# Matematik: Videnskaben om det uendelige

2

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# Den græske matematik

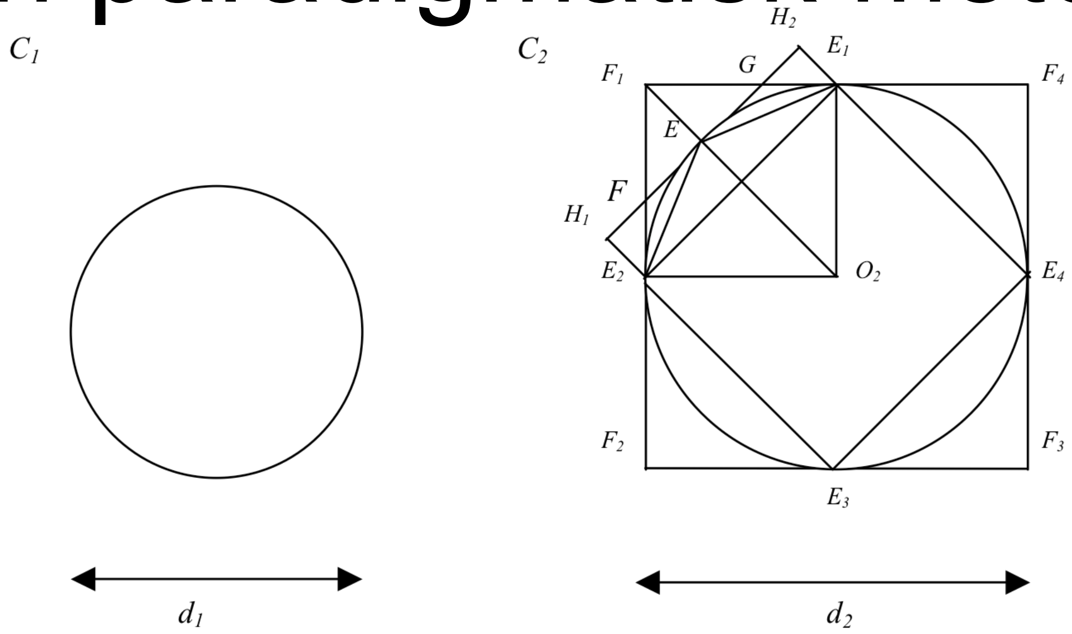
- Endelige geometriske objekter er matematikkens objekter

