

# Drawing Mathematics

Some Openings

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**The Mathematical Drawing/Diagram: An Interdisciplinary Symposium**

University of Helsinki, June 2023

# Our two stops

The Roots / Mathematical Ekphrasis?

Gliding / Following / Cutting

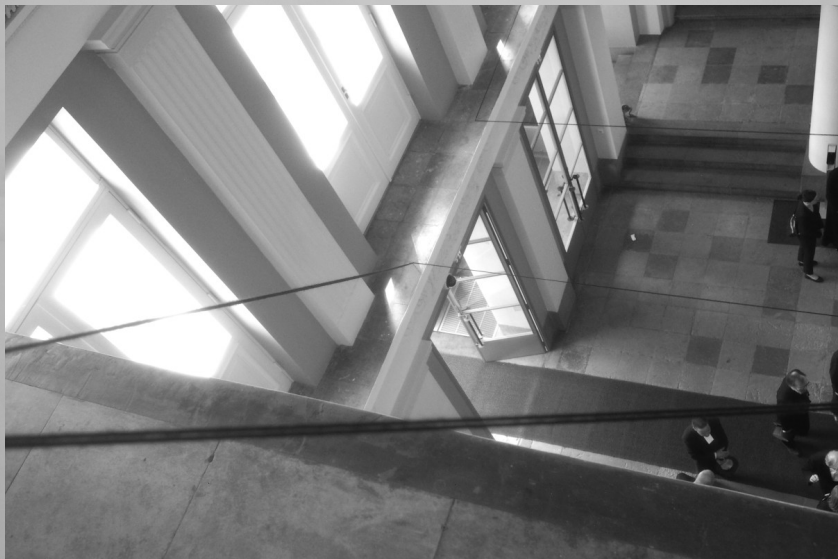
Vico/Auerbach

Poetry and Images: Cole/Winters

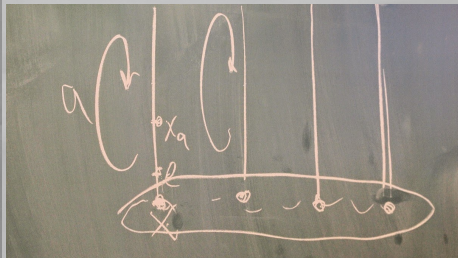
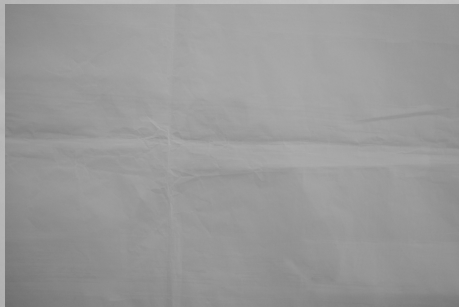
Essential incompleteness / Turning Away From Drawing

Coda of the Overture

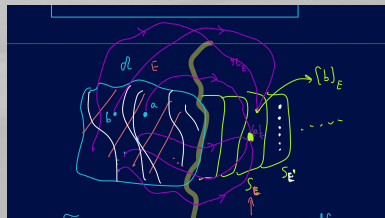
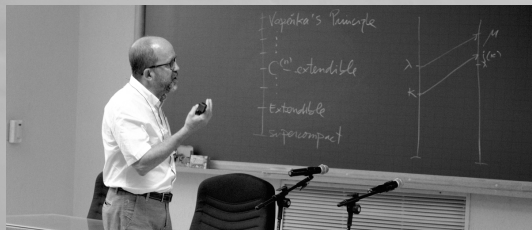
# Fred Sandback in Helsinki (9 June 2023 - Photo: AV)



# Quick gallery: Hilten / Zilber



# Quick gallery: Bagaria / AV



# Quick gallery: AV / Zilber

29

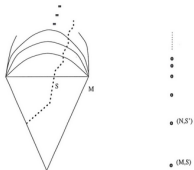
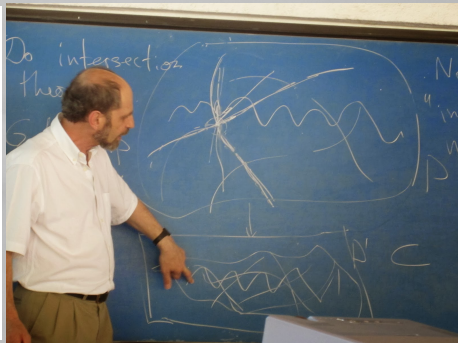


