

Cambridge University Press  
978-1-108-06184-1 - Apollonii Pergaei Quae Graece Exstant Cum Commentariis  
Antiquis: Volume 1  
Edited by Johan Ludvig Heiberg  
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### **Apollonii Pergaei quae Graece exstant cum commentariis antiquis**

The Greek astronomer and geometrician Apollonius of Perga (c.262–c.190 BCE) produced pioneering written work on conic sections in which he demonstrated mathematically the generation of curves and their fundamental properties. His innovative terminology gave us the terms ‘ellipse’, ‘hyperbola’ and ‘parabola’. The Danish scholar Johan Ludvig Heiberg (1854–1928), a professor of classical philology at the University of Copenhagen, prepared important editions of works by Euclid, Archimedes and Ptolemy, among others. Published between 1891 and 1893, this two-volume work contains the definitive Greek text of the first four books of Apollonius’ treatise together with a facing-page Latin translation. (The fifth, sixth and seventh books survive only in Arabic translation, while the eighth is lost entirely.) Volume 1 contains the first three books, with the editor’s introductory matter in Latin.

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APOLLONII PERGAEI  
QUAE GRAECE EXSTANT  
CUM COMMENTARIIS ANTIQUIS.

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EDIDIT ET LATINE INTERPRETATUS EST

**I. L. HEIBERG,**

DR. PHIL.

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UOL. I.



LIPSIAE  
IN AEDIBUS B. G. TEUBNERI.  
MDCCCXCI.

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## PRAEFATIO.

Conica Apollonii Pergaei, quae mathematicorum consensu summis iustissimisque efferuntur laudibus, post Halleium neminem editorem inuenerunt. et fortasse mathematicis, qui res solas spectant, aliquatenus interpretationibus satis fit; sed ne de iis dicam, quorum interest scire, quibus uerbis Apollonius ipse usus sit, et qua ratione formulas signaque nostrorum mathematicorum aequare potuerit, ipsis illis interpretationibus fundamentum certum tandem aliquando iactum esse oportet; quod Halleius, qui adhuc solus Conica Graece edidit, neque uoluit facere neque potuit, quae erat illis temporibus ratio artis criticae. itaque nouam editionem Conicorum codicibus Graecis perlustratis et collatis parare decreui, praesertim cum uiderem, editionem Halleii tam raram esse, ut etiam immodico pretio uix ac ne uix quidem posset comparari. sed ab initio mihi constabat, eos tantum libros, qui Graece exstarent, mihi tractandos esse. nam quamquam me non fugiebat, editionem ita mancam et quasi detruncatam fore, tamen a me impetrare non potui, ut interpretationem librorum V—VII, quam ex Arabico fecerat Halleius, nullis subsidiis criticis adiutus repeterem. et codices Arabicos propter linguae illius ignorantiam ipse adire non potui. imperfectum igitur maneat opus, donec aliquis linguae Arabicae

a\*

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## IV

## PRAEFATIO.

peritus codicibus Arabicis collatis nouam recensionem illorum librorum instituerit. et ut sperare possimus, hoc breui futurum esse, effecit L. L. M. Nixius edita dissertatione, quae inscribitur *Das fünfte Buch der Conica des Apollonius von Perga in der arabischen Uebersetzung des Thabit Ibn Corrah* (Lipsiae 1889). qui ut opus bene et utiliter inceptum ad finem perducatur, mecum optabunt, quicumque scripta mathematica Graecorum nouerunt coluntque.

Quattuor libris Conicorum, qui Graece supersunt, in uolumine altero adiungam fragmenta et Conicorum et reliquorum operum Apollonii, quae Graece habemus, et praeterea lemmata Pappi et commentaria Eutocii. constat, huius uiri recensionem librorum I—IV solam relictam esse; quare id primum mihi agendum erat, ut ea e codicibus restitueretur. quantum de pristina Conicorum forma ueri similiter statui potest, in prolegomenis criticis uoluminis alterius colligam; ibidem de cognatione codicum uberius exponam. hic breuiter indicabo, quibus codicibus nitatur recensio mea, et quanti quisque aestimandus sit. sunt igitur hi:

V — cod. Vatican. Gr. 206 bombyc. saec. XII—XIII, fol., duobus uoluminibus constans; continet fol. 1—160 Conicorum libros I—IV, fol. 161—239 Sereni opuscula. in fine mutilus est et omnino pessime habitus; singula folia plerumque charta pellucida inducta sunt. manus recentior (m. 2) lacunas quasdam (in Sereno) expleuit et in Apollonio nonnulla addidit et emendauit, manus recentissima (m. rec.) in margine nonnulla adscripsit. contuli Romae 1887.