- Kun det potentielt uendelige accepteres
  - Objekter
  - Processer

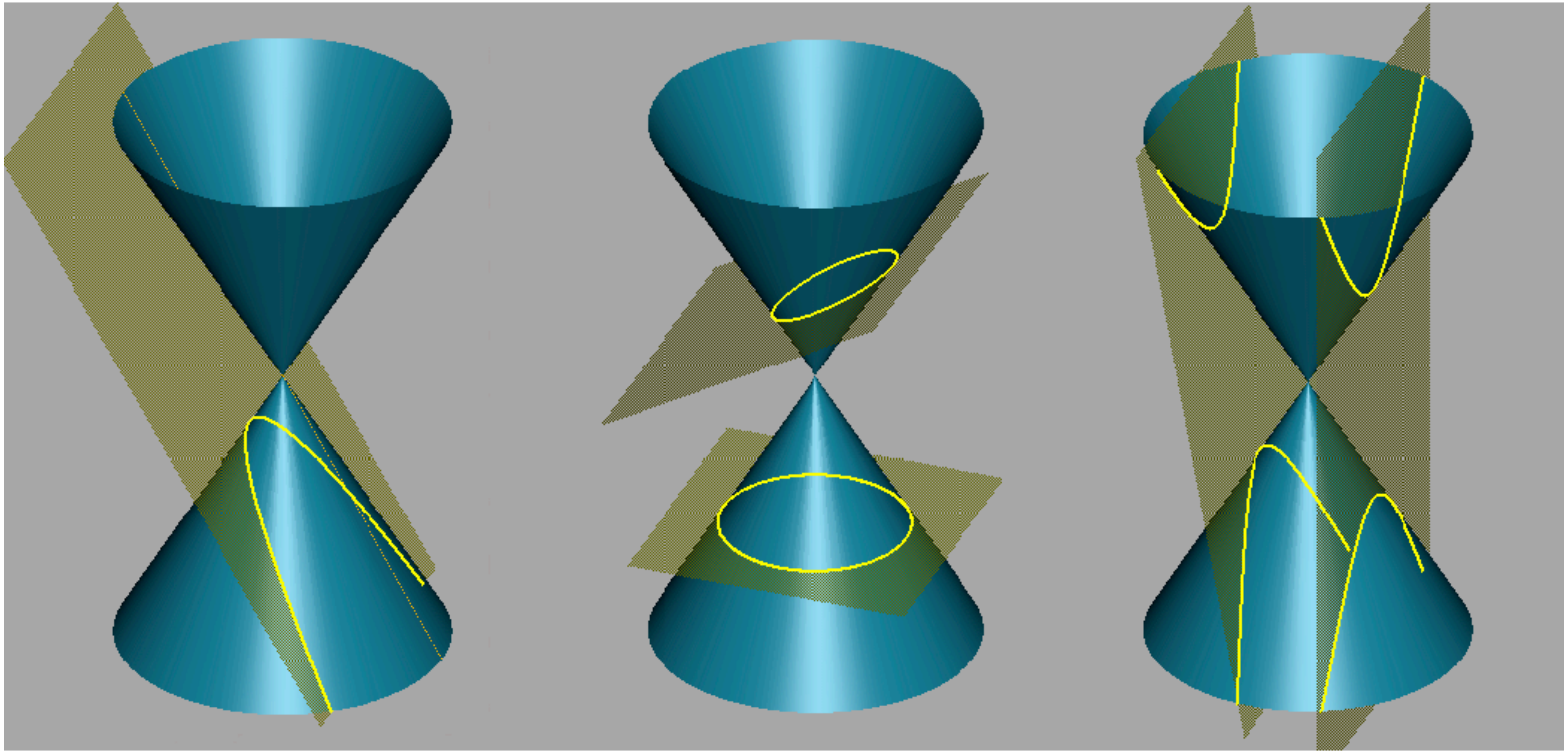
- Det fysiske er abstraheret væk i matematikken

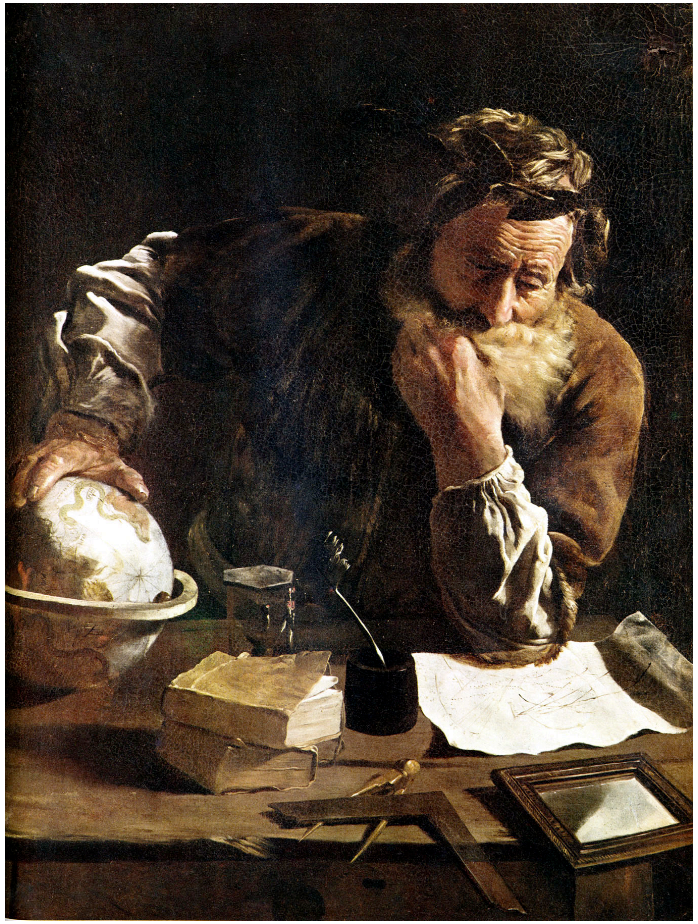
Filosofien havde en indflydelse på matematikken

