A NEW MATHEMATICAL TEXT
FROM ANTOINE THOMAS (1685),
NOW IN NEW YORK

Résumé. — Des recherches systématiques font de plus en plus resurgir des manuscrits négligés ou non identifiés d'Antoine Thomas, S.J., qui fut d'abord l'assistant de Ferdinand Verbiest, avant de lui succéder. Nous publions ici un nouveau texte, directement lié à l'enseignement des mathématiques que Thomas prodigua au *Colégio das Artes* de Coimbra, qui montre comment il a relancé les cours de mathématiques dans le principal collège jésuite du Portugal en s'appuyant sur les ouvrages de mathématiciens français contemporains.

Abstract. — Pursued research surfaces more and more overlooked or unidentified manuscripts of Antoine Thomas, S.J., the assistant and later successor of Ferdinand Verbiest. We publish here a new text which is directly linked to Thomas' mathematics teaching at the Coimbran *Colégio das Artes* and shows how he re-established mathematical instruction at the main Portuguese Jesuit college on the basis of contemporary French mathematical treatises.

Introduction

Over the entire 17th century, there was a remarkable "boom" of spiritual vocations in the Jesuit Province of Belgium, which had been split into two separate provinces in 1612, viz. the *Provinciae Flandro-Belgica* and *Gallo-Belgica* (see the figure in E. PUT *et al.* [1991], p. 32). This resulted in a quick spread of colleges and residences throughout the country, especially in the Flandro-Belgian province. Thanks to the very flourishing Jesuit cultural life, their educational institutions attracted a large number of students. On the occasion of the first centenary of the *Societas Jesu* in 1640, the order "exposed" and celebrated these facets of a rich Jesuit life for the first time, finding its most spectacular bookish expression in the *Imago Primi Saeculi* (Antwerp, *ex Officina Plantiniana*). One year later, Ferdinand Verbiest (1623-1688), a true *coryphee* of the 17th-century Jesuit Missions in China, entered the *Societas Jesu* in the Flemish Province (viz. in Mechelen). Four years later, Antoine Thomas, who would become another spearhead of the Chinese missions, was born in Namur, a town in the Gallo-Belgian province. The lives of both personalities of Belgian origin, Verbiest and

Thomas, would become mutually intertwined in China (Peking): Thomas was appointed Verbiest's collaborator in the management of the Imperial Astronomical Bureau (*Qintianjian*) and the calculation of the yearly calendar in 1685 before succeeding Verbiest after his passing away in January 1688[1].

From the very outset, Thomas had enjoyed a Jesuit education. Starting at the local Jesuit *Collège* (Namur, *rue de la Marcelle*) from 1652 to 1660 (see P. SAUVAGE [2017] on this period), he pursued his studies at colleges in Mons, Tournai and Douai, the main centers of the *Provincia Gallo-Belgica* (see M. HERMANS [2017]). In the margins of this education, mainly as the fruit of *studium privatum*, he acquired good mathematical and astronomical skills, which contributed decisively to the approval of his successive applications for the China mission (*Litterae Indipetae*). This selection brought him, in a first phase, through Paris (where he had contact with Jean de Fontenay, astronomer and future head of the "*5 mathématiciens du Roy*"), over Burgos (Spain), to the *Colégio das Artes* in Coimbra. After arriving in March 1678, he started teaching the local students – Jesuits and laymen, *Indipetae* and others – mathematics from 1677 to 1680. For lack of competent professors, all mathematical instruction had been interrupted for several years, which might have led to an average level of *grands débutants*. His courses, based on a wide reading of contemporary mathematical literature and observational practice, found their way to the press: *Synopsis Mathematica* was printed in Douai (1685), in two volumes. Without being a great success, it circulated within Jesuit educational institutions until ca. 1740.

This printed course and its reception were the object of earlier publications[2]. Meanwhile, hitherto unknown manuscript texts have resurfaced (also in rather unexpected places of conservation), which were successively produced in Coimbra, Goa and Macau. The first of these texts – an introduction to the entire range of mathematical sciences, 16 in total – refers to Thomas's instruction in Coimbra. As a token of sympathy for my old friend Lambert Isebaert, himself during his education and part of his professional life closely connected to the Jesuit institution of Namur, this text will be discussed in the present contribution.

