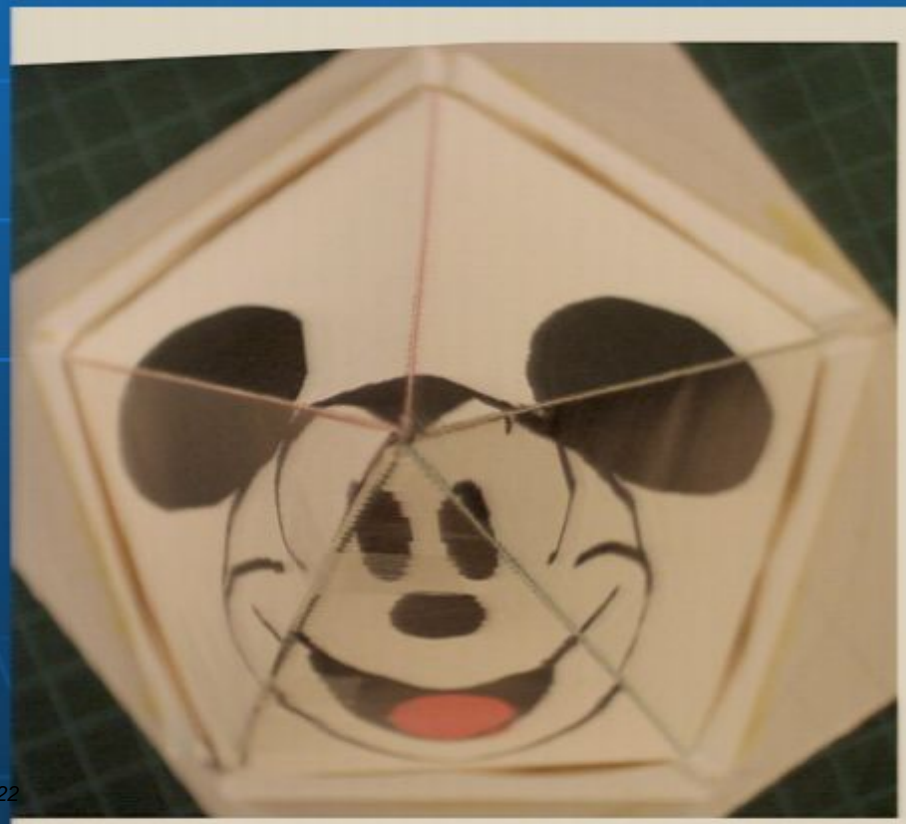
5-sided pyramid

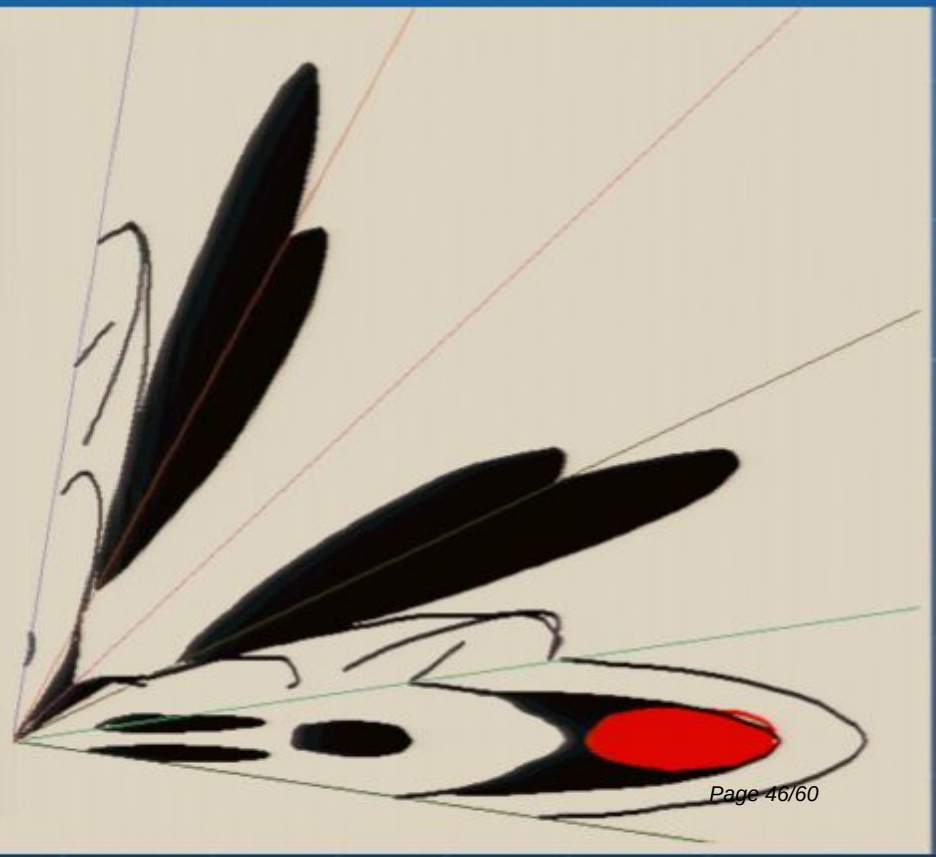




Jean Francois Niceron and La Perspective Curieuse

