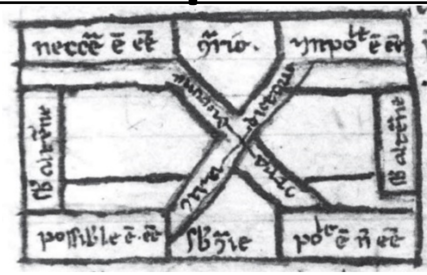
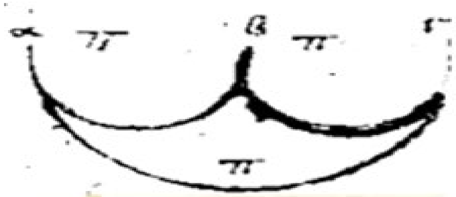
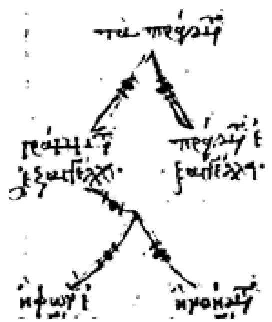
Testing Validity with 17th century Euler-type and Phoebifer Axis Diagrams

Jens Lemanski
(Hagen, Germany)

Content

1) SHORT HISTORY OF EARLY MODERN LOGIC DIAGRAMS

Most Popular Logic Diagrams

QUADRATA FORMULA/ SCHEMA OPPOSITIONUM		**9th (/13th) century** **Italy** Robertus Anglicus: Commentrary on the Summulae logicales of Peter of Spain, Remnant Trust no. 0894, Ms 26, fol. 14r.
PONS ASINORUM		**12th century,** **central Europe** Aristoteles: *Organon* (Wolfenbüttel. Cod. Guelf. 24 graec., fol. 32r)
ARBOR PROPHYRIANA /SCIENTIA		**late 13th century,** **Terra d'Otranto:** Aristoteles: *De Interpretatione with a Comm. of Psellus* (Magdalen College, P. Magdalen Gr. 15, fol. 1r)
EULER-TYPE DIAGRAMS		**early 16th century,** **Netherlands** Juan Luis Vives: *De censura veri et falsi*. Bruges 1531

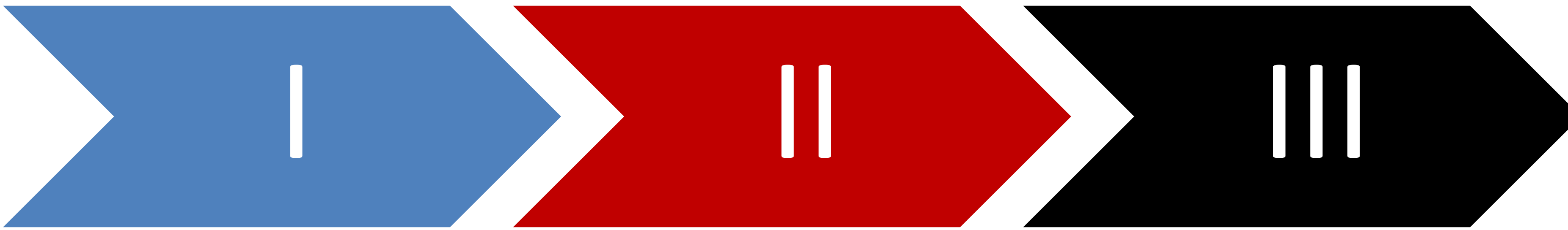
Vives
Reimers
Keckermann
Alsted

Weigel
Sturm
Leibniz

Weise
Großer
Lange

Ploucquet
Lambert
Euler

et al.



1531 – 1611

1660 – 1712

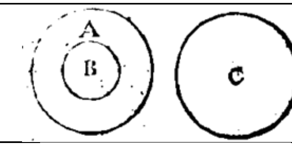
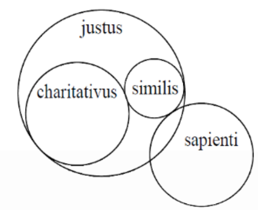
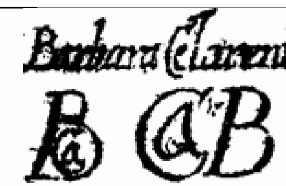
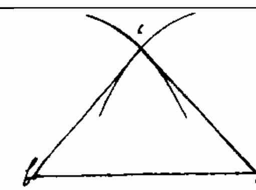
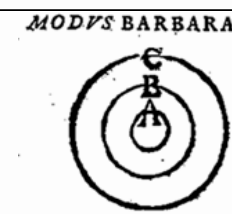
1758 – 1880

Typical characteristics of a period

1) After the end of a period Euler-type diagrams fall into oblivion
2) Therefore, the first logicians at the beginning of a period claim that they are the inventors of Euler-type diagrams
3) All logicians of a period know only the Euler-type diagrams of logicians from your own period

2) 2ND PERIOD OF EULER-TYPE DIAGRAMS

Period II: 1660–1712

Life data	Name	Place	Work	Year	Notation
1635–1703	JOHANN CHRISTOPH STURM	(Jena) Leiden	*Novi Syllogizandi Modi*	1661	
1646–1716	GOTTFRIED WILHELM LEIBNIZ	Hannover (Jena)	Beiblatt von *De cogitationum analysi*	~1687–1690	
1625–1699	ERHARD WEIGEL	Jena	*Philosophia Mathematica*	1693	
1664–1736	SAMUEL GROSSER	Görlitz	*Gründliche Anweisung zur Logica; Pharus Intellectus*	1697	
1669–1756	JOHANN CHRISTIAN LANGE	(Zittau)/ Gießen	*Nvclevs Logicae Weisianae*	1712	

Characteristics of the 2nd period

- **Rejection** of the **scholastic** proof method for syllogisms (Barbara, Celarent etc.)
- Euler-type diagrams are intended to represent a **unified proof** theory for all syllogisms
- Euler-type diagrams are used exclusively by **Protestant logicians** in Northern Europe.
- Euler-type diagrams are a **counter movement** to Catholic Baroque scotism in southern Europe (Phoebifer Axis-diagrams).

Jena School and Zittau School

Erhard Weigel
Jena
(1625–1699)

G.W. Leibniz
Jena/ Hanover
(1646–1716)

J.C. Sturm
Jena/ Leiden
(1635-1703)

Christian Weise
Zittau
(1642-1708)

Samuel Grosser
Zittau/Görlitz
(1664-1736)

Johann Christian Lange
Zittau/ Gießen
1669-1756)

Erhard Weigels *Neu-erfundener Hauß-Rath/* Newly invented appliances (1672)

“Logometrum or the inference measure/ for the facilitation of the art of reasoning/ by this one can distinguish true syllogisms and inferences from the false ones in a very handy and comfortable way.”

„Logometrum oder das Schlussmaß/ zur Erleichterung der Schliessekunst/ dadurch mann die wahren Syllogismos und Schlußreden von den falschen recht Handgreiflich unterscheiden kann.“

Erhard Weigel

Erhard Weigel: Philosophia Mathematica (1693)

"I have discovered that the coincidence & distance of lines and figures have a closer resemblance with metaphysical identity & diversity, viz. so much that equally the identity looks like coincidence (viz. predicative) & the diversity looks like distance, so that on both sides the strength and force of the whole Syllogisation is close to the dictum de omni & nullo.