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## PRAEFATIO.

V

- v — cod. Vatic. Gr. 203, bombyc. saec. XIII, fol.; inter alia Conica continet fol. 56—84 e V descripta. cum e V descriptus sit, antequam is tempore et situ male habitus est, utilis est ad eos locos supplendos, qui in V euanuerunt uel correcti sunt; etiam figurae, quae interdum in V cum marginibus sublatae uel detruncatae sunt, saepe e v restitui potuerunt. inspexi codicem Romae 1887 et enotauī, quae opus esse uidebantur.
- c — cod. Constantinopolitanus palatii ueteris nr. 40 bombyc. saec. XIII—XIV, fol., situ et madore paene pessumdatus, ceterum codicis V gemellus. is, cum a Fr. Blassio protractus esset et descriptus (Hermes XXIII p. 622 sq.), intercedente Ministerio nostro, quod res rationesque externas moderatur, Hauniam missus est et totus a me collatus 1889, sed cum plerumque cum V consentiat, scripturam plenam in adparatu non dedi, sed ea tantum, quae meliora praebet, sane paucissima; reliquam scripturae discrepantiam in prolegomenis criticis notabo. Conica habet fol. 349—516.
- p — cod. Paris. Gr. 2342 chartac. saec. XIII, fol. totum contuli Hauniae 1888, sed cum ab homine sermonis mathematicorum Graecorum peritissimo impudenter interpolatus sit, in adparatum eas tantum scripturas recepi, quae ad uerba Apollonii emendanda facerent; reliquas prolegomenis seruauī. quae meliora habet, sine dubio pleraque coniectura inuenta sunt.

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## VI

## PRAEFATIO.

ceterorum codicum nullum prorsus usum esse, in prolegomenis demonstrabo, nisi quod e cod. Paris. 2356 chartac. saec. XVI unam et alteram coniecturam probam recepi.

itaque recensio Conicorum tota codice V nititur, cuius scripturas omnes in adparatu indicaui. sicubi eius scriptura retineri non poterat, auctorem scripturae receptae nominaui („corr.“). qua in re praeter codices mihi praesto fuere:

Memus — Apollonii Pergei philosophi mathematiciqve excellentissimi Opera per Doctissimum Philosophum Ioannem Baptistam Memum Patrietium Venetum Mathematicarumque Artium in Vrbe Veneta Lectorem Publicum De Graeco in Latinum Traducta et nouiter impressa. Venet. MDXXXVII fol.

Comm. uel Command. — Apollonii Pergaei conicorum libri quattuor ... F. Commandinus Vrbinas mendis quamplurimis expurgata e Graeco conuertit et commentariis illustrauit. Bononiae MDLXVI fol.

Halley — Apollonii Pergaei Conicorum libri octo et Sereni Antissensis de sectione cylindri et conii libri duo, ed. E. Halleus. Oxoniae MDCCX fol.

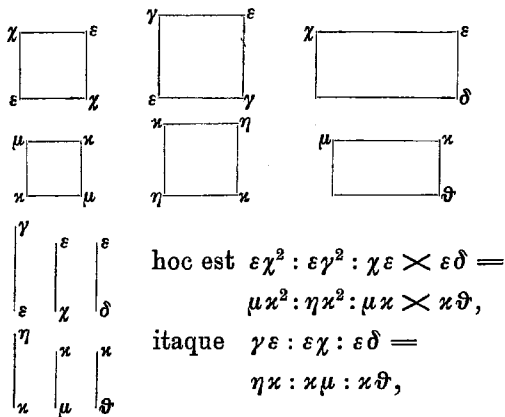
de fontibus horum librorum in prolegomenis uidebimus. Memo et Commandino emendationem tum quoque tribui, ubi tacite ueram scripturam interpretantur, nisi etiam errore non perspecto eodem modo interpretati essent.

in interpretatione mea propositiones Apollonii citauit libro et propositionis numero, ubi eiusdem

PRAEFATIO.