5-sided pyramid





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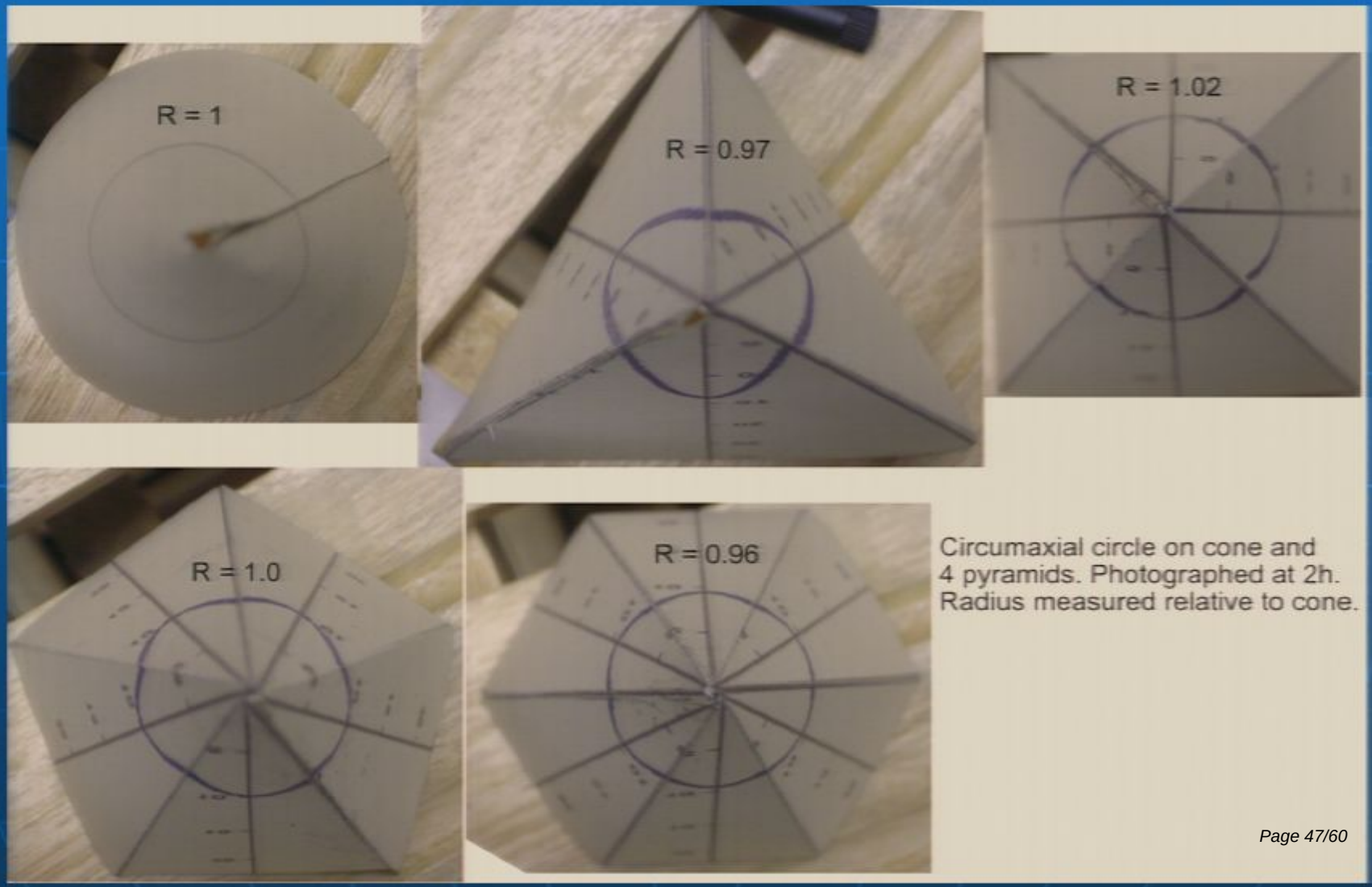