Finally, I have discovered that Aristotle had not only good reasons for using terms of the geometers (boundary, connection, scheme [πέρας, σύνδεσμος, σχῆμα]) in order to describe the traditional syllogisms, but also that all modi of the syllogisms can be learned more easily by means of geometrical schemes and figures than by Barbara, Celarent and can be demonstrated (or reduced) in much shorter form than by *Phoebifer axis obit terras aethramque quotannis*;"

Jena School and Zittau School

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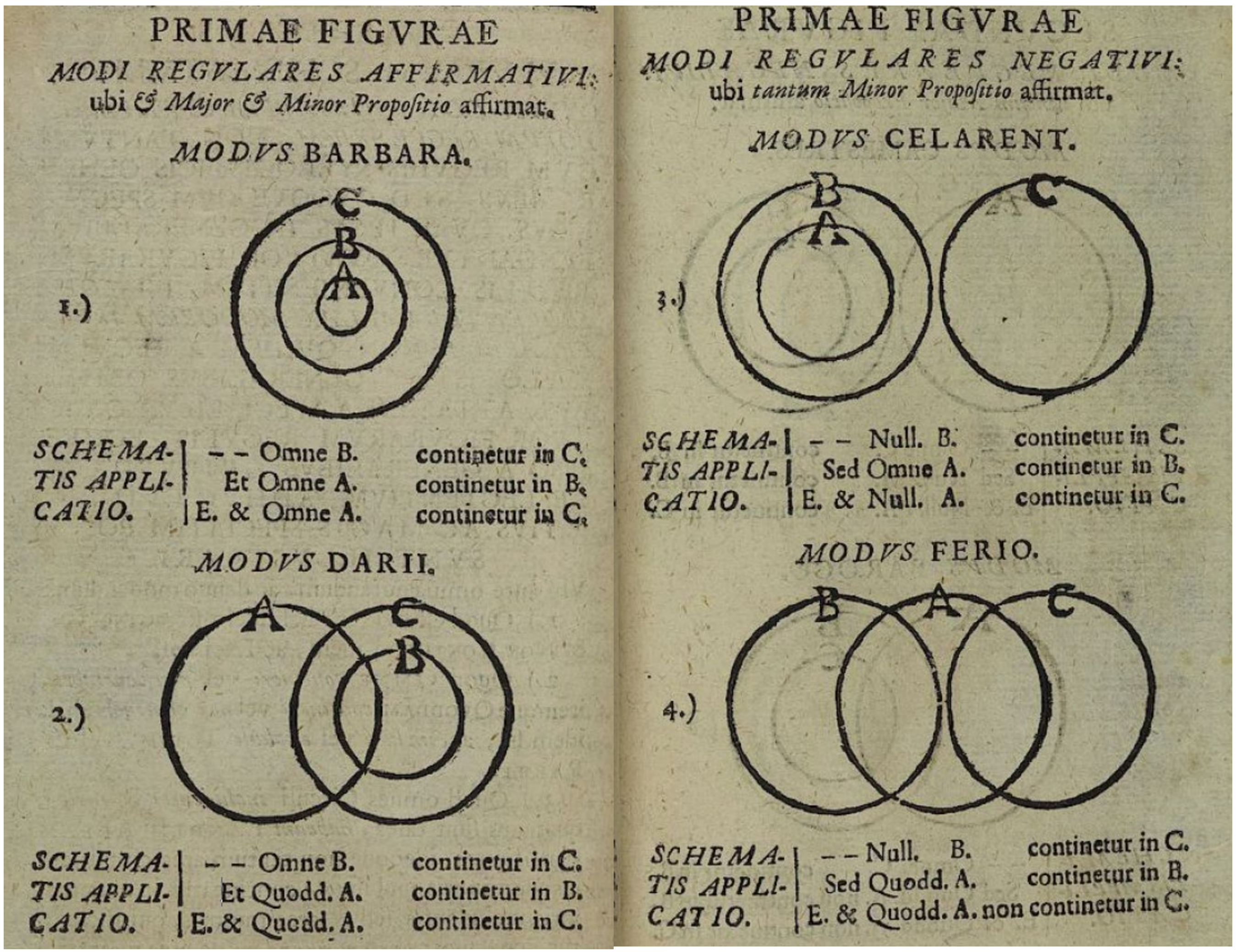
1669-1756)

J.C. Lange‘s Nucleus Logicus Weisanae (1712)

“The natural foundation of syllogistic reasoning can be called a threefold explanation: 1) of containment or subalternation, 2) of consequence or consecution; 3) of convenience or comparison.”

1. Containment



PRIMAE FIGVRAE

MODI REGVLARES AFFIRMATIVI: ubi & *Major* & *Minor Propositio* affirmat.

MODVS BARBARA.

SCHEMATIS APPLICATIO.	– – Omne B.	continetur in C.
	Et Omne A.	continetur in B.
	E. & Omne A.	continetur in C.

MODVS DARII.

SCHEMATIS APPLICATIO.	– – Omne B.	continetur in C.
	Et Quodd. A.	continetur in B.
	E. & Quodd. A.	continetur in C.

PRIMAE FIGVRAE

MODI REGVLARES NEGATIVI: ubi *tantum Minor Propositio* affirmat.

MODVS CELARENT.

SCHEMATIS APPLICATIO.	– – Null. B.	continetur in C.
	Sed Omne A.	continetur in B.
	E. & Null. A.	continetur in C.

MODVS FERIO.

SCHEMATIS APPLICATIO.	– – Null. B.	continetur in C.
	Sed Quodd. A.	continetur in B.
	E. & Quodd. A.	non continetur in C.

2. Consequence

MODVS BARBARA.

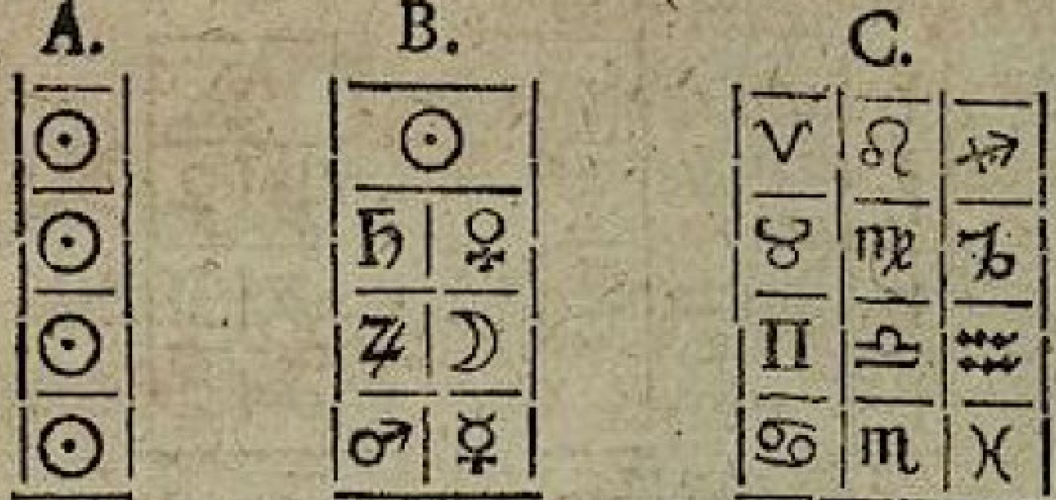
A. B. C.

SCHEMATIS APPLICATIO.

Omne B. *antecedit* C. (*quoddam*;)
Et Omne A. *antecedit* B. (*quoddam*;)
E. Et Omne A. *antecedit* C. (*quoddam*.)

3. Convenience

MODVS CELARENT.



SCHEMATIS APPLICATIO.

Nullum B. *convenit* cum C. (*ullo*;)
Sed Omne A. *convenit* cum B. (*quodam*;)
E. Et Nullum A. *convenit* cum C. (*ullo*.)

Algorithmic Proof Method

(A) Construct all possible diagrams according to the construction rules of the 1st and then the 2nd premise.

(B) Check if you can read the conclusion from all constructed diagrams or not.

(B1) yes: the inference is valid (regularis)

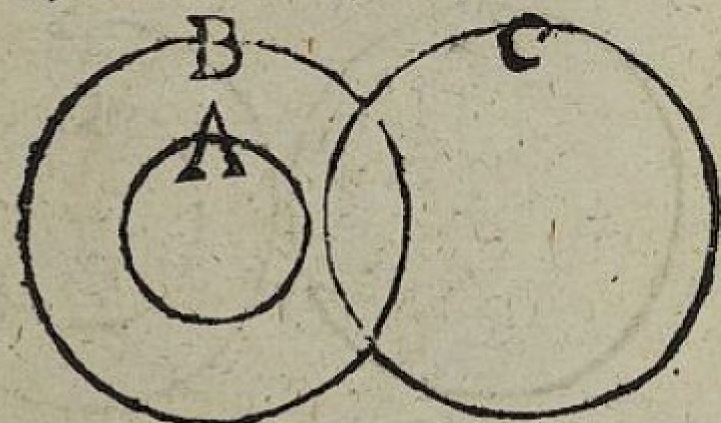
(B2) no: the inference is invalid (irregularis)

Example: B2

MODI IRREGVLARES:
PECCANTES CONTRA REGVLAM,
Quæ *Majorem Propoſitionem* vult eſſe *univerſalem.*

MODVS, ubi *Major Prop.* eſt *particul. affirmans.*

20.)



SCHEMATIS APPLICATIO.	– – Quodd. B.	continetur in C.
	Et Omne A.	continetur in B.
	E. & Quodd. A.	continetur in C.