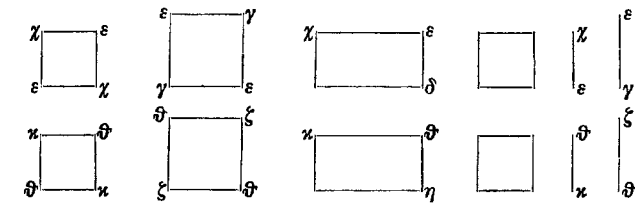
libri sunt, solo numero propositionis indicato; „Eucl.“ Elementa, „dat.“ Data Euclidis significat; lemmata Pappi numeris in Graeco ab Hultschio positos citantur.

Dixi infra p. 293 et alibi, in V interdum rectangula rectasque descripta esse; quae figurae quid significant, hic exponam. explicandi uiam mihi monstrauit Hieronymus G. Zeuthen, uir de Apollonio optime meritus. primum igitur in II, 50 inueniuntur hae figurae\*):



quae est ratiocinatio Apollonii p. 292, 27—294, 9. ergo figuras illas aliquis adscripsit ad ratiocinationem Apollonii illustrandam oculisque subiiciendam.

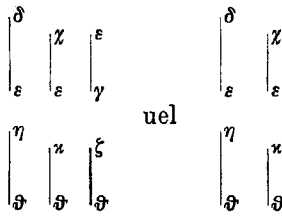
eodem modo paullo infra:



\*) Ubi V mutilus est, figuras e v supplendi; e eadem fere habet

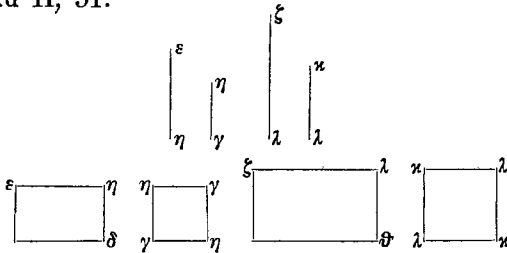
VIII PRAEFATIO.

quae figurarum series ad p. 296, 17 sq. pertinet, sed tam mutila est, ut difficile sit dictu, quo modo ordinanda sit. nam in V sola secunda series rectangularum exstat, quorum unum litteris caret; reliqua e v petita sunt. omnia ordine decurrent, si quattuor illae rectae primo loco ponentur et pro duobus quadratis litteris carentibus describentur hae rectae



tum enim habebimus: quoniam  $\chi\varepsilon : \gamma\varepsilon = \kappa\vartheta : \vartheta\xi$ , erit  $\chi\varepsilon^2 : \varepsilon\gamma^2 : \chi\varepsilon \times \varepsilon\delta = \kappa\vartheta^2 : \vartheta\xi^2 : \kappa\vartheta \times \vartheta\eta$ ; quare  $\delta\varepsilon : \chi\varepsilon : \varepsilon\gamma = \eta\vartheta : \kappa\vartheta : \xi\vartheta$  (uel  $\delta\varepsilon : \chi\varepsilon = \eta\vartheta : \kappa\vartheta$ ).

Ad II, 51:



haec Vv, nisi quod V in  $\xi\lambda$  pro  $\lambda$  habet  $\kappa$ . praeterea in v post quattuor rectas adduntur hae

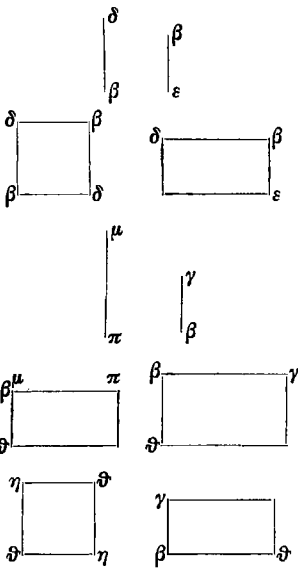
$\begin{array}{|c|} \hline \eta \\ \hline \end{array} \begin{array}{|c|} \hline \eta \\ \hline \end{array} \begin{array}{|c|} \hline \lambda \\ \hline \end{array} \begin{array}{|c|} \hline \kappa \\ \hline \end{array}$  (in  $\lambda\vartheta$  littera  $\vartheta$  in solo c servata est). has rectas si cum Zeuthenio ultimo loco ponemus, habebimus

$\varepsilon\eta : \eta\gamma = \xi\lambda : \kappa\lambda$  et  $\varepsilon\eta \times \eta\delta : \eta\gamma^2 = \xi\lambda \times \lambda\vartheta : \kappa\lambda^2$ ;

PRAEFATIO.

quare  $\eta\delta : \eta\gamma = \lambda\vartheta : \kappa\lambda$ , h. e. demonstrationem ab Apollonio omissam, triangulos  $\kappa\vartheta\lambda$ ,  $\gamma\eta\delta$  similes esse, u. p. 304, 17—19 et conf. Pappi lemma VII.