Circumaxial circle on cone and 4 pyramids. Photographed at 2h. Radius measured relative to cone.

A Brand New Puzzle

All becomes clear in anamorphic painting mystery

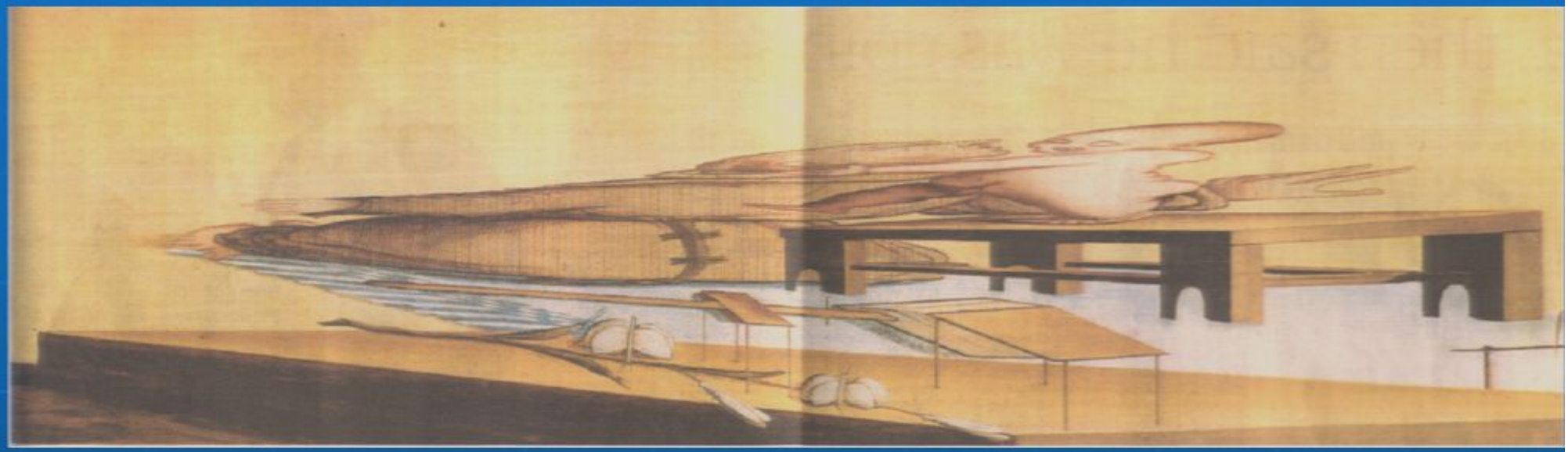
Lost 18th century painting that may have inspired Dali will go on show in London