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1. For a narrative biography of Ferdinand Verbiest, see R. A. BLONDEAU (1970); on Antoine Thomas, see Y. DE THOMAZ DE BOSSIERRE (1977).
2. See N. GOLVERS (2017). For an earlier analysis with an emphasis on mathematics, see H. BOSMANS (1925).

I traced the autograph manuscript of this *Introductio* – written in Thomas's well-known calligraphic handwriting, and certainly not a draft – in the collections of the *Hispanic Society of America* in New York (call number Ms. HC 371/277: *A. Thomas: Introductio ad scientias mathematicas*). The item was acquired from an auction of the House Hiersemann in Leipzig in 1909, and was described in their *Katalog* 371 (*Americana et Hispanica rariora,* Leipzig, 1909, p. 93), as part of a collection of papers, entitled: *China: 8 Briefe*; all other items are related to the same China mission in the Verbiest - Thomas period (between 1678-1682), and it is clear that they have the same origin. This may have been the personal archive or library of *Duquesa* Maria Guadalupe de Lencastre (1630-1715), who was, living in Madrid, a prominent Portuguese benefactor of the Jesuit missions in the East (Japan / China) and West Indies. Having built an intense letter exchange with Antoine Thomas in particular (E. J. BURRUS [1965] & J. GILLESPIE [2016], p. 128-133), she was also the "patron" of the *Synopsis Mathematica*, as can be inferred from the dedication in the first volume.

To the best of my knowledge, this document was only mentioned once, without attracting any further attention so far[3]. Another hand "introduced" it in Spanish on the preceding folio: *Papel de la Introducion de matematicas q. embio el P(adre) An(tonio) Thomas de Lisboa*. This enables us to determine the date of the text (or at least, of its sending, and indirectly a *terminus ante quem* of the draft), as Thomas left Lisbon for China – after the end of his didactical commitment in Coimbra – on 3 April 1680.

The title of the document is its program: *Introductio ad scientias mathematicas*. The targeted audience is identified in the next line: "*Aditum ad artes mathematicas duo reddere tyronibus difficilem solent*": the *tyrones* mentioned constituted also the intended readership of the *Synopsis*, and refer to the same public of his courses. The same didactic approach as in the *Synopsis* is again present in this *Introductio*: it includes a preference for a concise formulation, a focus on "definitions" (Art. 1 and 2); attention to the "order" of the didactic progression, going from more general to more specific parts (Art. 3), "concentration" of the presentation on the "essential" aspects of the various sciences, with intentional exclusion of too "specialized" aspects, reduction to the basic authors for further reading in every part. Therefore, there is a direct relation between this *Introductio* and the production of the *Synopsis*, which was rather brutally interrupted shortly be-

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3. See R. STREIT *et al.* (1929 [1964]), p. 910, sub 8°. 4, without clear bibliographical reference. A long bibliographic research led me first to the Hiersemann Auction Catalogue, and from there to the (unmentioned) buyer.

fore 22 January 1680, when he left Coimbra for a farewell visit to Salamanca (31 January), Madrid (where he met Maria de Guadalupe on 8 February 1681), Beja (7 March) and Lisbon (25 March), leaving on 3 April for China.

(Text edition)

Introductio
Ad scientias mathematicas

Aditum ad artes mathematicas duo reddere tyronibus difficilem solent.

Primum quod earum scriptores plerique parum se tyronum imbecillitate accomodare voluerint, ne forte doctis displicerent: alterum, quod plerique eorum, qui haec studia capessunt, certum ordinem, qui in omni scientia ediscenda accurate servari debet, non teneant. Quare praecipua pars difficultatis, quae in harum artium aditu occurrit, non tam ex earum propria obscuritate, quam ex tradendi ratione haec studia inchoantibus parum accomodata, et ex ipsorum Tyronum vitio aptam sibi viam non tenentium petenda est.

Igitur ut facilis ad illas scientias reddatur aditus, partim proponendi sunt ii autores, quibus potissimum utendum sit, indicatis etiam iis, quae seligere, quae omittere oporteat: partim

(p. 2) certus ordo tradendus, quo veluti gradatim ad penitiorem harum artium cognitionem, et sublimiores demonstrationes ascendatur.