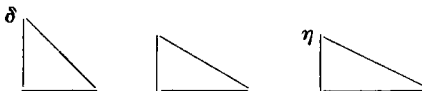
III, 15:



haec series figurarum illustrat, quae habet Apollonius p. 344, 14—24. in codicibus Vvc hae sunt discrepantiae: ante primas rectas habet V



in quadrato  $\delta\beta^2$  inferius  $\beta$  hab. vc, om. V, pro inferiore  $\delta$  hab.  $\varepsilon$  Vvc; rectam  $\gamma\beta$  solus c habet; in rectangulo  $\beta\vartheta \times \mu\pi$  in latere inferiore add. litt.  $\eta - \vartheta$  Vvc; rectangulum  $\beta\gamma \times \beta\vartheta$  solus habet c; in quadrato  $\eta\vartheta^2$  omnes litteras om. V, superiores  $\eta$ ,  $\vartheta$  vc; pro rectangulo  $\gamma\beta \times \beta\vartheta$ , quod omisit V, triangulum  $\gamma\beta\vartheta$  habent vc; deinde v solus addit



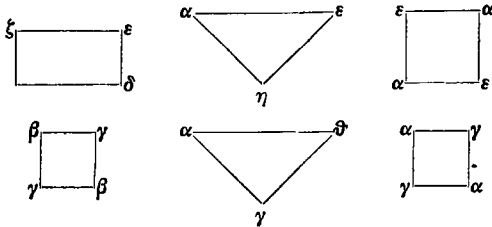
erroribus emendatis hoc efficitur:

$$\begin{aligned} \delta\beta : \beta\varepsilon &= \delta\beta^2 : \delta\beta \times \beta\varepsilon = \mu\pi : \gamma\beta \\ &= \mu\pi \times \beta\vartheta : \beta\gamma \times \beta\vartheta = \vartheta\eta^2 : \beta\gamma \times \beta\vartheta. \end{aligned}$$

X

PRAEFATIO.

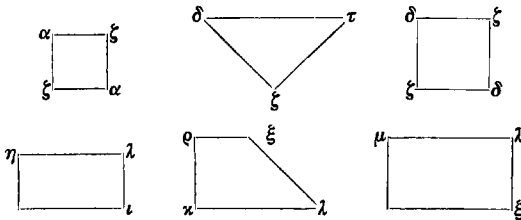
III, 16:



hunc ordinem praebet c, in V binae figurae componuntur. in primo rectangulo  $\delta$  om. V; in priore triangulo  $\epsilon$  et  $\eta$  permutat c, in altero  $\gamma$  om. V; in quadrato  $\alpha\gamma^2$  litteras inferiores om. V,  $\alpha$  inferius c. illustrantur uerba Apollonii p. 350, 5 sq.

$$\xi\epsilon \times \epsilon\delta : \alpha\epsilon\eta : \alpha\epsilon^2 = \gamma\beta^2 : \alpha\delta\gamma : \alpha\gamma^2.$$

III, 19 (in extrema prop. 17 leguntur):

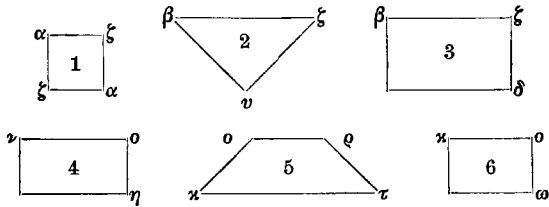


hanc seriem om. c, primas tres figuras hab. v, om. V; in  $\alpha\xi^2$  litteras inferiores om. v; in  $\eta\lambda \times \lambda\iota$  litteras  $\eta, \lambda$  om. V,  $\mu$  et  $\alpha$  earum loco hab. v; in  $\rho\lambda\xi$  litt.  $\xi$  om. V, pro ea  $\xi$  hab. v; in  $\mu\lambda \times \lambda\xi$  litt.  $\mu, \lambda$  hab. v, om. V. illustratur, ut uidit Zeuthen, locus p. 358, 2 sq.

$$\alpha\xi^2 : \delta\tau\xi : \delta\xi^2 = \eta\lambda \times \lambda\iota : \rho\xi\lambda\xi : \mu\lambda \times \lambda\xi.$$

PRAEFATIO.