Charlotte Higgins, Arts correspondent
Saturday April 29, 2006

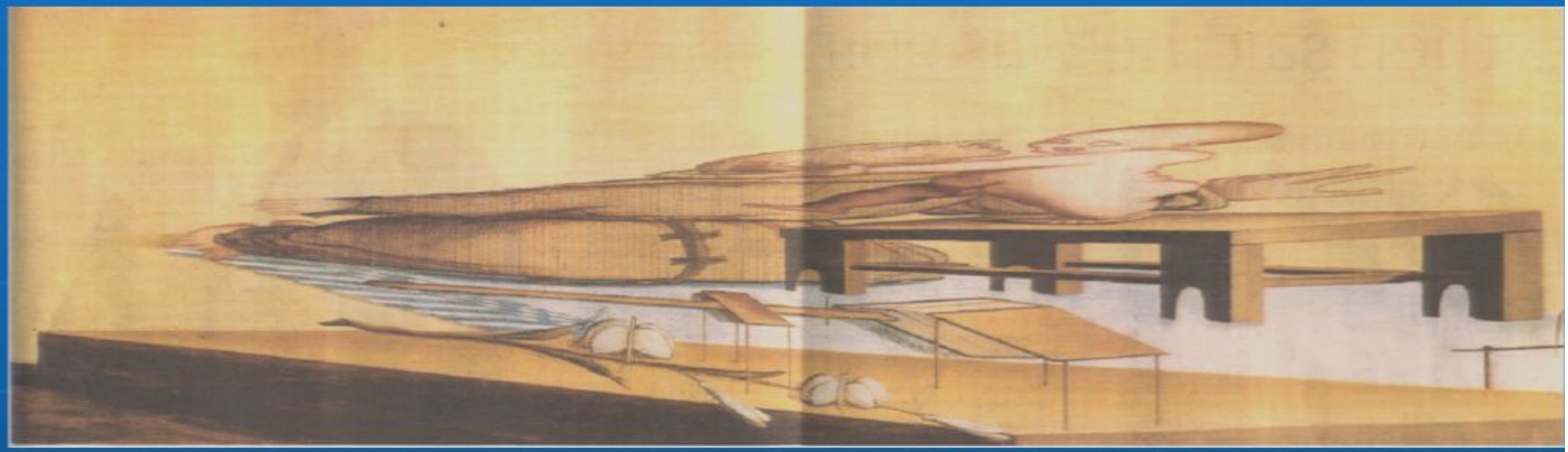
It looks like an abstract painting, perhaps involving some kind of bridge over a stretch of water and a shoreline sprinkled with puzzling objects - giant insects, table-like structures.

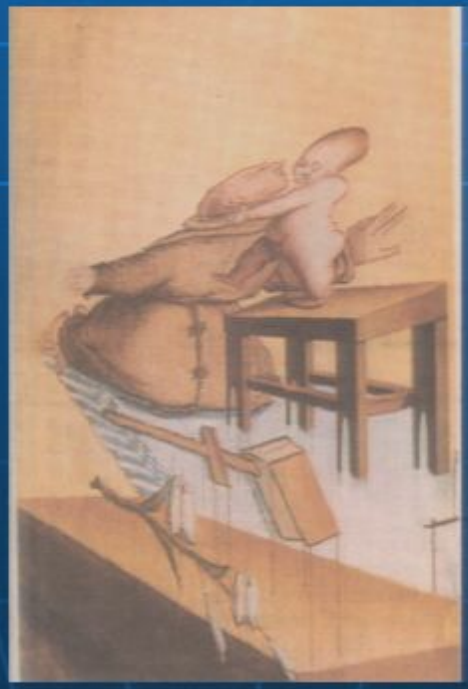
But squint a little and apply some imagination, and the image at the top of the page resolves itself into a saint dangling the infant Jesus atop a table. The giant insects become a lily lying on the floor; the table-like object in the foreground a Bible; the long, slender pier-like structure above the insects, a cross.