Utrumque ut clarius perficiatur, primum trademus generalem quondam mathematicae eiusque partium notitiam, agendo de eius obiecto, natura, divisione, deinde certam seriem proponemus artium mathematicarum, secundum quam progredi tyronem oporteat, adscriptis ad singulas partes autoribus, quibus eum uti, ad illas facilius ediscendas oporteat.

Articulus primus.
Quid sit Mathesis,
Eius obiectum et natura?

Mathesis (quod nomen ex Graeco vocabulo mathesis, disciplinam sive doctrinam significat) hanc appellationem prae caeteris aliis scientiis habuit, quod e certis et evidentibus principiis omnes suas conclusiones demonstrare soleat; vel, ut alii volunt, quod in scholis Graecorum, olim

(p. 3) inter alias scientias, omnium prima esset ediscenda.

Obiectum mathematicae ab omnibus communiter assignatur quantitas terminata tam continua quam discreta. Discreta quidem, quia versatur circa

numeros, eorum numerandi modum, ac proprietates tradens, atque varias
diversorum numerorum inter se comparationes ac proportiones. Continua
autem, quia circa lineas, superficies et corpora, prout varie terminantur, et
varias efficient figuras, scilicet angulos, triangula, quadrata, circulos, cubos,
globos, pyramides cylindros etc.

Non tamen omnes mathematicae partes eodem modo circa quantitatem
versantur. Aliae enim quantitatem discretam considerant, ut ab omni materia
sensibili abstractam. Talis est arithmetica, quae naturam et proprietates
numerorum considerat, methodosque tradit numerandi, abstrahendo ab hac
vel illa materia numerabili, scilicet pecunia, lignis, saxis, hominibus etc.

Aliae quantitatem eandem discretam **(p. 4)** considerant in certa tantum
materia, v.g. musica, quae pro obiecto habet numerum in sono.

Aliae similiter versantur circa quantitatem continuam abstrahendo a certa et
determinata materia, ut geometria speculativa, quae linearum, superficierum
et corporum naturam ac proprietates, independenter a quavis materia
expendit: neque enim triangulum, circulum etc. quatenus in auro sunt aut
ligno considerat, sed sine ullo respectu ad materiam determinatam. Item
geometria practica, quae tradit modum metiendi lineas, superficies, corpora,
quacumque in materia reperiantur.

Aliae autem eandem quantitatem continuam in certa tantum materia pro
obiecto habent. ut optica in radiis visualibus, architectura in aedificiis,
astronomia in caelo, geographia in globo terrestri. Ex his variae divisiones
artium mathematicarum oriuntur, de quibus articulo sequenti agetur.

Collige ex dictis, quae sit Mathematicae natura seu definitio: est nempe
scientia tractans de quantitate terminata, abstracta, vel ad certam materiam
determinata.

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(**p. 5**) Articulus secundus.
Quae sit diversio
Artium mathematicarum?

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Antiquissimi philosophi et Mathematici Pythagorici, quos plurimi deinceps
secuti sunt, mathematicas disciplinas in quatuor partes diviserunt,
Arithmeticam, Musicam, Geometriam et Astronomiam. Fundamentum
autem huius divisionis hoc videtur fuisse: scilicet quod quantitas, quae est
obiectum Matheseos, duplex sit, nempe continua et discreta sive multitudo et
magnitudo, utraque autem considerari possit dupliciter, vel secundum se, vel
prout ad certam materiam determinata.

Igitur, consentaneum putarunt, iuxta quadruplicem illam quantitatis
considerationem, quatuor constituere mathematicae species. Illam igitur
speciem, quae quantitatem discretam seu numerum considerat, secundum se,

inquirendo et explicando numerorum proprietates, appellarunt Arithmeticam sive scientiam de numeris. Quae eandem quantitatem discretam considerat determinatam, scilicet ad sonum, contemplando numerum sonorum sive sonum numerorum et harmonicum

(**p. 6**) appellarunt Musicam: quae quantitatem continuam secundum se considerat, Geometriam: quae eandem comparatione seu respectu ad aliud, nempe ad magnitudinem et motum corporum caelestium, Astronomiam appellarunt.

Verum haec Antiquorum divisio, quantumvis ingeniosa, in hoc tamen videtur deficere, quod omnes mathematicae partes non comprehendat, ut mox videbitur. Quare alia divisio assignanda est, non tamen longe ab illa diversa hoc modo.