# En paradigmatisk metode




Der findes et areal $B = C_2$ sådan at $$\frac{C_1}{C_2} = \frac{d_1^2}{d_2^2}$$





THE WORKS OF

# *Archimedes*

EDITED IN MODERN NOTATION

WITH INTRODUCTORY CHAPTERS BY

*T. L. Heath*

WITH A SUPPLEMENT

*The Method of Archimedes*

RECENTLY DISCOVERED BY HEIBERG

NEW YORK

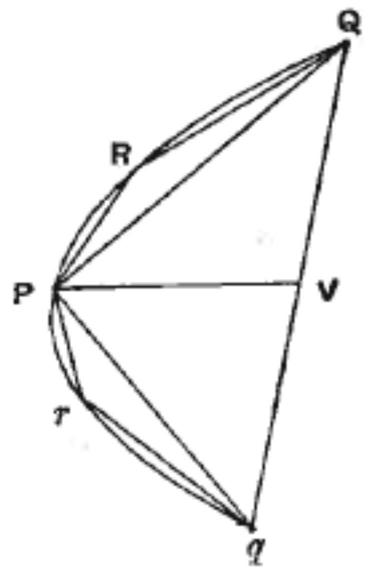
DOVER PUBLICATIONS, INC.

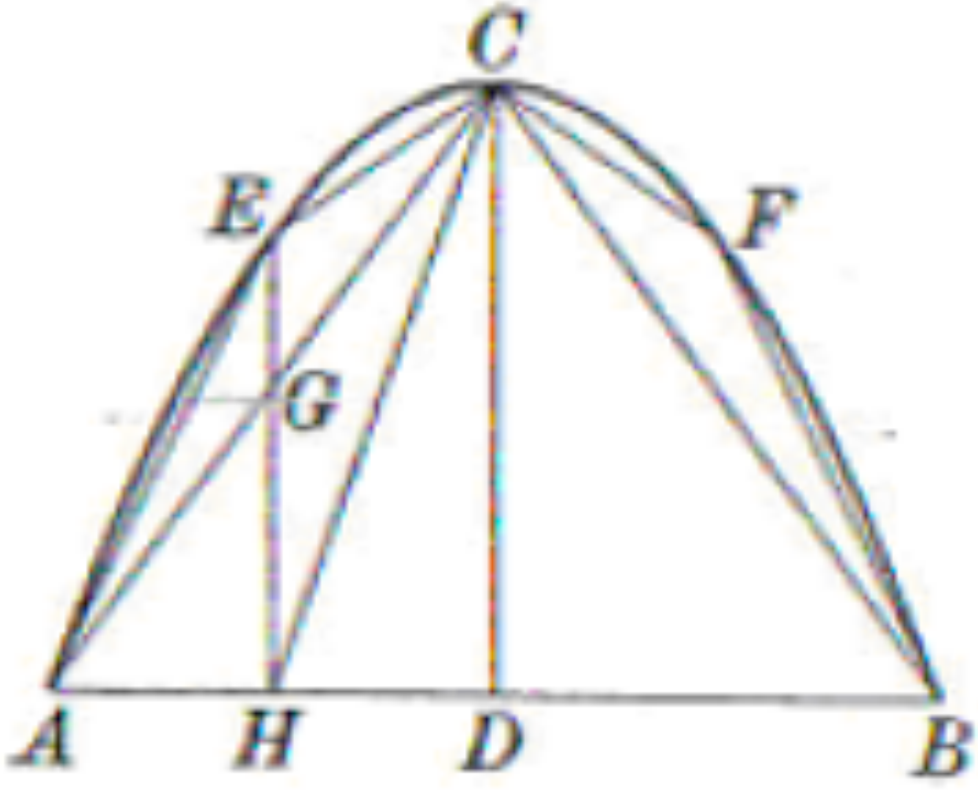
# Archimedes og Parablens Kvadratur

Skriftet om "Parablens kvadratur" ender med:

**Proposition 24.**

*Every segment bounded by a parabola and a chord Qq is equal to four-thirds of the triangle which has the same base as the segment and equal height.*

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## Proposition 23.