Figure 3: Unfoldables and Chains in  $(\mathcal{E}_{(\mathcal{R}(s), \mathcal{E}, S)}, \prec_s)$

The parameter  $S$  in the definition of unfoldable cardinals is crucial for them to be of any interest: as Enayat points out in [6], given any model  $M$  of  $ZF$  such



## Quick gallery: Lartigue / Cerro Azul



## Two roots: gliding, following (and cutting)

- **DRAW:** Proto-IE: \*dhreg'- To draw, glide. Oldest form \*dhreg-, becoming \*dhreg- drink - drench - drown
- **deSIGN:** \*sekw-no-, from root \*sekw- (1) "to follow." De Vaan has it from PIE \*sekh-no- "cut," from PIE root \*sek- "to cut", sakin (Hebr., Aram.)



gliding / cutting / following



Lartigue - Excerpt from Grises (Grays)

## Framing Mimesis

Auerbach opens his Mimesis (written in exile in Istanbul during World War II) by a comparison of the *Odyssey* and the Abraham and Isaac passage in Genesis.

Whereas in the *Odyssey* descriptions of places, times, meals served in banquets, motivations and details (e.g. Odysseus' old scar, recognized by the old woman who worked for his family when he has come back, still unannounced) are detailed, in Genesis the story of Abraham leading his son Isaac to sacrifice is left bare:

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Whence? Beersheva? We don't know. Where is Moriah? Near Jerusalem? We don't know! They walk for three days, they leave in the morning. No details on what they eat, what Isaac says, what Abraham thinks.

## Framing Mimesis

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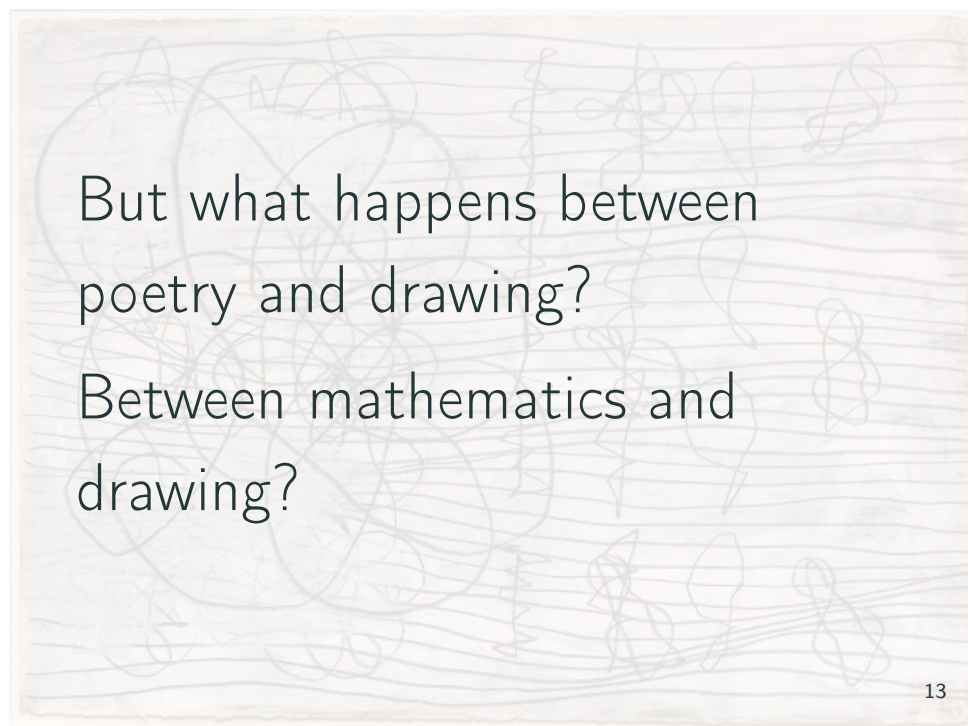
Yet, says Auerbach, by the power of its bareness, its barrenness, the story conveys an extremely powerful PLACE, a psychological PLACE, a place in consciousness still unfolding. . .

Reality is made more powerful by the bareness.

As in mathematical drawings. . .