Mathesis omnis, ut supra dictum est, versatur circa quantitatem terminatam, discretam vel continuam, abstractam a certa materia vel determinatam. Quae circa discretam et abstractam a certa materia versatur (i.e.) circa numerum secundum se consideratum, dicitur Arithmetica; speculativa quidem, si speculative consideret numeros eorumque proprietates, practica vero si methodum tradat numeris utendi. In hunc etiam locum venit Algebra, quae quidem modum numerandi tradit abstractum a certa materia, quod cum Arithmetica commune est; sed aliam longe methodum habet specieque diversam, ideoque alteram numerandi scientiam constituit.

(**p. 7**)
Quae circa eandem discretam quantitatem, determinatam ad certam materiam versatur, scilicet, quae circa numerum sonorum dicitur Musica seu speculativa seu practica, prout speculative aut practice circa numerum sonorum versatur.

Quae quantitatem continuam pro obiecto habet, sed a materia sensibili abstractam, Geometria communiter dicitur; alia quidem speculativa, quae in sola speculatione naturae et proprietatum istius quantitatis sistit, alia practica, quae ulterius tendit ad praxim, sive ad lineas, superficies et corpora metienda.

Quae autem circa eandem continuam quantitatem in certa materia versatur, in plures dividitur species, Antiquorum divisione prius allata non comprehensas.

Hae sunt:

Astronomia tam speculativa quae corporum caelestium magnitudinem motusque metitur, quam practica quae varias praxes docet, quibus Kalendarium conscribi, Astrorum observationes fieri, horologia designari, naves dirigi ex astris possint.

<u>Optica</u> quae scientia considerat

(**p. 8**) radios visuales, sub ratione linearum, superficierum, angulorum, etc., modosque et causas variae obiectorum apparentiae demonstrat. Et quoniam triplex est radius visualis, directus, reflexus et refractus, ideo optica in tres dividitur species: quarum ea, quae radium directum considerat, simpliciter optica dicitur, quae reflexum catoptrica, et quae refractum dioptrica appellatur. Optica alia speculativa, quae in sola obiecti cognitione ac demonstratione sistit: alia practica, quae modum tradit, quo obiectorum visualium apparenta possit in tabella exhiberi, eaque pars huius scientiae dicitur <u>perspectiva.</u>

<u>Geographia</u> quae globum terrae metitur et describit.

<u>Hydrographia</u>, quae de oceano, mari variisque ad navigationem pertinentibus tractat.

<u>Mechanica</u>, quae versatur circa machinarum constructionem, et per eas movendi gravia methodum tradit ac demonstrat.

<u>Statica</u>, quae est ponderandi corpus grave scientia, simulque multiplices gravitatis effectus ostendit.

<u>Hydraulica</u>, quae de fontibus, praesertim artificialibus agit.

(**p. 9**)
Architectura, quae praecepta tradit, quibus fabrica ex arte exstrui possit. Alia civilis, quae de aedificiis publicis aut privatis tractat, ad utilitatem aut ad ornatum: alia militaris, quae munimentis ad locorum defensionem excitandis intendit. Ad hanc quoque pertinet aggrediendi leges tradere, atque etiam machinas bellicas exstruendi.

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Articulus Tertius.
Quis ordo servandus sit
in mathematicis discendis?
Et quibus libris utendum?

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Duobus ad has artes velut fundamentis opus est, scilicet Arithmetica et geometria; quarum quidem notitia ita ad caeteras partes necessaria est, ut vix ulla, sine earum subsidio perfecte et commode edisci possit. Igitur

1° <u>Arithmetica</u> discenda, in qua quidem Tyro primum quatuor communes regulas ediscet, nempe additionem, subtractionem, multiplicationem et divisionem: deinde regulam proportionalium quae *aurea* dicitur, regulam Societatis, positionis, alligationis etc. Post haec percurret librum septimum et octavum Euclidis

(**p. 10**)
qui scilicet ad Arithmeticam pertinent.

> Vide libellum Arithmeticae Patris Tacquet, demonstrationibus tamen praetermissis.