3) PHOEBIFER AXIS DIAGRAMS

Erhard Weigel: Philosophia Mathematica (1693)

“I have discovered that the coincidence & distance of lines and figures have a closer resemblance with metaphysical identity & diversity, viz. so much that equally the identity looks like coincidence (viz. predicative) & the diversity looks like distance, so that on both sides the strength and force of the whole Syllogisation is close to the dictum de omni & nullo.

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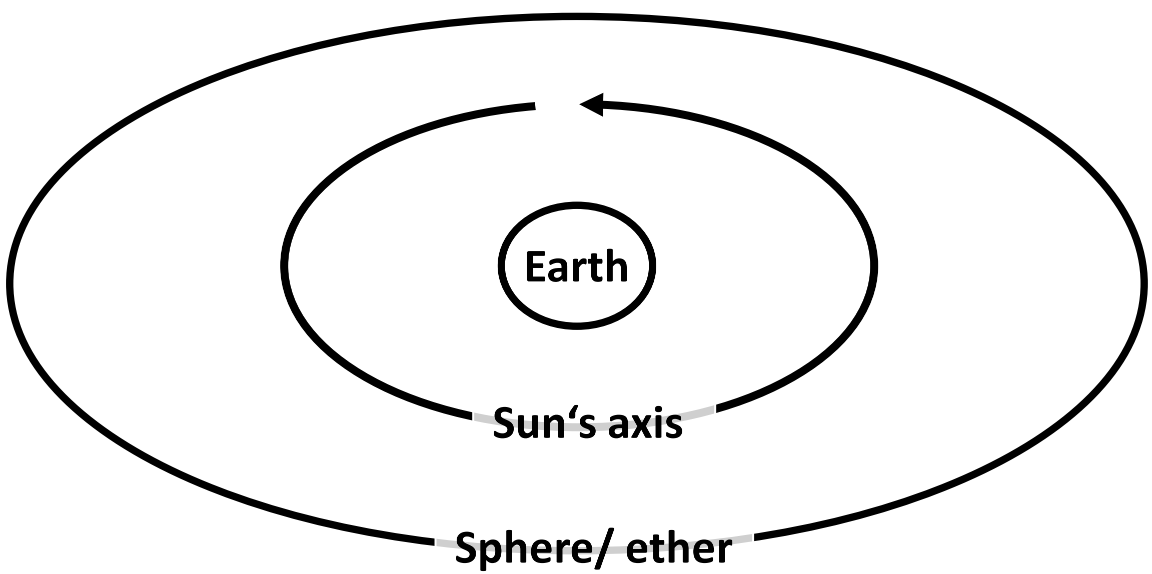
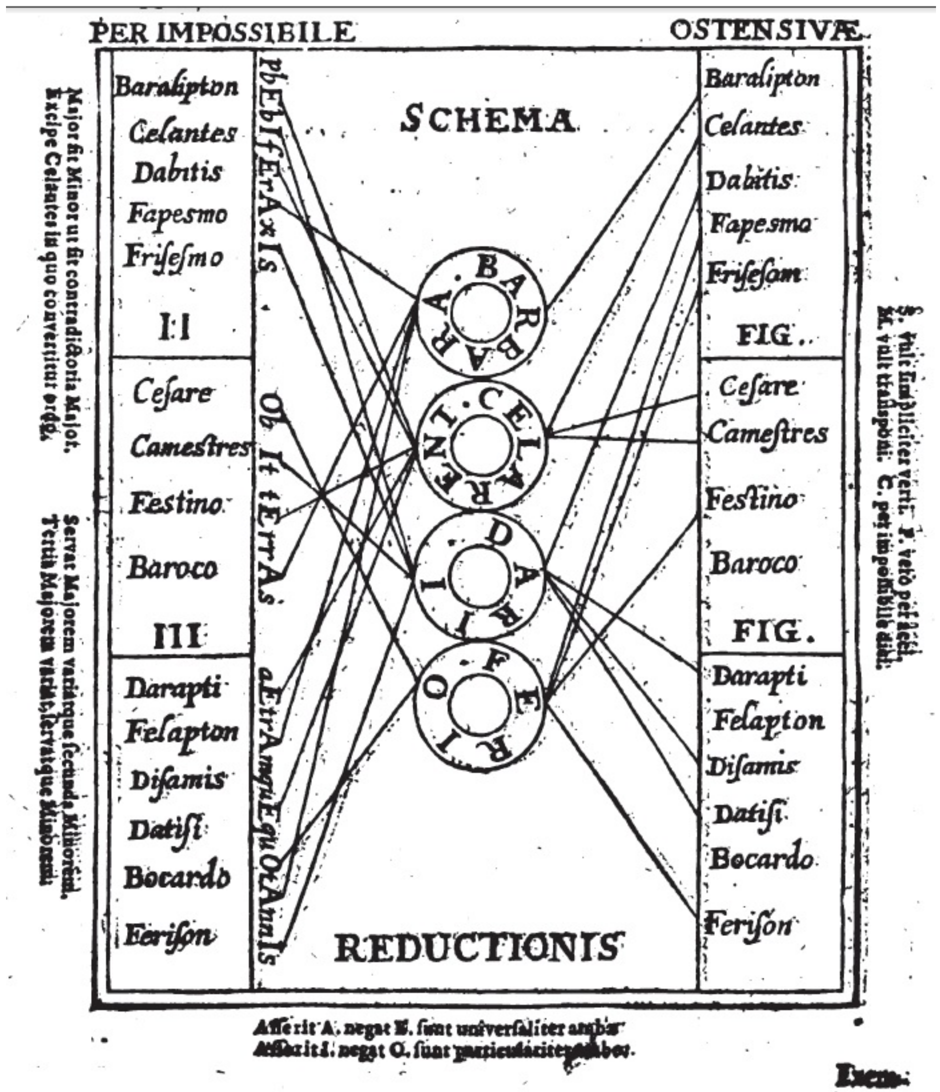
- “Phoebifer axis obit terras sphaeram/aethram-que quotannis.”
- “The sun's axis revolves around the earth and the sphere/ether every year.”



Year	Place	Book	Name	Life Data	Confession
1657	Würzburg	Curriculum philosophiae peripateticae	Melchior Cornäus	1598–1665	Jesuit
1663	Prague	Domus Sapientiae	Antonín Brouček	?–1690	Scotist, Franciscan
1676	Olomouc	Sol Triplex	Amand Hermann	1639–1700	Scotist, Franciscan
1684	Prague (Nives)	Schola Philosophica Scotistarum	Bernhard Sannig	?–1704	Franciscan
1693	Salzburg	Logica Aristotelico-Thomistica	Cölestin Pley	1662–1723	Benedictine
1697 (1711)	Flemish Region (from Baden-Würt.)	Cursus Philosophicus	Johann Martin Brunck/Gervasius Brisacensis	1648–1717	Scotist, Capuchin
1735	Vienna	Philosophia Scholæ Scotisticæ	Crescentius Krisper	1679–1749	Scotist, Franciscan