A Brand New Puzzle

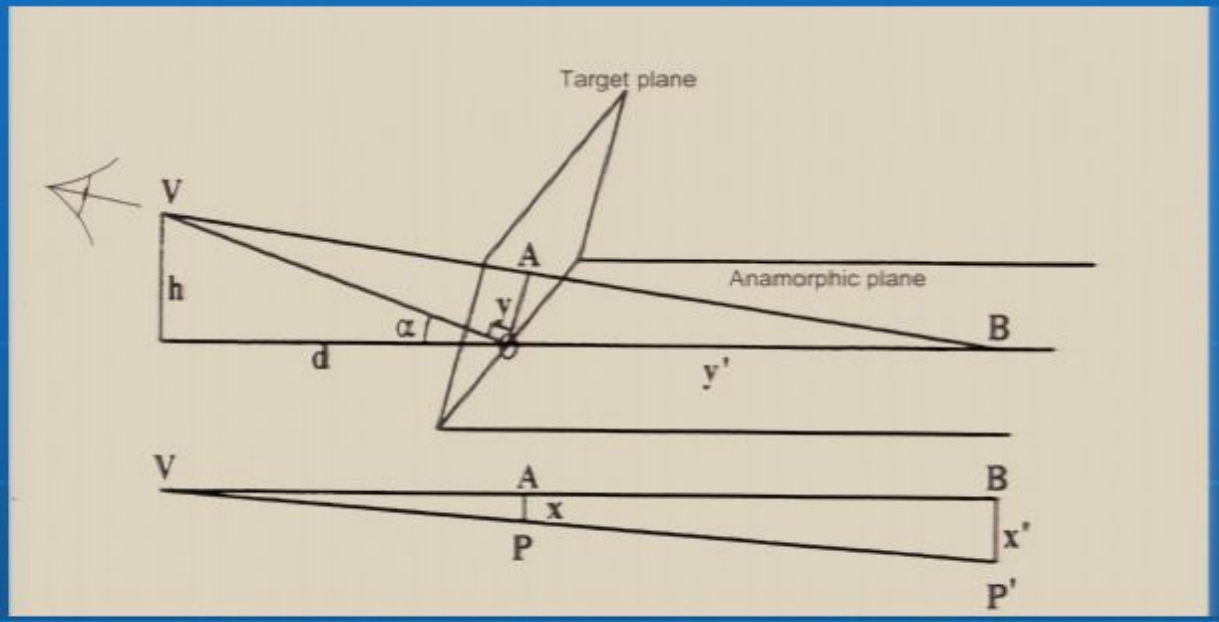


A Brand New Puzzle





A Brand New Puzzle

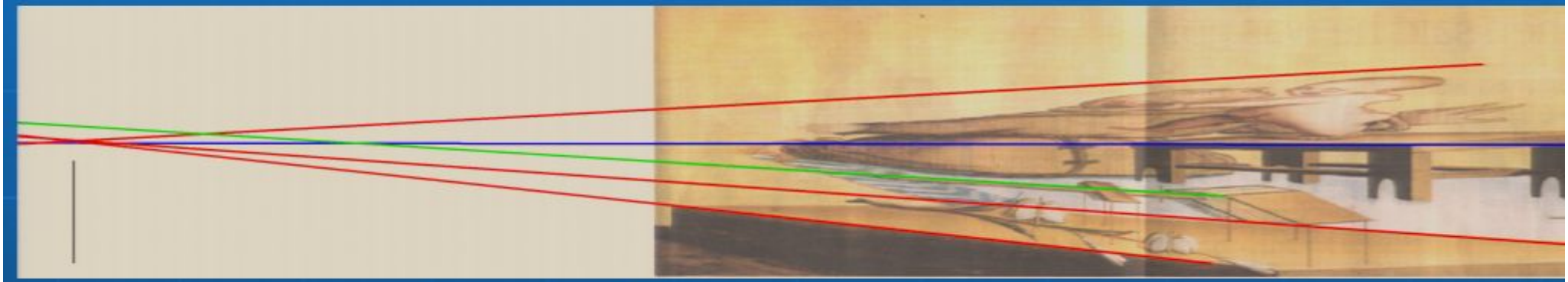


$$\frac{y/\sin\alpha}{1-(y/h)\cos\alpha} = \frac{y'\sin\alpha}{1+(y'/d)\cos^2\alpha}$$