2° Geometria speculativa sive Elementa Euclidis, saltem quae sex primis et undecimo libro continentur. In his quoque a Tyrone variae demonstrationes omitti possunt, quae plus difficultatis habent quam utilitatis, et tantum praecipuae seligi, quas ediscat: caeterarum autem solam propositionem quae demonstratur, memoria utcumque tenere sufficit.

> Vide libellum geometricum Patris Tacquet aut P(atris) Dechalles.

3° Trigonometria: haec ad geometriam pertinet et ad plerasque partes mathematicae utilissima est. Ea tradit methodum, qua certarum tabularum ope et beneficio regulae aureae, ex tribus cognitis in triangulo, v.g. uno latere et duobus angulis, caetera, quae ignota sunt cognoscuntur, idque tam in triangulis rectilineis quam sphaericis. Haec scientia in paucis regulis cognoscendis, et ad usum applicandis consistit; quarum demonstratione necesse non est Tyronem detineri.

> Vide libellum, cui titulus: Canones sinuum, tangentium, secantium vel Trigonometriam Patris Dechalles.

(**p. 11**)
Nota hanc trigonometriam per tabulas communes sinuum, tangentium, secantium, pati nonnihil difficultatis in eo, quod calculus aliquanto longior plerumque adhibendus sit, cum fiat per multiplicationem et divisionem magnorum numerorum, adeoque longa et nonnihil molesta sit operatio.

Quare tabulae Logarithmicae a recentioribus ingeniose excogitatae fuerunt, quibus multo facilius triangula quaelibet resolvuntur, ideoque his potius quam prioribus est utendum.

> Vide libellos logarithmorum impressos Parisiis, Lugduni vel etiam tractatum P(atris) Dechalles de Logarithmis.

4° Geometria practica utilissima, et facilis scientia. Ea docet artem metiendi quamlibet quantitatem continuam, v.g. turrium, montium, nubiumque altitudinem, hortorum et camporum aream, cuiusvis corporis soliditatem, vasorum naviumque capacitatem, etc.

> Vide tractatum Patris Dechalles et praecepta Archimedis in fine Geometriae Patris Tacquet.

5° Mechanica, quae tradit machinas, quibus potentia movens augetur ad gravia movenda. Hanc artem, uti et geometriam practicam praecipue illustravit Archimedes, variis demonstrationibus ingeniosissime excogitatis.

Vide similiter P(atrem) Dechalles de Mechanicis

(p. 12)

6° Statica. Hanc partem varii confundunt cum Mechanica, sed male: cum Mechanica gravium movendorum, statica vero eorundem ponderandorum sit scientia; aliud enim est gravia per machinas movere, aliud pondera eorum explorare, quod ad staticam pertinet.

Vide elegantem tractatum
apud P(atrem) Dechalles.

in quo solide probat contra plerosque philosophos, quod aqua intra anthliam non metu vacui sed propter aeris, exterius aquae incumbentis gravitatem ascendat; et per hanc omnia explicat, quae philosophi metu vacui evenire semper docuerunt.

7° Hydraulica. Haec pars agit de fontibus tam naturalibus quam artificialibus. De his pulcherrimum scripsit tractatum Hiero antiquus scriptor.

Vide Patris Scotti librum de fontibus.
Item Patrem Dechalles.

8° Musica, quam Euclides definit contemplandi et concentum exercendi scientiam. De ea tractarunt, post Euclidem, Ptolemaeus, Boëthius, Stabulensis, Keplerus, Kirkerus, aliique multi insignes Mathematici, ut merito inferri possit eam non esse inter mathematicas artes ultimam.

Vide Athanasium Kirkerum et
Patrem Dechalles.

(p. 13)

9° Optica, est scientia, quae considerat, ut supra diximus, radios visuales. Agit primum de oculi structura, partibus etc., deinde de radiis directis, modumque tradit obiectorum apparentiam in tabulam transferendi; item artificium, quo pictura deformis ex certo loco visa effigiem aliquam elegantem exhibeat etc. Tum tractat de radiis per speculum reflexis, variasque experientias ingeniose excogitatas tradit. Denique agit de radiis refractis, ac nominatim tuborum cuiusvis generis artificium exhibit.

Vide insignem tractatum P(atris) Dechalles,
in quo experientiae novae non desiderantur.

10°. Architectura civilis et militaris. Prior tradit artificium domos, palatia, templa construendi; agit de columnarum varietate, et certas, quae servari debeant, adfert proportiones ex Vitruvio antiquo autore.