1657 Melchior Cornäus



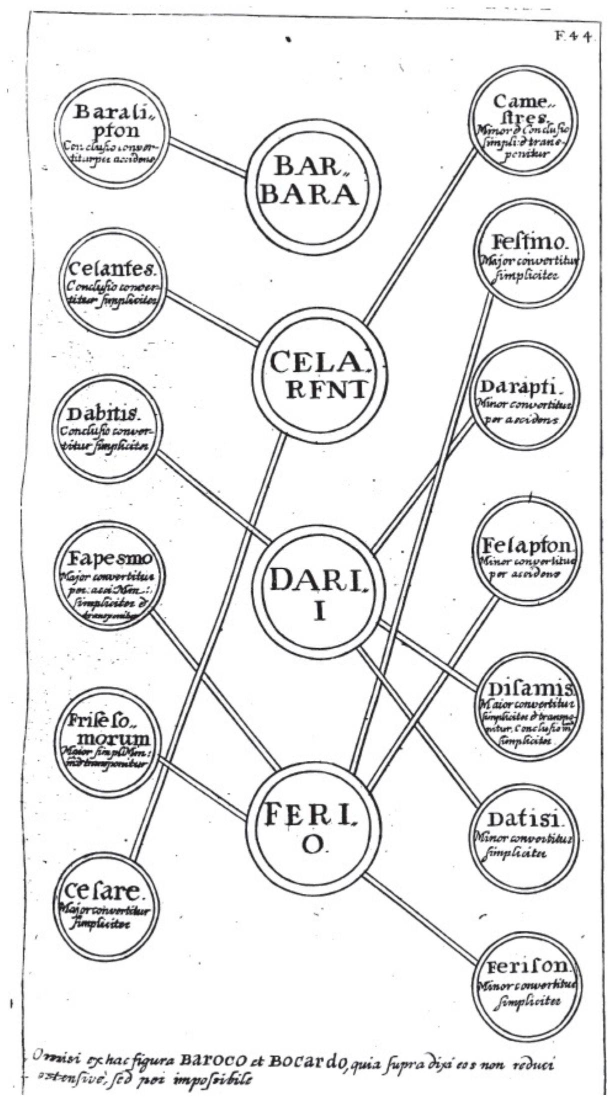
1663 Antonín Brouček

Reductio ostenſiva,		Reductio ad impoſsibile.	
	1. BARBARA.		
1. Baralip		Baralip	2
2. Celantes		Celantes	3
3. Dabitis		Dabitis	2
4. Fapeſmo	2. CELARENT	Fapeſmo	1
4. Friſeſom		Friſeſom	3
2. Ceſare		Ceſare	4
2. Cameſtres		Cameſtres	3
4. Feſtino	3. DARII.	Feſtino	2
Baroco		Baroco	1
3. Darapti		Darapti	2
4. Felapton		Felapton	1
3. Diſamis		Diſamis	2
3. Datiſi	4. FERIO.	Datiſi	4
Bocardo		Bocardo	1
4. Feriſon		Feriſon	3

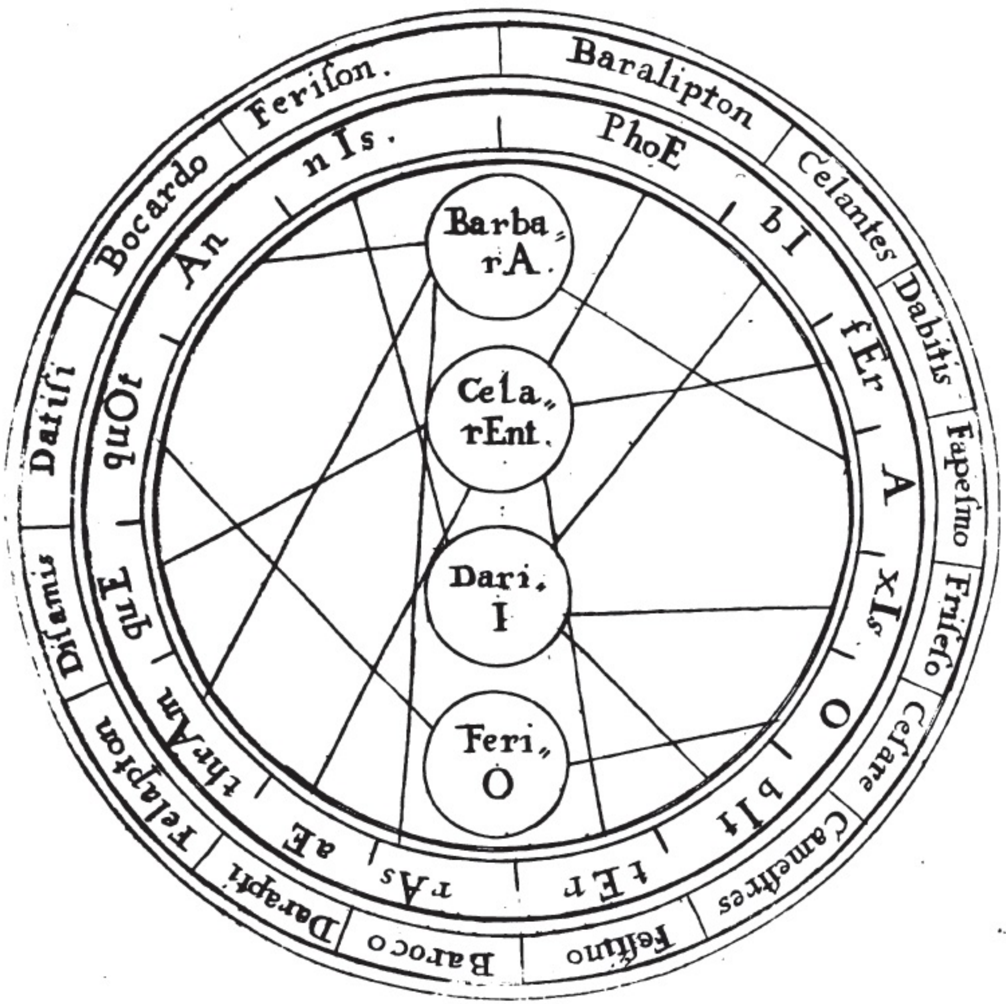
phEbItEr AxIs ObIt tErrAs ſphErAmquE quOt AnnIs.