*Given a series of areas* $A$, $B$, $C$, $D$, ... $Z$, *of which* $A$ *is the greatest, and each is equal to four times the next in order, then*

$$A + B + C + \ldots + Z + \tfrac{1}{3}Z = \tfrac{4}{3}A.$$

# Achimedes: Metoden

Fundet af den danske filolog
J.L. Heiberg i 1906

# THE METHOD OF ARCHIMEDES TREATING OF MECHANICAL PROBLEMS— TO ERATOSTHENES

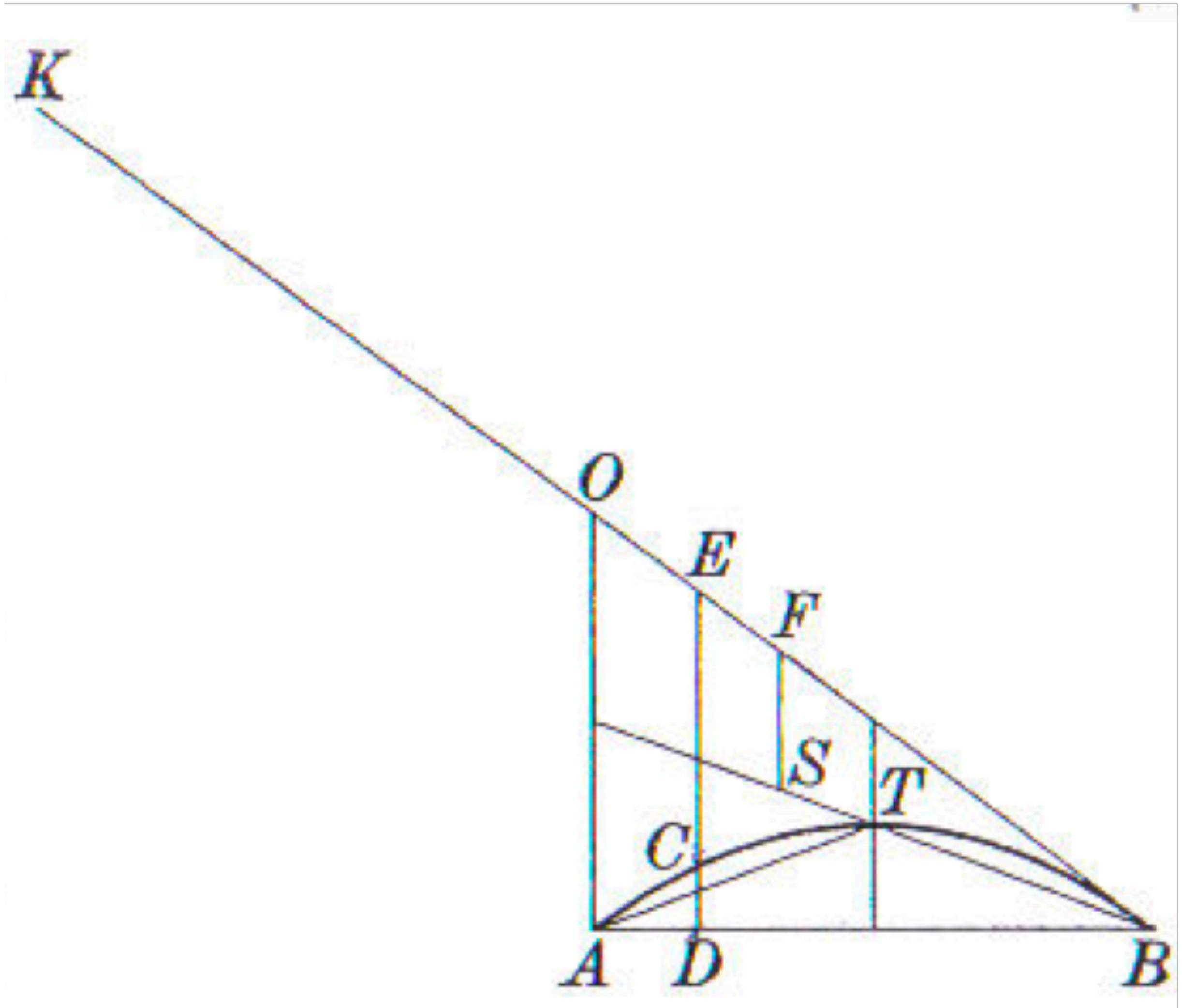
"Archimedes to Eratosthenes greeting.