Vide Patrem Dechalles.

Militaris agit primum de modo loca tam regularia quam irregularia muniendi; deinde de urbium oppugnatione et defensione, ac denique de castrorum metatione, ordinatione exercituum, bellicorum tormentorum directione, aliisque machinis et inventis bellicis.

> Vide Les travaux de Mars
> Libellum D(omi)ni Fruitac et D(omini) Pagan.
> Et P(atrem) Dechalles, in libello de munitionibus.

(p. 14)

11° Astronomia. Est scientia, quae situm, ordinem, motum, magnitudinem, distantiam aliaque phaenomena et accidentia siderum considerat. Haec pars mathematicae omnium nobilissima est, sive obiecti spectat dignitatem, sive antiquitatem scientiae, quae multo ante Christum natum habuit Chaldaeos, deinde Hipparchum Rhodium, et Bithinum observatores et scriptores insignes, qui prima Astronomiae fundamenta tradiderunt; sive etiam procedendi in tam sublimi contemplatione methodum: ob quae iure merito haec scientia magno in honore ab antiquis philosophis, et a plurimis Regibus habita est, quorum etiam varii, ut Ptolemaeus Rex Aegypti et Alphonsus Castellus etc. ei operam suam diligenter tradidere. Hanc etiam magnopere commendat, eius beneficio, Evangelii ad Sinas propagatio, eius ad caelestia et ad amorem Conditoris animos erigendi potentia, de qua Plato Dialogo 7 ait: "Nonne caelestium varietate utendum est, velut exemplo quodam, ad supernarum rerum contemplationem? Idem facturum censeamus verum Astronomum, quando motus siderum intuebitur, arbitraturum scilicet quam pulcherrime ab ipso Caeli conditore, caelum

(p. 15)

ipsum, et quae in eo sunt, esse fabricata."

Huius scientiae rudimenta ordiri primum oportet a tractatu de sphaera in communi, deinde de sphaera caelesti et elementari.

> Vide de his commodum tractatum
> apud P(atrem) Ricciolum, initio Almagesti,
> tum etiam apud P(atrem) Dechalles.

Deinde assumendus est tractatus de motu solis et lunae, et utriusque eclipsibus

> Vide P(atrem) Dechalles et Mullerum.
> Item P(atrem) Ricciolum et P(atrem) Tacquet
> sed variis praetermissis, quae ad
> artis peritos pertinent.

Post haec videndus tractatus de stellis fixis, de quinque minoribus planetis, denique de cometis, de vanitate Astrologiae iudiciariae.

> Vide P(atres) Ricciolum, Tacquet,
> Dechalles.

12° Kalendarium, quod ex Astronomia nominatim deducitur. Ibi agitur de annis antiquis diversi generis, de ratione eos numerandi, de Olympiadibus, annis Iulianis, de Kalendarii reformatione anno 1582 per Gregorium 13 Pontificem Romanum, de cyclis solis et lunae, de indictionibus, epactis, luna Paschali, festis mobilibus, etc.

> Vide Mullerum in fine; P(atrem) Deschalles
> et P(atrem) Gautruche in Synopsi Mathematica.

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13° Horologiographia, vetustissima scientia, docet methodum conscribendi horologia, tum Geometricam, tum Arithmeticam, quae postrema methodus, sua facilitate, longe praeferenda est priori.

> Vide P(atrem) Gautruche in Synopsi math(ematica) (,)
> P(atrem) Dechalles.

14° Geographia, scientia perquam utilis. Tradit divisionem terrae in certas zonas, climata etc., item in regna, provincias, quarum certas proprietates, v.g. amplitudinem, praecipuas civitates, fluvios, incolarum mores etc. describit.

> Vide P(atrem) Deschalles; P(atrem) Gautruche
> ac nominatim libros geographicos
> D(omi)ni Sanson, eiusque chartas
> geographicas.

15° Hydrographia, non solum de Oceani ac marium extensione, profunditate, fluxu et refluxu agit, verum etiam de navium fabricatione, oneribus, gubernatione, de ventis, de acu nautica, aliisque ad navigandum instrumentis.

> Vide P(atrem) Fournier, P(atrem) Dechalles,
> Petrum Herigonium, Stevinum, etc.