 Quæ

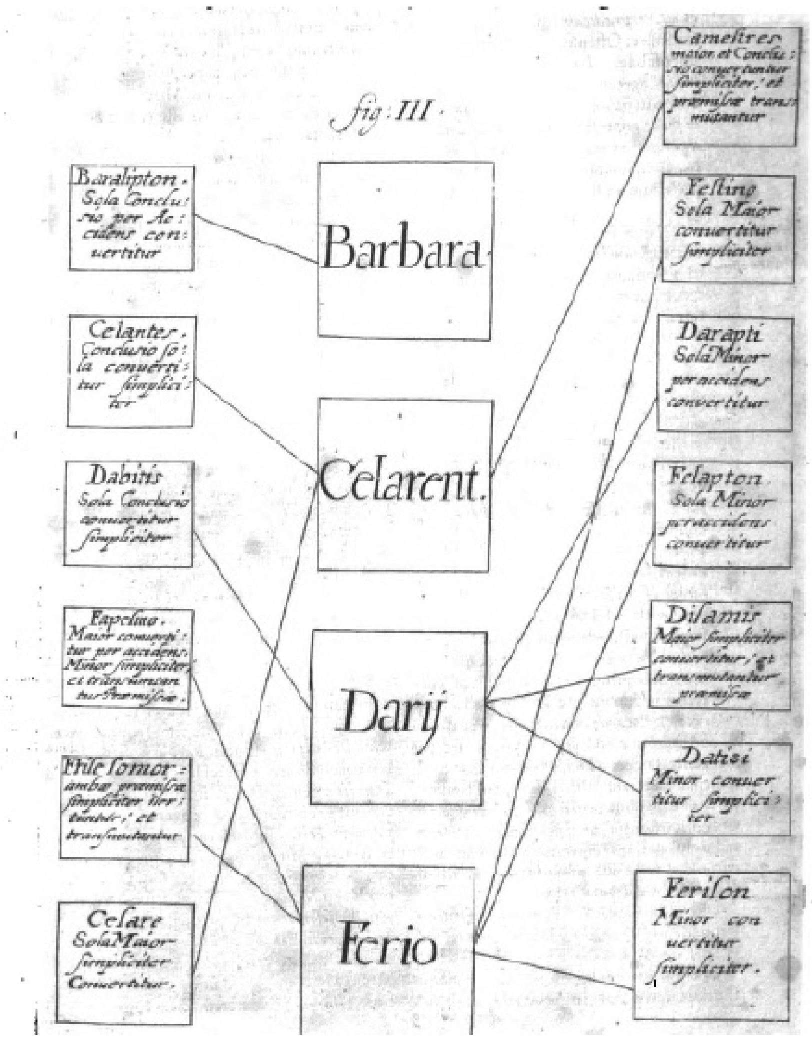
1676 Amand Hermann



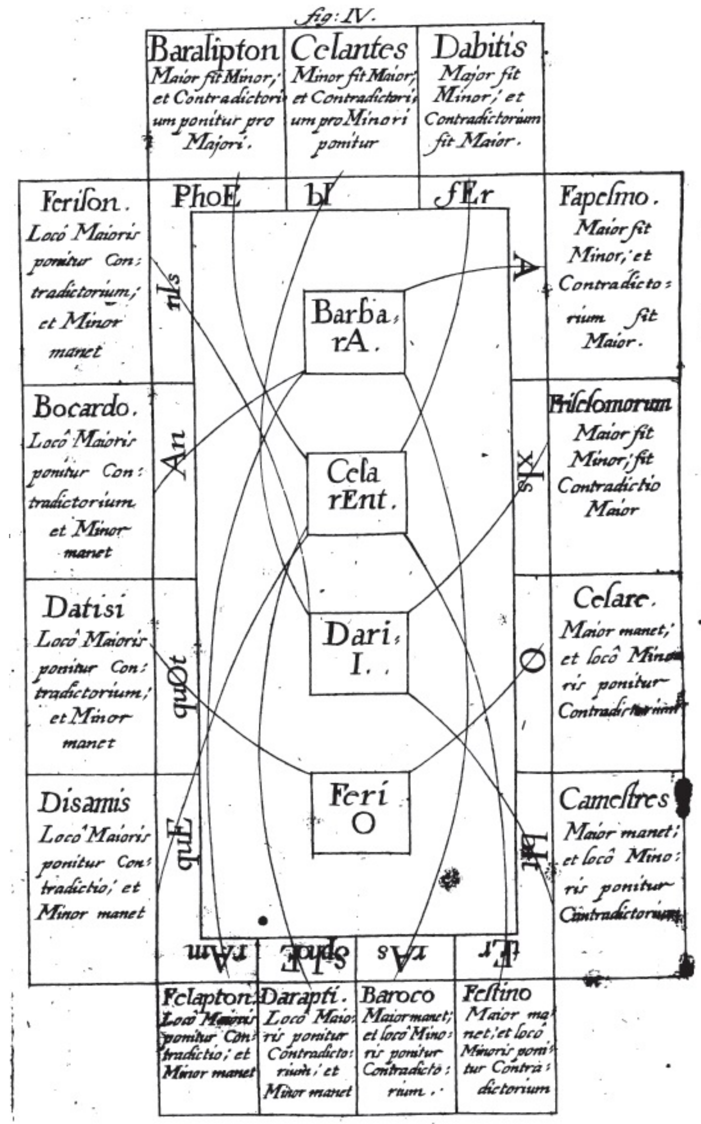
1676 Amand Hermann



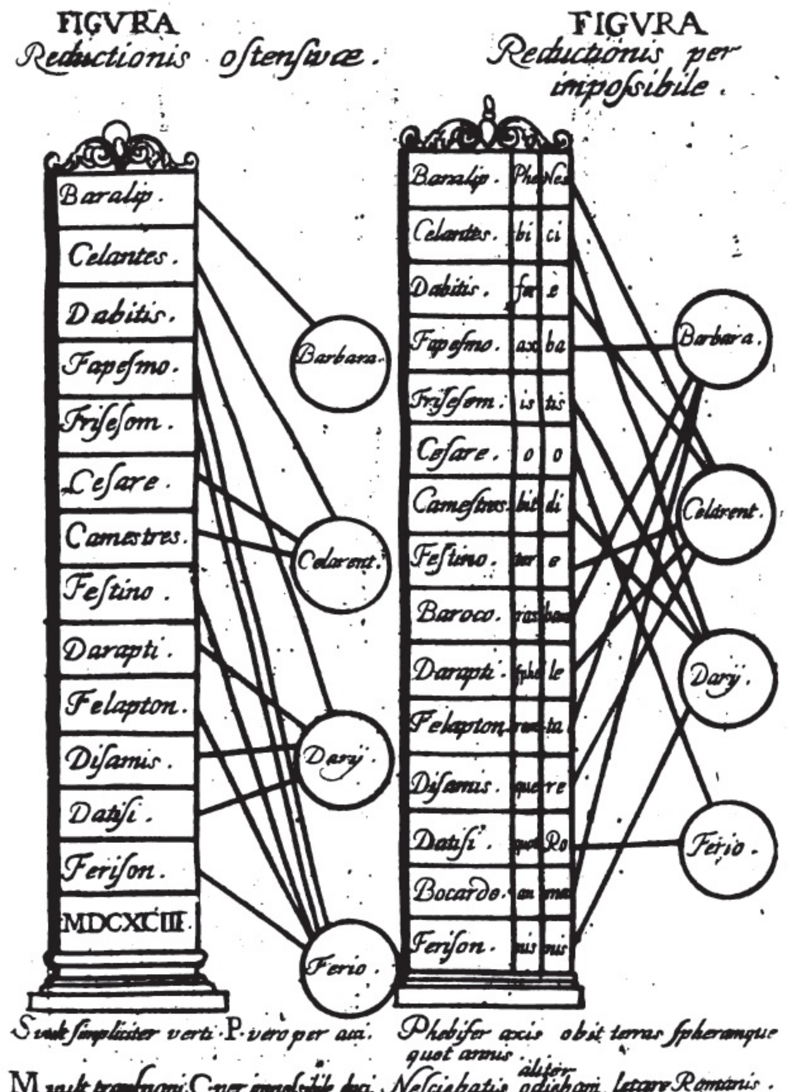
1684 Bernhard Sannig



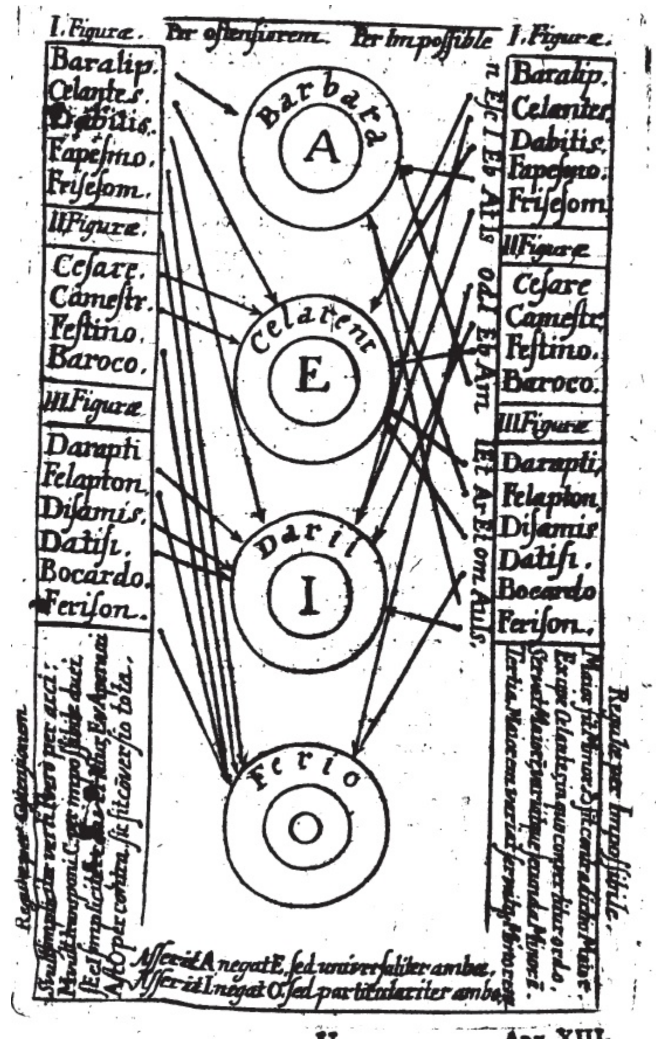
1684 Bernhard Sannig



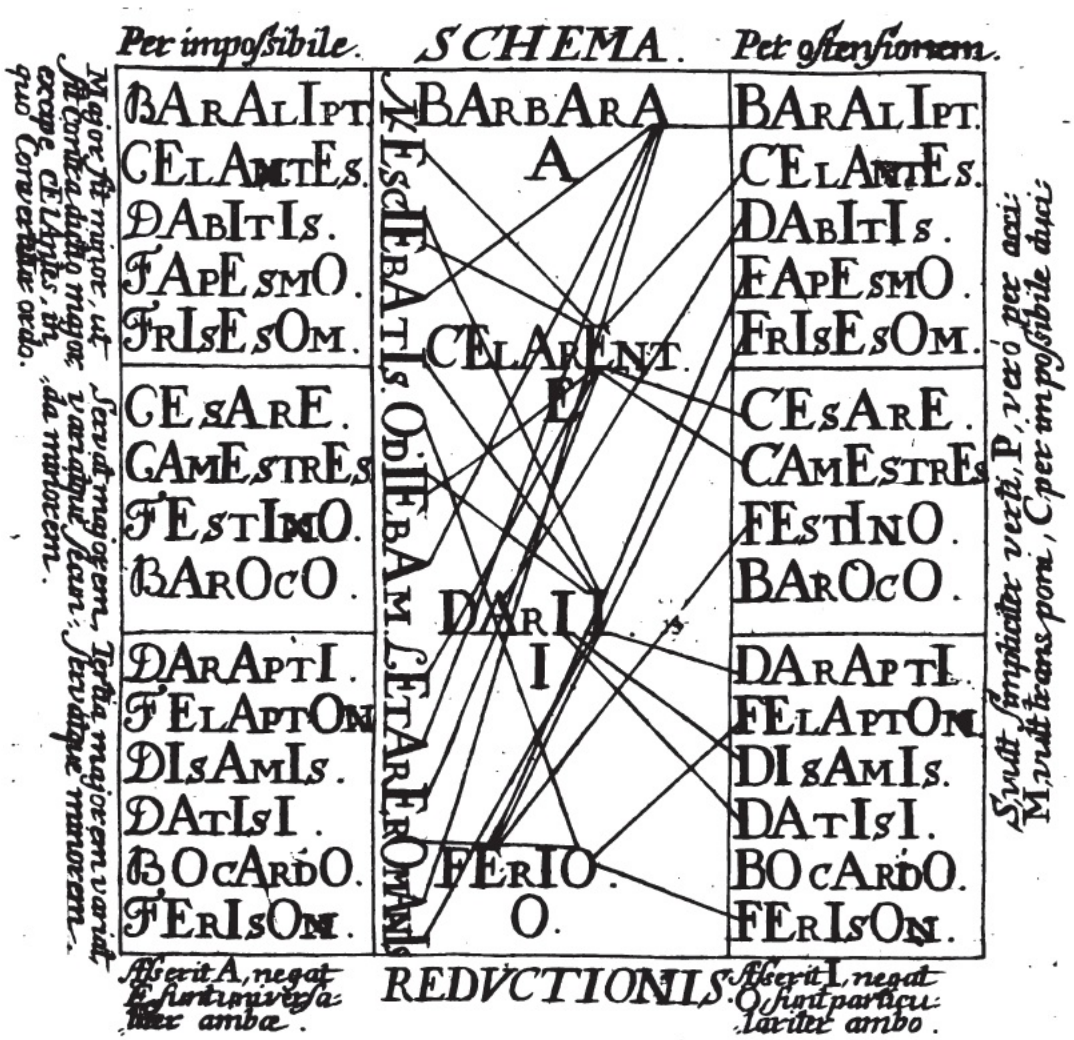
1693 Cölestin Pley



1697 Gervasius Brisacensis

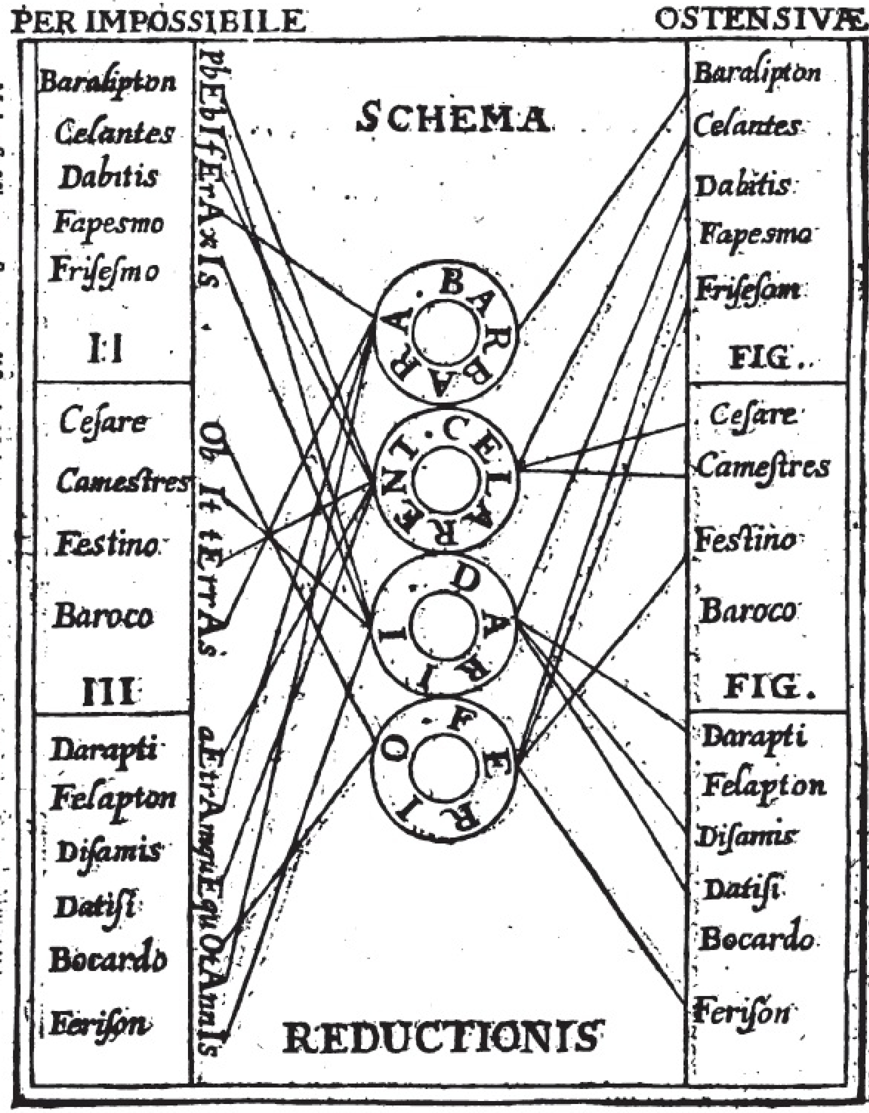


1735 Crescentius Krisper



Major fit Minor ut fit contradictoria Major.
Excipe Celantes in quo convertitur ordo.

Servat Majorem variatque secunda Minorem.
Tertia Majorem variat, servatque Minorem.



S. vult simpliciter verti. P. vero per acci.
M. vult transponi. C. per impossibile duci.

Asserit A, negat E, sunt universaliter ambæ