# Ekphrasis



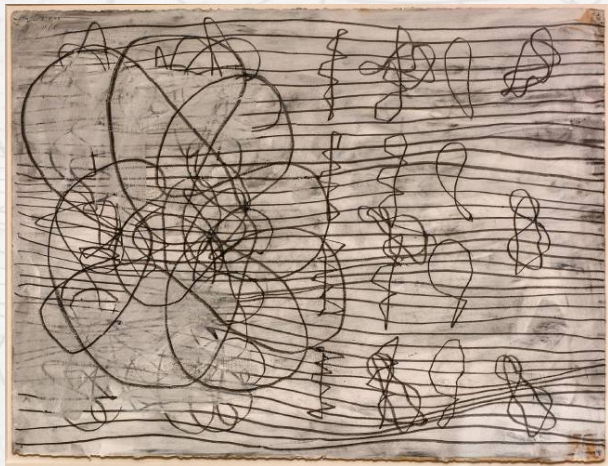


But what happens between  
poetry and drawing?

Between mathematics and  
drawing?

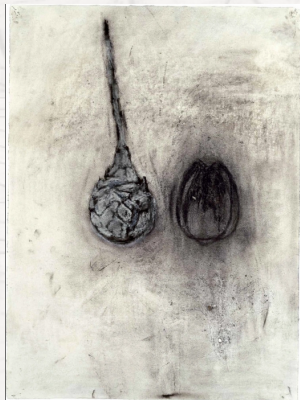


## Peter Cole draws his poems from Winters' drawings



## Peter Cole, on ekphrasis

*"They seem like knots, or a strange music's notes on a staff, in a whorl, like petals opening, to be heard. Something scored. Scars or sores. A soaring. Drawing words. It is the immediacy of ekphrasis that draws me. The contact. I realize it's odd to turn to another medium for a sense of immediacy. And yet, as with translation, that palpable sense of relation compels (completes?). And that's what I'm after — to speak into or through the drawings. To be dyed by their material qualities, as I feel them coming through me, or bringing me into their matrix. To take on their tinge."*



*"The smudged sounds give rise to lines, a syntax like synapses. Grappa in its capillary action. The narrow descent paradoxically widens out and lifts along a spectrum of endless adjacencies, in every direction, and every inflection," as Levi Yitzhak of Berditchev sang, in his gentle Yiddish, 'Still You. However You. Only You. Every You ...'"*



*"You, the viewer? The reader?  
Whoever you are, and where ...  
Drawing really does — draw us in  
(to the object rendered and the time  
taken) and out (of ourselves to further  
seeing and other surfaces, even souls,  
or simple tensility sensed)."*

Peter Cole - On Being Drawn

# Plan

The Roots / Mathematical Ekphrasis?

Gliding / Following / Cutting

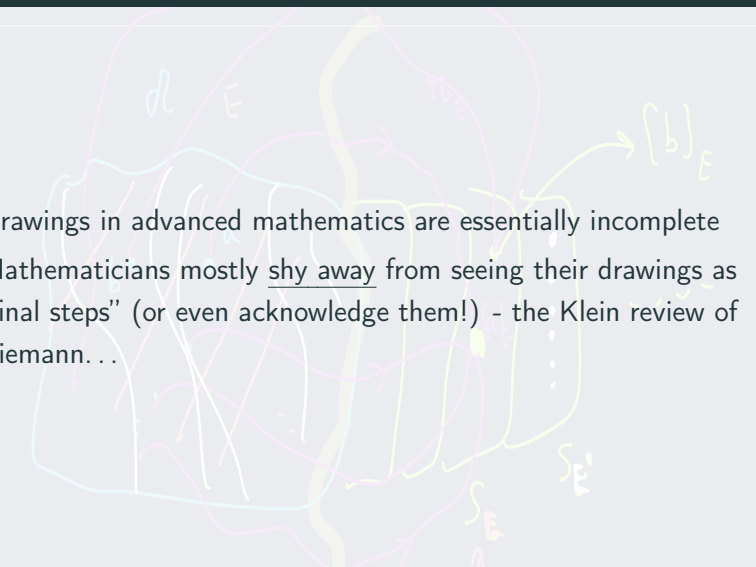
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Essential incompleteness / Turning Away From Drawing

Coda of the Overture

# Essential incompleteness + Shying Away from Showing: two axioms?

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- Drawings in advanced mathematics are essentially incomplete
  - Mathematicians mostly shy away from seeing their drawings as “final steps” (or even acknowledge them!) - the Klein review of Riemann...

## Back to the problem - some issues

Peter Cole evokes the closeness to death in the act of translation, and makes it an essential part of drawing.

Syntax like synapses truly seems to cut to the heart of drawing.

Capillary action (capillary mathematics?). The narrow descent (of what? lymph? a vital fluid? information?) and the adjacencies, in every direction, and every inflection (Leibniz-like theme here?)