16° Algebra, quae est subtilior ars numerandi, ab Arabibus excogitata, deinde a P(atre) Clavio S.J. magnopere illustrata ac deinde a D(omino) Decartes in novam methodum longe meliorem traducta, quae proinde dicitur "algebra speciosa". Hanc partem Tyronibus parum accomodatam in hunc locum reiciamus. Vide Clavium, Dechalles, Gottinez.

Finis

Discussion

The parallels between this Introduction and the text of *Synopsis*, composed between 1678 and 1680 (probably also relying on pre-existent notes dating from the period of his activity in Douai), are obvious. Nevertheless, some differences stand out:

- the order of the parts is partly different. The position of *astronomia* is probably the most striking difference: while being n° 15 in the *Synopsis*, constituting the final target of the entire mathematical education, it is n° 10 in the *Introductio*. Similarly, the cluster *geographia - hydrographia*, n°s 5 and 6 in the *Synopsis*, appears as n°s 14-15 in the new text.

- The *Synopsis* version has a separate section on "algebra" (more specifically the *algebra speciosa*), as n° 16 and the very last in the series, which Thomas explains by the fact this discipline was less "adapted" to the young *tyrones* (i.e. "beginners"). This is probably also the reason why a separate chapter on algebra is missing in the *Synopsis*. Still, it is not inconceivable that Thomas had the ambition to include it into the *Synopsis* as the last discipline, but that this was thwarted by his seemingly sudden departure from Coimbra. Whatever the case, it is certain that during the entire 17th century algebra was only slowly and with much restraint accepted and included into the Jesuit school curricula in Europe.

- The authors or sources cited here are clearly selected for their (relatively speaking) "basic" and "didactic" approach (*adscriptis ad singulas partes autoribus, quibus eum [= tyronem] uti, ad illas facilius ediscendas oporteat*). For obvious reasons, a large proportion of the authors included in the "further reading" section are the same in both cases: Claude-François Milliet Dechalles is the main source of reference. There is no doubt that his *Cursus Mathematicus*, published in Lyon in 1674, is meant here (cf. T. MULCRONE [2001]; ANON. [2018]), a very successful mathematical textbook in France, which was highly praised for its comprehensive and clear explanations [4].

- The wording is different.

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4. Still five copies of it are surviving in the Beitang Collection in Peking (H. G. VERHAEREN [1949], n°s 1259-1263), viz. two of the first edition 1674, and three of the revised edition (Lyon, 1690). N° 1259, which has the library indication: *Coll[egii] Pek[inensis] S[ocietatis] J[esu]* – the Nantang College in Peking, where A. Thomas lived – might be a copy brought by Thomas himself.

Still, the *Introductio* mentions a number of other authors, to whom there is no reference in the *Synopsis*. The most important of these is another Jesuit mathematician, Pierre Gautruche (Orléans, 1602 - Caen, 1681), professor of mathematics at the University of Caen (1667-1681), and quoted by Thomas as the author of a *Synopsis mathematica*, probably an informal title either for his *Mathematicae totius Institutio* (Caen, Cavelier, 1635) or his *Philosophiae ac Mathematicae totius Institutio. Cum assertionibus disputatis, et vario genere problematum*, vol. III: *Mathematica,* Caen, A. & J. Cavelier, 1656 (cf. H. BEYLARD [2001], *s.v.* "Gautruche (Gaultruche), Pierre"; Ch. E. O'NEILL [2018]). He was mentioned as an authority in calendar making and horologiography; which is somewhat unexpected, since Gautruche was mainly renowned for his works on music, mythology and philosophy (cf. L. W. B. BROCKLISS [1995], p. 187-219).

Other authors recommended to his students are:

- Boethius (ca. 480 - 525), for Music;

- Fournier, Georges, S.J., *Hydrography*, Paris, 1633; Fournier (1595 - 13 April 1652) was a student from the S.J. college in Caen, Andin (1629-1633) a mathematics teacher at the S.J. college of La Flèche;

- Friutac, i.e. Fritach or Freitag, Adam (1600-1699), author of *Architectura militaris*, translated into French as *L'architecture militaire ou la fortification*, Paris, 1657;

- Gottinez, recommended author for algebra, i.e. Gilles-François de Gottignies[5] (1630-1689), "Belgian" student of André Tacquet in Antwerp; professor of mathematics at the *Collegio Romano* between 1662-1689;

- Hiero, certainly to be understood as Hero (Alexandrinus);

- *Les travaux de Mars*, by Alain Manesson Mallet (1630-1706), author of an homonymous work, in 3 vols, 1st ed. 1671-1672;

- Pagan, Blaise François, another French author on military architecture, author of *Les fortifications du comte du Pagan*, Paris, 1645, etc.