I sent you on a former occasion some of the theorems discovered by me, merely writing out the enunciations and inviting you to discover the proofs, which at the moment I did not give. The enunciations of the theorems which I sent were as follows.

# Metoden var karakteriseret ved

1. Brug af et vægtstangsprincip, så arealer kan ’vejes’

2. Arealet af en figur forstås som (samlingen) af alle parallelle linjestykker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# Metoden passer ikke til det græske paradigme

Archimedes' metode er i konflikt med både Platon og Aristoteles:

- Vægtstangsprincippet er mekanisk (ikke-geometrisk)
- Der findes uendeligt mange linjer – kan vi manipulere med en sådan samling?

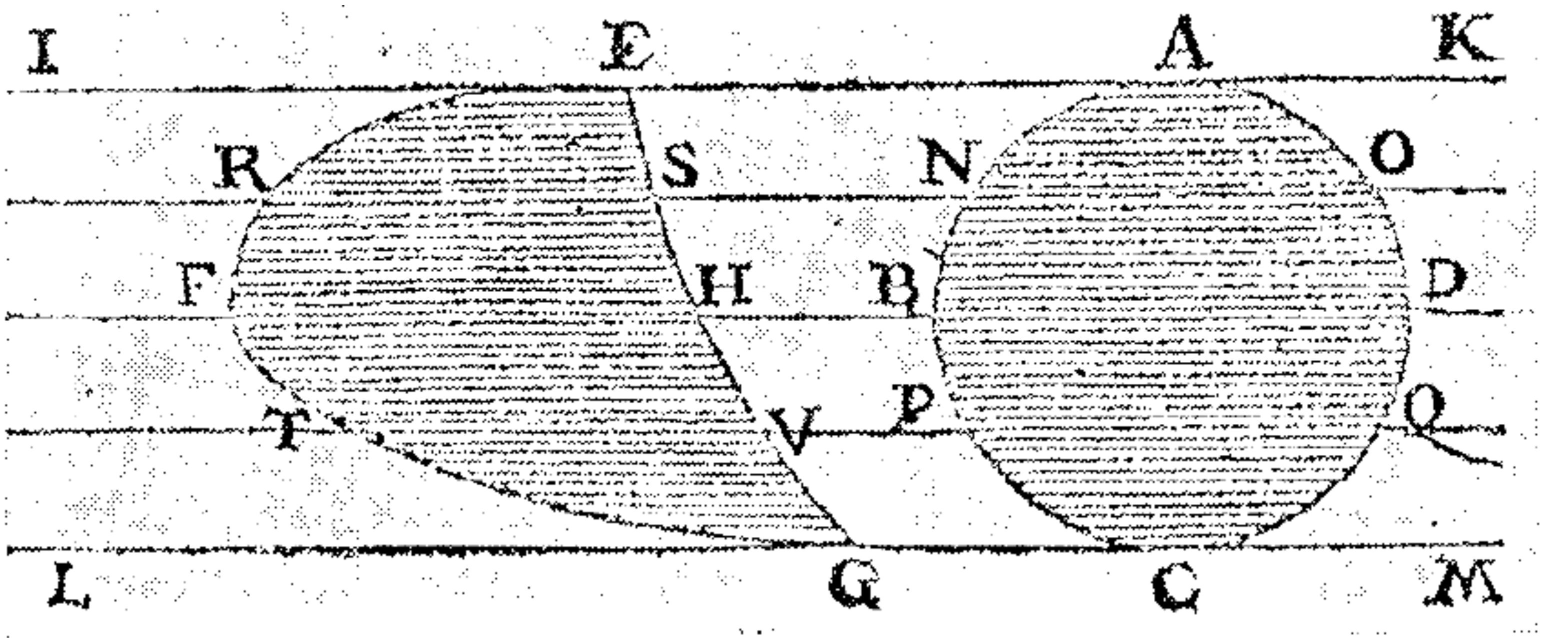
# De udelelige er ikke egentligt begrebsliggjort