The You from Levi Yitzhak of Berdichev, possibly the viewer, the reader, the mathematician who hears a proof explained.

## Back to the problem - Coda (of the Overture)

And drawing draws us in and out (to the object rendered, the time! and of ourselves to further seeing). . . Drawing and undrawing, drawing and erasing constantly, capillary action. How many times does a mathematician draw/redraw/undraw/redraw a proof until she sees it? Until she is drawn in-to the proof/object and the time taken, until she is drawn out to other surfaces? What is tensility in mathematics? What is capillarity?



# Ekphrasis?

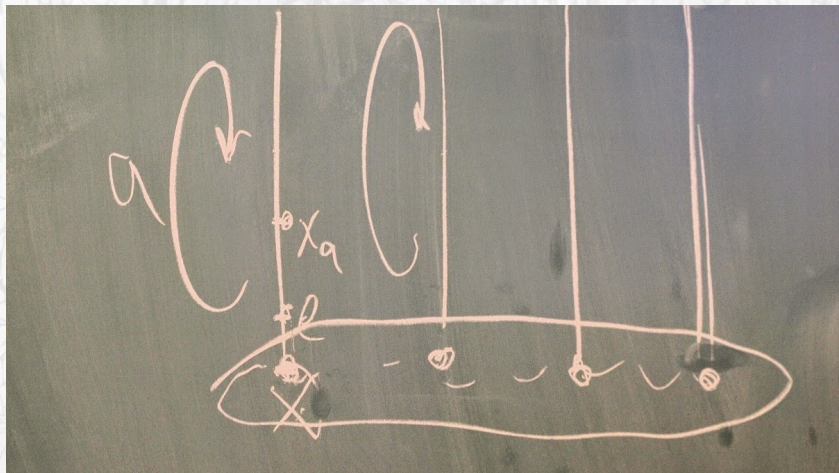
Is mathematical ekphrasis even possible?

How does grounding operate between mathematics and its drawings?

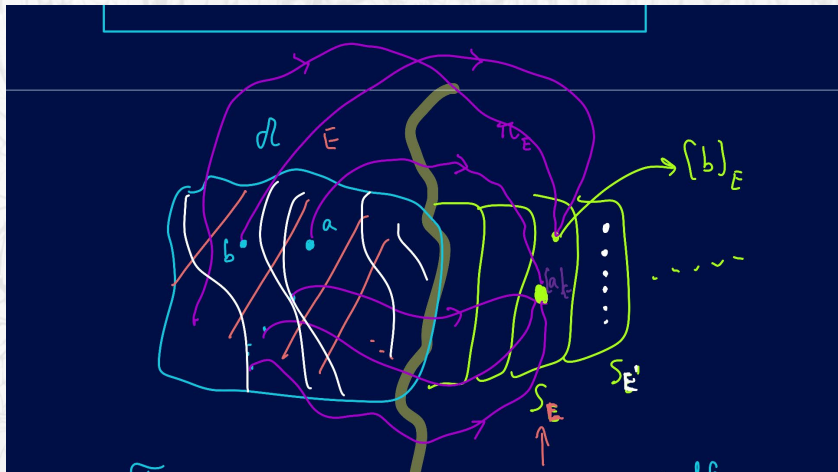
Back to the quick gallery



## Back to the quick gallery



# Back to the quick gallery



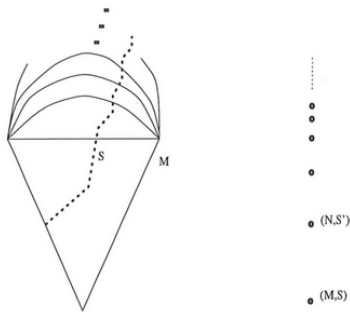
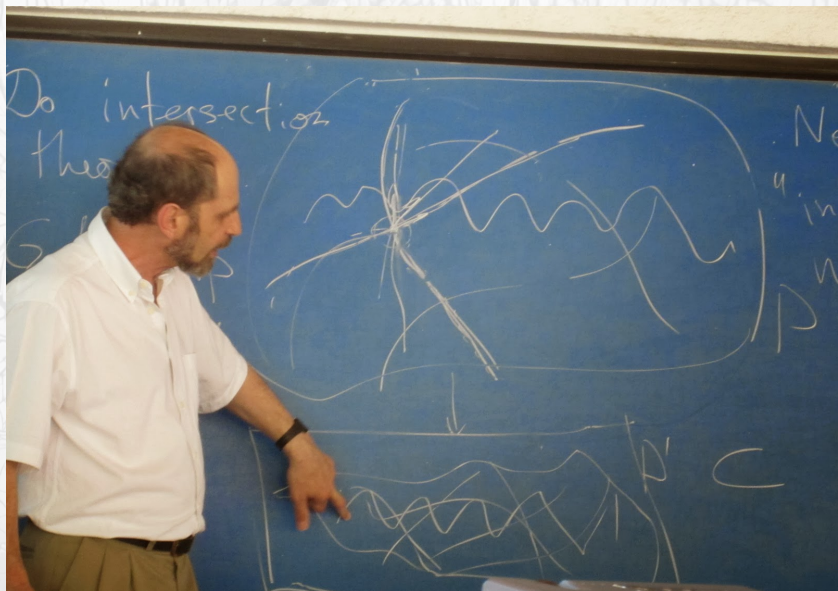