- Schottus, Gaspar, S.J. (1608-1666), "de fontibus", in all probability a reference to his work on hydraulics, viz. *Mechanica hydraulico-pneumatica*, Frankfurt, 1657 (dealing, among others, with *alvei, canales, fontes salientes, siphones, tubi …*);

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5. For the spelling *Gottinez*, cf. Gio. D. CASSINI, *Lettere astronomiche […] sopra la varietà delle machie osservate in Giove*, Roma, 1665, p. 1; the same author spells *Gottignez* in his *Epistola ad P. Fr. de Gottignez responsoria* (Bononiae, 1665).

-   Stabulensis, i.e. Faber (Jacobus) Stabulensis (ca. 1450 - 1536); his recommended treatise on music must be *Musica libris demonstrata quattuor*, published together with *Arithmetica decem libris demonstrata* and *Epitome in duos libros arithmeticos divi Severini Boetii*, Paris, 1496, 1507, 1514.

This extension does not change the overall picture represented by the sources mentioned in the *Synopsis,* as listed in N. GOLVERS (2017, p. 140-145). It confirms indeed the outspoken "Jesuit" and "French" character of Thomas's sources, as witnessed by the presence of prominent Jesuit mathematicians of the 17th century, such as Christopher Clavius; Andre Tacquet, François de Gottignies, Giovanni Battista Riccioli, Millet De Challes, many of whom were French. If we compare this picture with an overview of the (French) Jesuit courses that were in circulation, it turns out that there were a number of "missing" items, such as Marolois (1st ed. 1616), Boulenger (1630), Bourdin (1639). the most striking absent item is probably the course of Pardies (1671) (see the overview in L. C. KARPINSKI and F. W. KOKOMOOR [1928] and in L. C. KARPINSKI [1928]).

Neither of these two characteristics will be surprising, given the above-mentioned Jesuit and French curriculum and background: the prominent presence of French mathematical books in his courses at the *Colégio das Artes* in Coimbra indeed reflects his own education (especially in Tournai and Douai), but probably also the lack of appropriate printed manuals on mathematics in Portuguese, or manuals whatsoever, as can be inferred from the complaints the author voiced upon arriving in Coimbra [6].

Finally, it remains unclear whether these references are merely echoes of his own reading memory, probably supported by notes he made in the past, before he arrived in Coimbra, or whether he brought or ordered these books from France to Coimbra. In any case, it remains interesting to see how in 1679, when Thomas arrived in Coimbra, he tried to "revive" or restore mathematical teaching – which had been very irregular for many decades in the absence of competent Portuguese professors – by relying on mainly French mathematicians.

The relationship between this *Introductio* from 1685 and the *Synopsis Mathematica*, which was printed in Douai that same year, remains somewhat unclear, even though the connection between the two texts is undeniable. Since the *Synopsis* has in fact no introduction, and starts – after the

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6. *Perveni Conimbricam vigesimâ quintâ huius, a R(everen)do Patre Provinciali missus ad docendas scientias mathematicas hoc anno. Quare intra paucos dies illas inchoabimus, omni fere librorum subsidio destituti, eo quod in his regionibus vix ulli mathematici libri reperiantur*: see M. GUADALUPE DE LENCASTRE (1975), vol. 2, p. 157.

dedications, the *Privilegia* and the *Index* – immediately with *Caput primum*, one could assume that this text was conceived as the missing introduction to the *Synopsis*, and was written as the last phase of the writing process. For some reason, it was eventually omitted in the printing process. A counterindication, however, is that the order of the chapters is different, as are (part of) the recommended authors for each chapter. Nevertheless, the *Introductio* remains a revealing new testimony of the didactic practices *in mathematicis* of a great *Namurois* in such an interesting milieu as the *Colégio das Artes*, while preparing himself and some of his students for the Chinese mission.

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