III, 21:

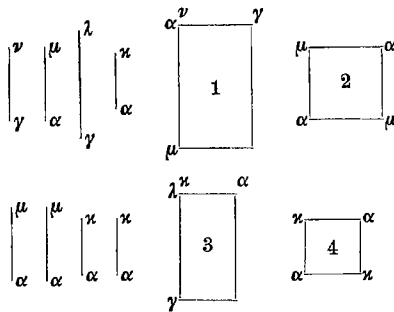


ordinem restituit Zeuthen; in c est  $\frac{1}{4} \frac{2}{5}$ , fig. 6 hab. v,

om. Vc. in fig. 1 pro inferiore  $\alpha$  litt.  $\delta$  hab. Vvc; in fig. 2  $\beta$  om. Vvc,  $\xi$  om. Vv, hab. c; in fig. 3  $\delta$  om. V; in fig. 4 pro o hab.  $\vartheta$  v; in fig. 5 o hab. c,  $\vartheta$  v, om. V,  $\phi$  om. V,  $\tau$  hab. c, om. Vv; in fig. 6  $\omega$  om. v, pro  $\kappa$ , o hab.  $\beta$ ,  $\vartheta$ . illustratur p. 362, 11 sq.

$$\alpha\xi^2 : \beta\xi v : \beta\xi \times \xi\delta = \nu o \times o\eta : \kappa o\phi\tau : \kappa o \times o\omega.$$

III, 54:



has om. c; in prima recta  $\kappa\alpha$  litt.  $\kappa$  om. V, hab. v; in fig. 2  $\alpha$ ,  $\mu$  ad partes dexteris om. V, hab. v; fig. 3 om. V,  $\alpha$  om. v, pro  $\gamma$  hab.  $\alpha$ . demonstratio

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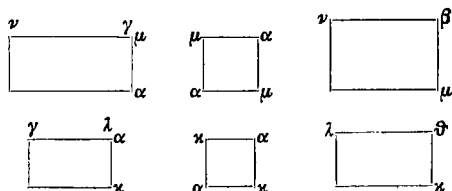
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XII

PRAEFATIO.

est proportionis p. 442, 12—13 ab Apollonio usurpatae; legenda enim

$\nu\gamma:\mu\alpha = \lambda\gamma:\kappa\alpha$  itaque  $\nu\gamma \times \mu\alpha:\mu\alpha^2 = \lambda\gamma \times \kappa\alpha:\kappa\alpha^2$ .  
 $\mu\alpha:\mu\alpha = \kappa\alpha:\kappa\alpha$



has om. c, posteriores tres om. V, hab.  $\nu$ ; in  $\nu\beta \times \beta\mu$  pro  $\mu$  hab.  $\nu$  uel  $\alpha$  V; in  $\lambda\theta\kappa$  pro  $\lambda$  litt.  $\alpha$  hab.  $\nu$ . legenda

$\nu\gamma \times \mu\alpha:\mu\alpha^2:\nu\beta \times \beta\mu = \lambda\gamma \times \kappa\alpha:\kappa\alpha^2:\lambda\theta \times \theta\kappa$ ,  
 quae illustrent uerba Apollonii p. 442, 14—15.

Praefandi finem faciam gratias quam maximas agens et praefectis bibliothecarum Parisiensis, cuius liberalitatem non semel expertus sum, et imperatoris Turcici, qui permisit, ut codex Constantinopolitanus hucusque peregrinaretur, et iis uiris, quibus intercedentibus mihi licuit codices illos Hauniam transmissos commode peruoluere, Christiano Bruun, bibliothecae regiae Hauniensis praefecto, et Petro A. F. S. Vedel, praeposito nostris cum populis externis rationibus.

Scr. Hauniae mense Octobri a. MDCCCXC.

I. L. Heiberg.