Figure 3: Unfoldables and Chains in  $(\mathcal{E}_{(\mathcal{R}(\kappa), \epsilon, S)}, \prec_e)$

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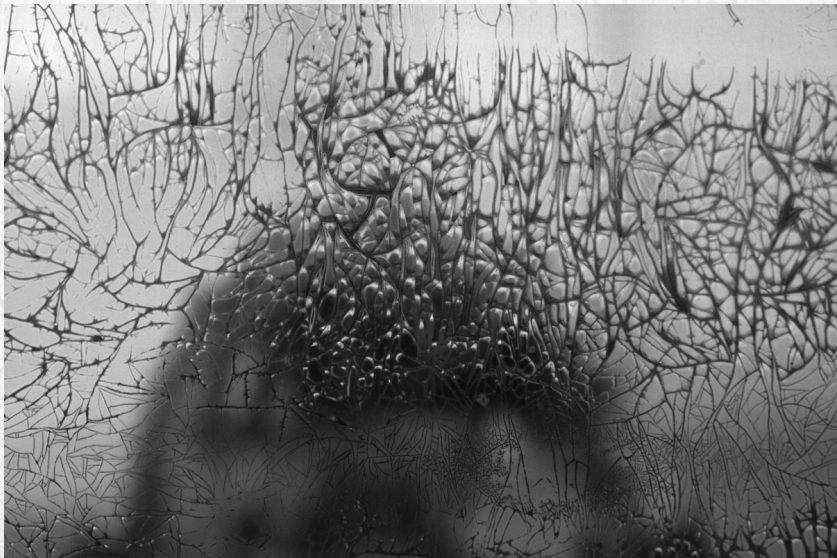


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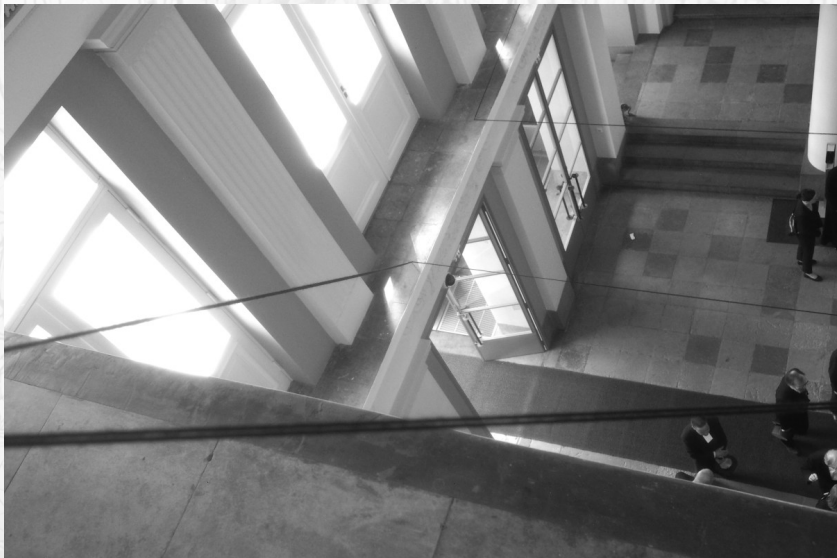




## Back to the quick gallery



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# The floor is open!



Ia



Ib

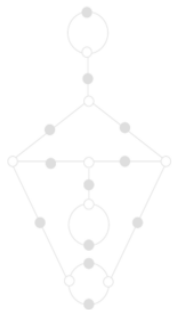


IIa



IIb

# Thank you!



IIIa



IIIb



IIIc



IV



III d