Similarly, for all other straight lines parallel to $DE$ and meeting the arc of the parabola, (1) the portion intercepted

# Bonaventura Cavalieri
(1598 – 1647)

Cavalieris princip:

If between the same parallels any two plane figures are constructed, and if in them, any straight lines being drawn equidistant from the parallels, the included portions of any one of these lines are equal, the plane figures are also equal to one another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# Brug af princippet

- Evangelista Torricelli (1608 – 1647)

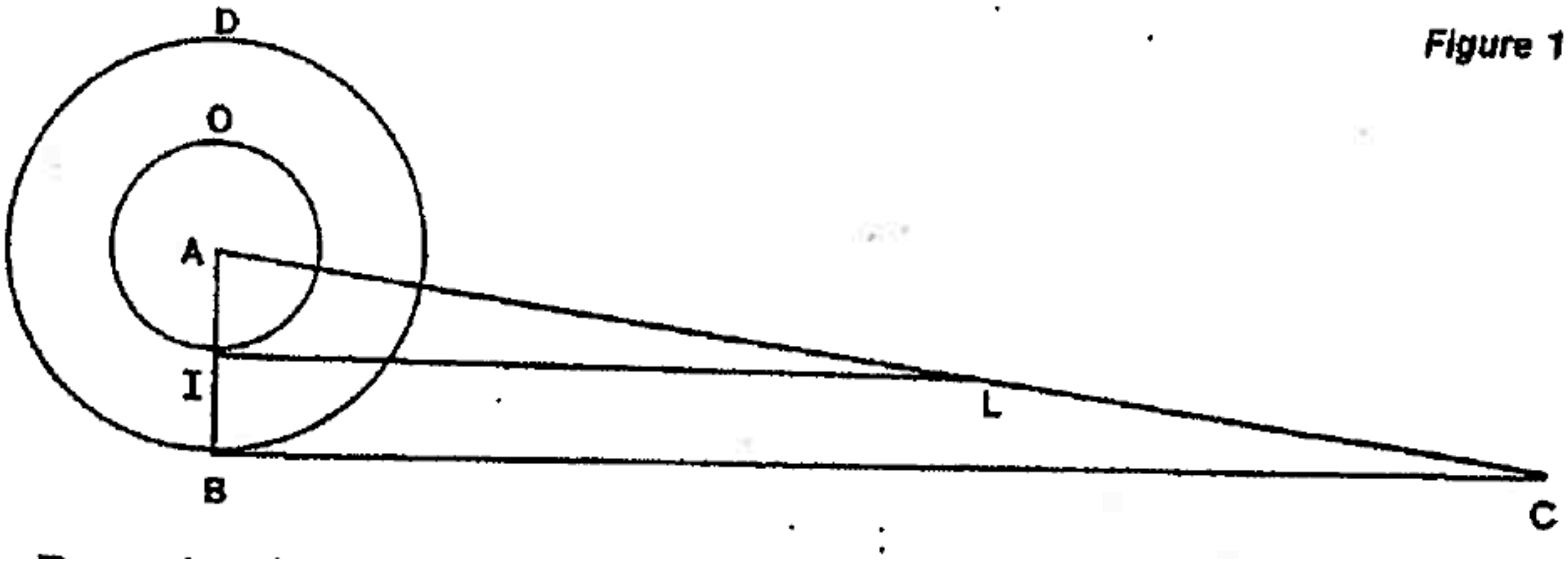


Figure 1

# Toricellis trumpet

En uendelig figur med et endeligt volume men uendelig overflade

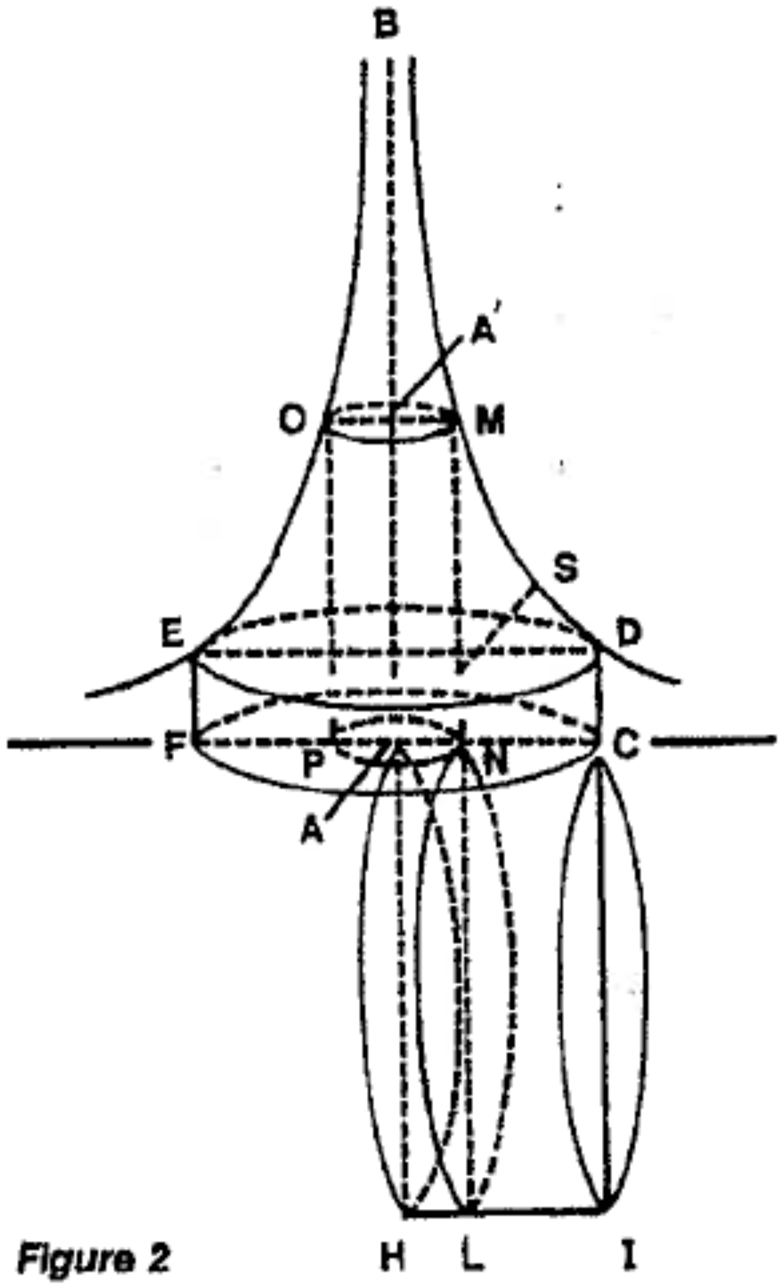


Figure 2

# Et brud med det græske paradigme

- Der findes uendelige figurer; det endelige og det uendelige kan sammenlignes
- Uendelige processer kan tænkes færdiggjorte
- Geometri er imidlertid stadig det centrale
- Men endnu ikke nogen generel teori til at finde arealer af figurer