$$\frac{x'}{\sqrt{h^2+(d+y')^2}} = \frac{x}{\sqrt{h^2+d^2+y^2}}$$

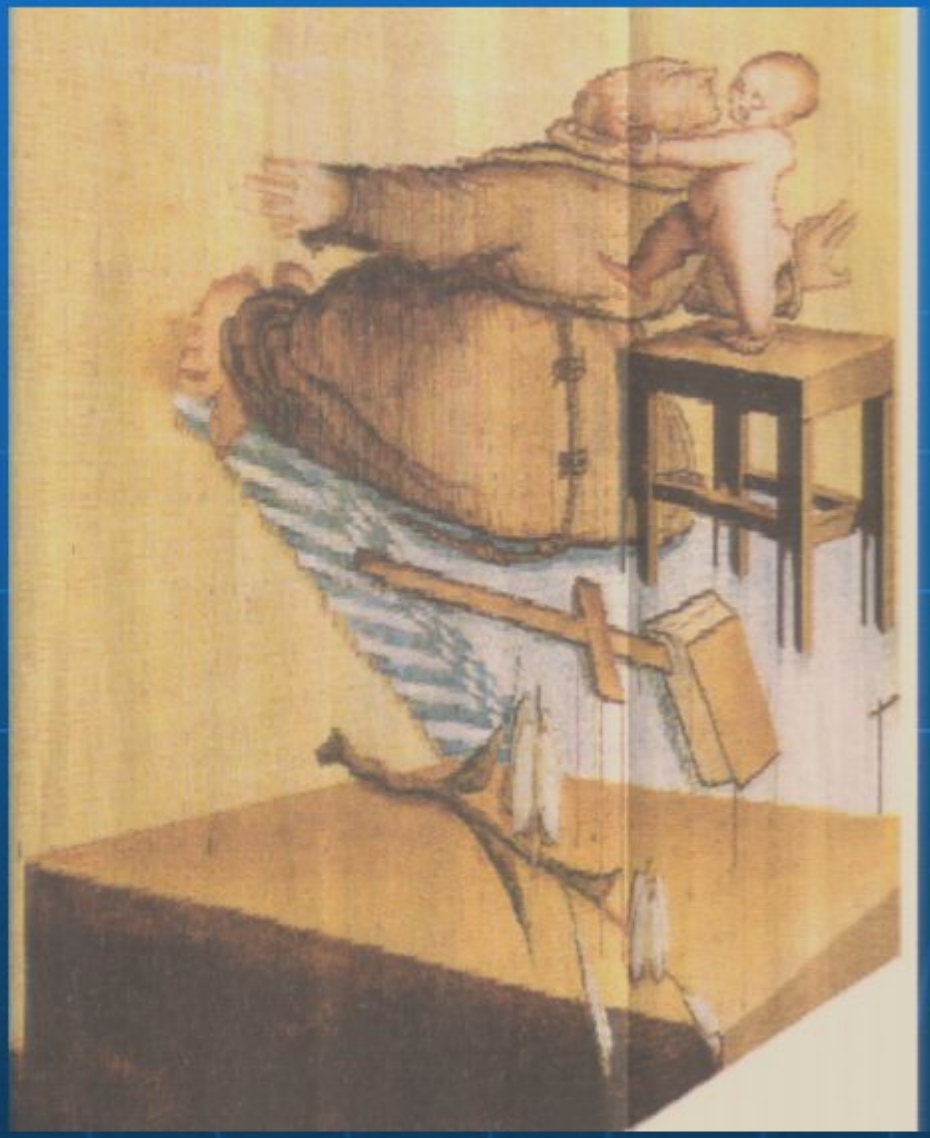
A Brand New Puzzle

Convergence to the Point of View (POV)