Asserit I, negat O, sunt particulariter ambæ.

Exem-

Algorithmic Proof Method

(A) Use Phoebifer Axis in order to find the perfect syllogism (PS) for proving an imperfect syllogism (IS) indirectly/apagogically.

(B) Use the contradiction of the IS-conclusion as one PS-premise and adopt one IS-premise as the other PS-premise unchanged.

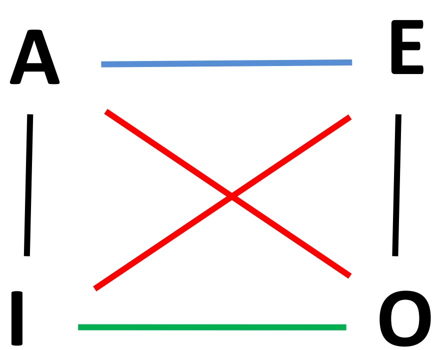
(C) Check whether the PS-conclusion is the contradiction (or contrarity) of the remaining IS-premise.

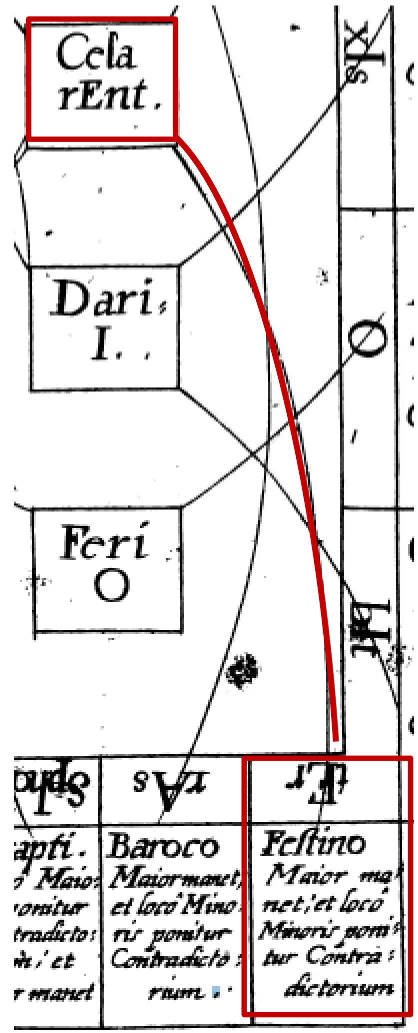
(C1) yes: the inference is valid

(C2) no: the inference is invalid

Apagogic Proof: bIt

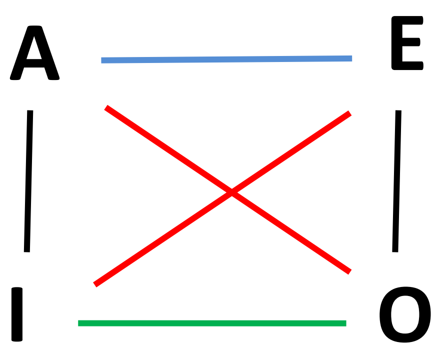
Festino	Celarent
eBC	eBC
iAC	aAB
oAB	eAC

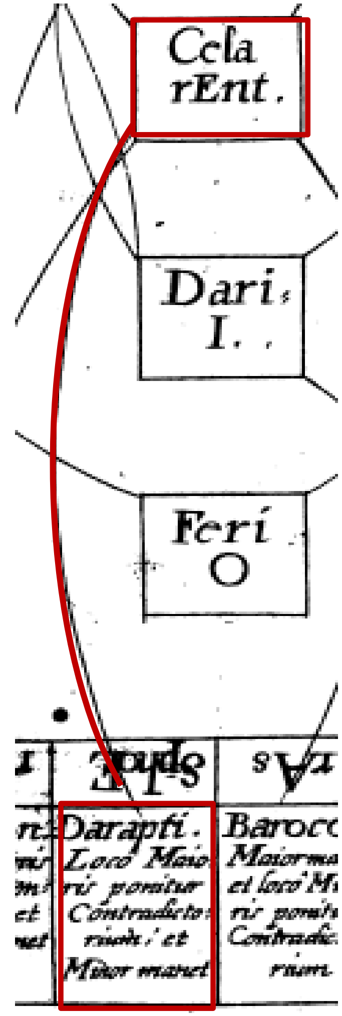




Apagogic Proof: SphE

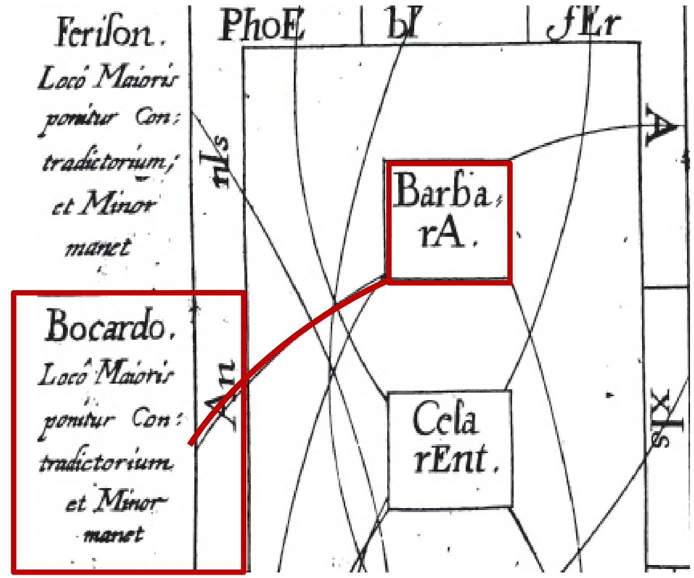
Darapti	**Celarent**
aCB	eAB
aCA	aCA
iAB	eCB