$\alpha = 13°$

A Brand New Puzzle



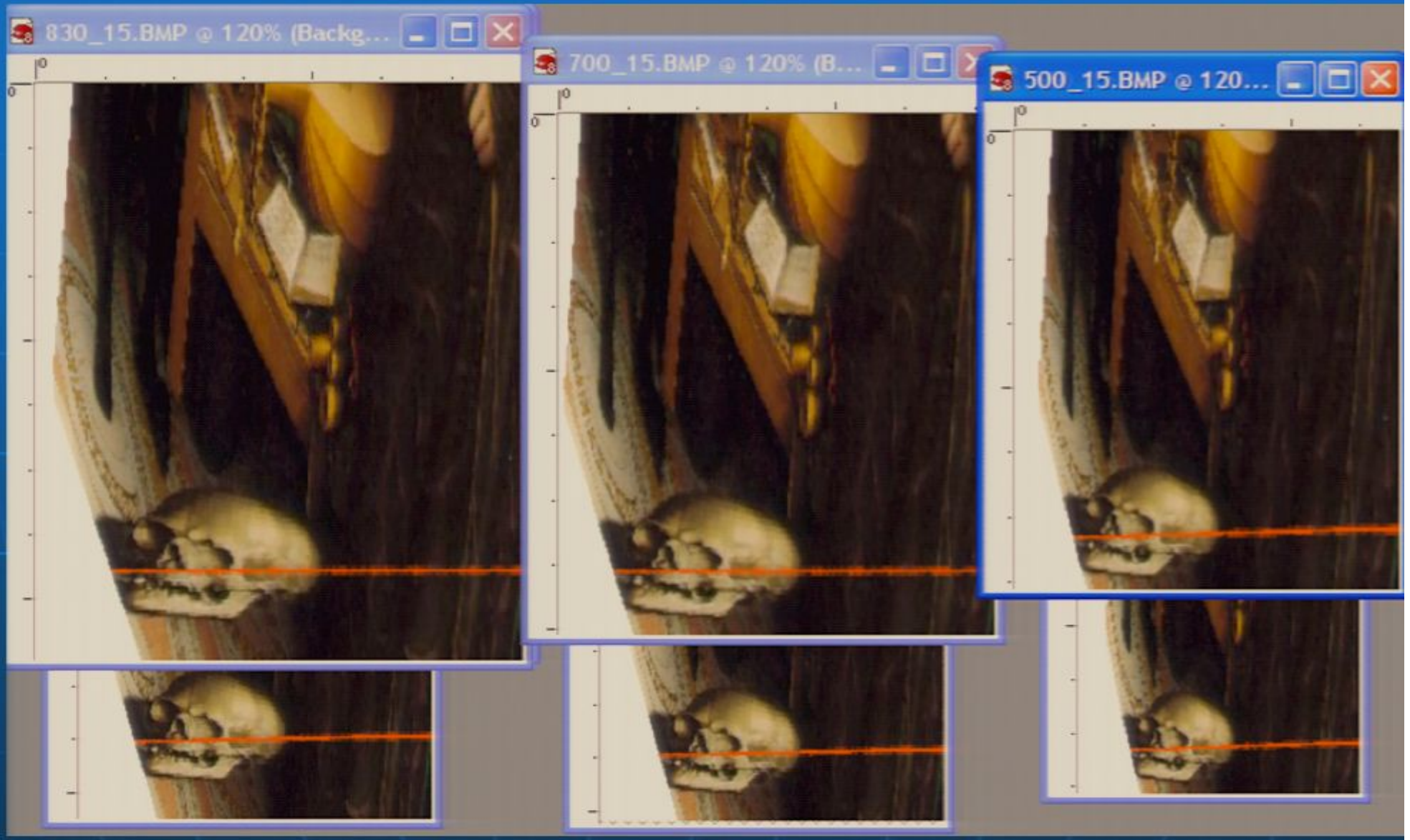
The Ambassadors Again

The Ambassadors Again

The Ambassadors Again

The Ambassadors Again

The Ambassadors Again



If you wish
you may take a
pyramidal anamorph
especially designed for you.

They are at the
front of the room.

(Some assembly is required)


THANK YOU