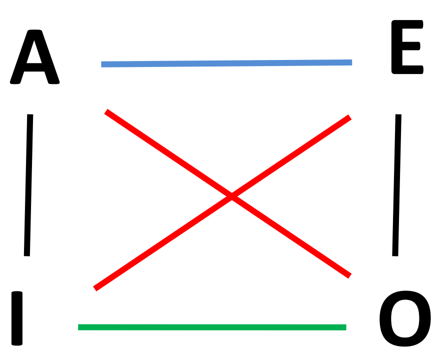




Apagogic Proof: An

Bocardo	**Barbara**
oCB	aAB
aCA	aCA
oAB	aCB

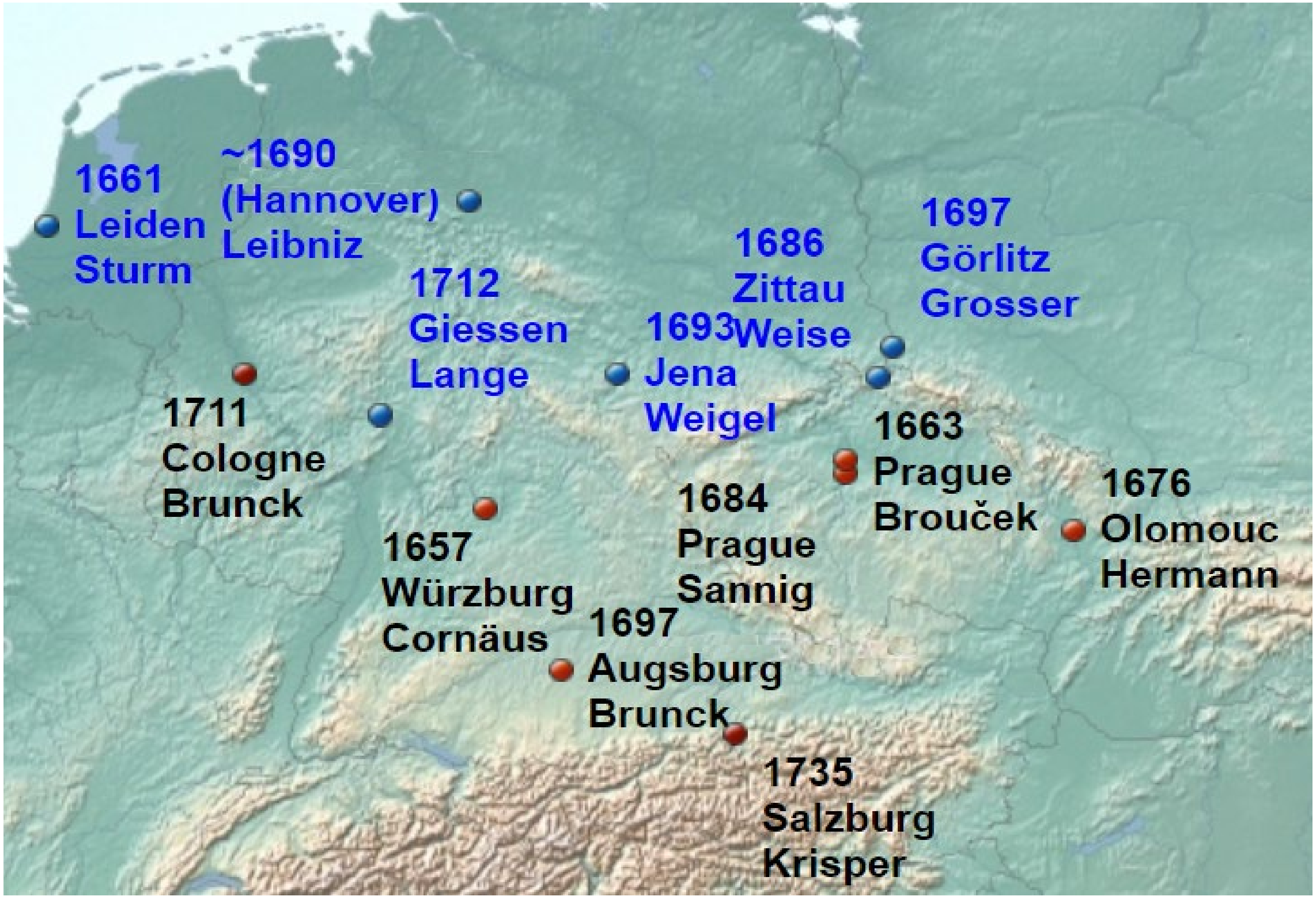




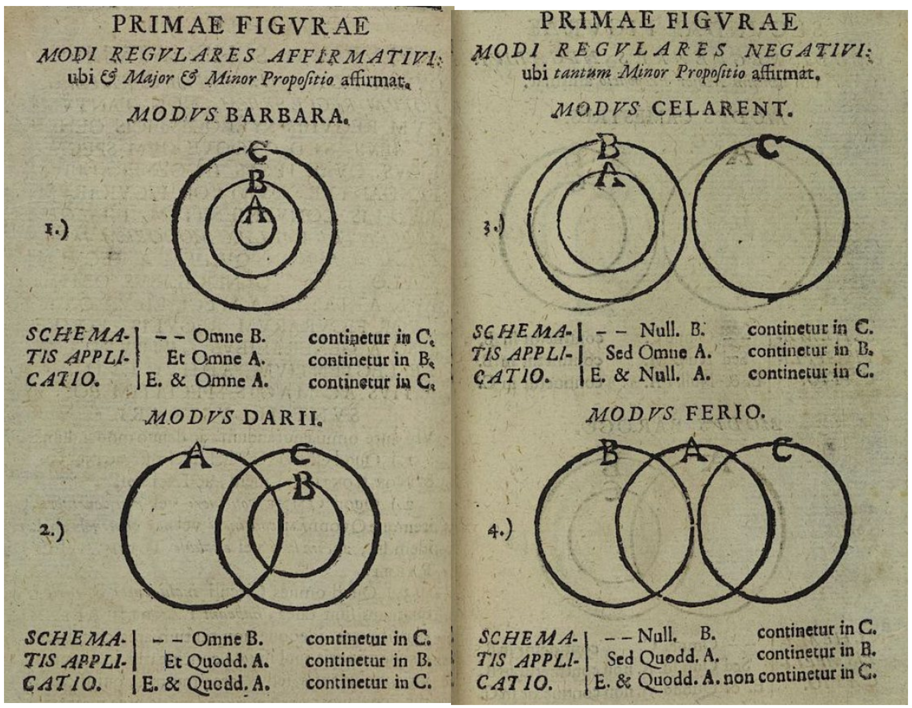
4. CONCLUSION

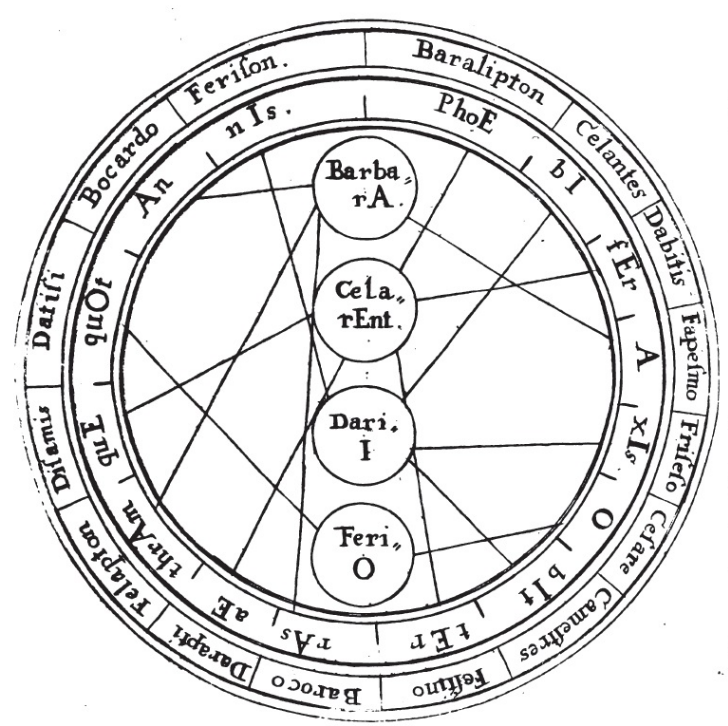
- Historical-cultural (protestant vs. Catholic)
- Simplicity of Proof method (Euler vs. Phoebifer)
- Unification of Proof method (17th Century vs. 21th Century)

Historical-cultural Protestant vc. Catholic Logic

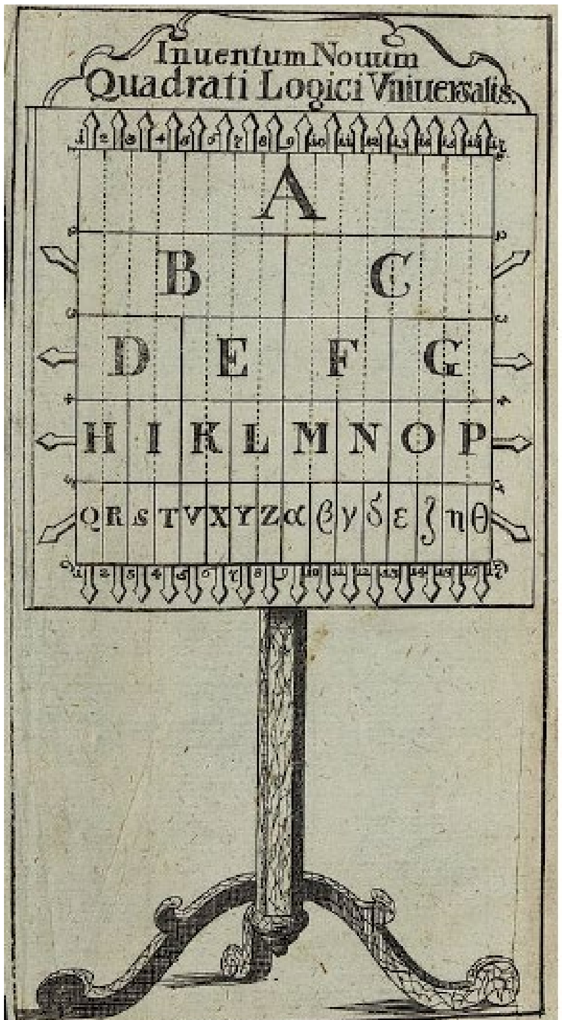


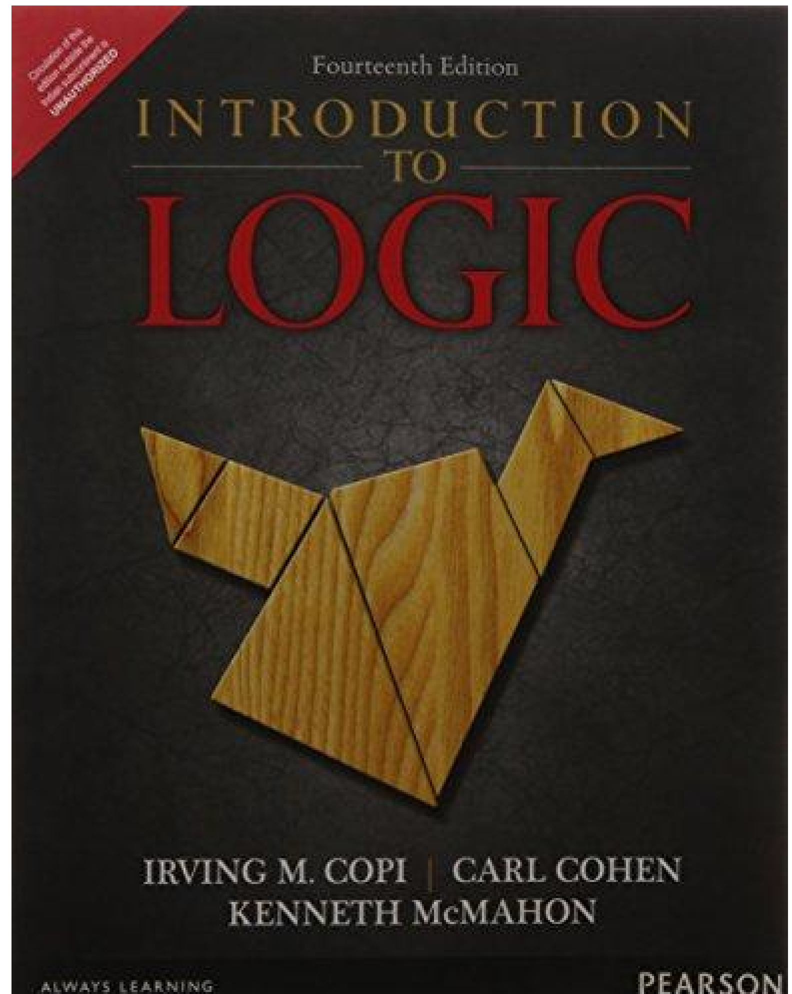
Simplicity of Proof method (Euler vs. Phoebifer)





Unification of Proof method (17th Century vs. 21th Century)





Thank You Very Much For Your Attention!

<u>Further Readings</u>

- J. Lemanski: "Periods in the Use of Euler-Type Diagrams". In: *Acta Baltica Historiae et Philosophiae Scientiarum* 5:1 (2017), 50–69
- J. Lemanski: "Logic Diagrams in the Weigel and Weise Circles". In: *History and Philosophy of Logic* 39:1 (2018), 3–28.
- J. Lemanski: Calculus *CL* as Ontology Editor and Inference Engine". In: *Lecture Notes in Artificial Intelligence 10871* (2018), S. 752–756.