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On the Types of Scholarly Latin Used by Authors in China

Abstract: This article examines the distribution of grammatical categories in the scientific and philosophical Latin used by some key European authors in China, especially in translations from the Chinese into Latin. These values are compared to other texts' distribution of grammatical features. The texts were automatically lemmatised and PoS tagged. As a basis of comparison, five large samples of Latin prose texts from five important time-frames were used.

I digitised a number of texts related to the Far East, especially three Latin translations of the Confucian Analects (论语, *Lúnyǔ*) and a collection of sphygmological Chinese treatises published by Andreas Cleyer in 1682. The grammatical composition of these texts as well as their translations of technical Chinese terms into Latin were compared to those of similar European Latin texts. The Confucius translations were found to differ relatively little from other scholarly Jesuit Latin, whereas the medical texts differ greatly from European medical texts on a similar topic.

Keywords: Corpus Linguistics, Jesuit Latin, Confucius, Analects, Parts-of-Speech, Andreas Cleyer, Sphygmology

1 Background on Types of Scientific Latin

I recently proposed a way to characterise scientific Latin compared to other types of Latin based on the distribution of grammatical categories in the texts. First, I here recapitulate some of the methods I used to this end briefly.[1] I defined five large samples of non-scientific Latin prose texts from five important time-frames.[2] They were automatically part-of-speech (PoS) tagged and lemmatised.[3] Words un-

1 For more details compare Roelli (2021) 398–438.

2 The differences between these five time-frames (from antiquity to early modern times) were smaller than expected for most grammatical parameters.

3 All the texts discussed here can be found on my free and open full-text repository Corpus Corporum (mlat.uzh.ch). The lemmatisation and PoS-tags are based on the word and form lists of Perseus plus (for forms unknown to Perseus) on a large experimental word list that CompHistSem Frankfurt kindly shares with us. The quality of this process was assessed in Roelli (2021) 400–401. We hope to be able to improve the automated tagging in the future once even larger and more accurate word lists become available.

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known to our word lists have been removed from the samples for this study, many of them being place names or transliterated Chinese terms. In Roelli (2021) a group of some forty texts from a variety of epochs and fields that can be considered to be of a scientific nature were compared. Besides these, I used some thematically defined samples, for instance arithmetical and medical texts. Some further non-scientific out-groups were compared to the general sample: poetry, the *Vulgate*, the *Digesta*, a collection of medieval charters, and some scientific translations from the Greek. I identified grammatical categories that differ significantly from the five benchmark samples, then used these in Principal Component Analysis (PCA) plots to find groups within the scientific Latin texts. Some of the results were surprisingly different from what one would expect from contemporary scientific English or German.[4] For instance, scientific Latin tends to use fewer nouns and verbs than the general benchmarks, but more adjectives and prepositions. Some parameters known to be typical of scientific English – the use of non-conjugated verb forms, the passive voice, a lack of the first-person singular, and nominalisation of processes – were tested for Latin as far as they were applicable. Some of them were found to be typical also of scientific Latin (especially: high numbers of third-person passive forms; low numbers of first-person singular forms and of possessive pronouns), but others were not (e.g. non-finite verb forms). Some were found to be typical of Latin science but not directly comparable to, or not yet studied for, English (high numbers of the nominative case, the verb *esse*, words with suffixes; low numbers of *ablativus absolutus*), some seemed typical of Greek translation style (more sentence-modifying particles like *autem, enim* etc.), and some opened up new questions: low textual entropy,[5] which had hitherto not been studied for scientific texts. The PCA plot based on the ten most significantly different grammatical categories is here reprinted as Fig. 1.

In the same study (Roelli 2021, 441–443), I identified several clear-cut types of scientific Latin; they were labelled: (i) "Hexametric" (didactic and scientific poetry), (ii) "Rhetorical" (e.g. Cicero, Quintilian), (iii) "Plain" (e.g. Pliny the Elder), (iv) "Bombastic" (e.g. Martianus Capella), (v) "Scholastic" (e.g. Albertus Magnus), (vi) "Mathematical" (e.g. Newton), (vii) "Modern academic" (e.g. Spinoza). For Latin's roughly 2,000 years of use in scholarship and science, the sample is admittedly rather small and the identified categories quite general. Due to Latin's deep memory, these approaches and their respective styles of writing did not supplant one another chronologically; for instance, Vesalius could still use a rather rhetorical approach in

4 See a comparison in Roelli (2021) 389–397.

5 This is – roughly speaking – a measure of how expected the next word in a text is. Its strict definition is quoted in Roelli (2021) 406–407.

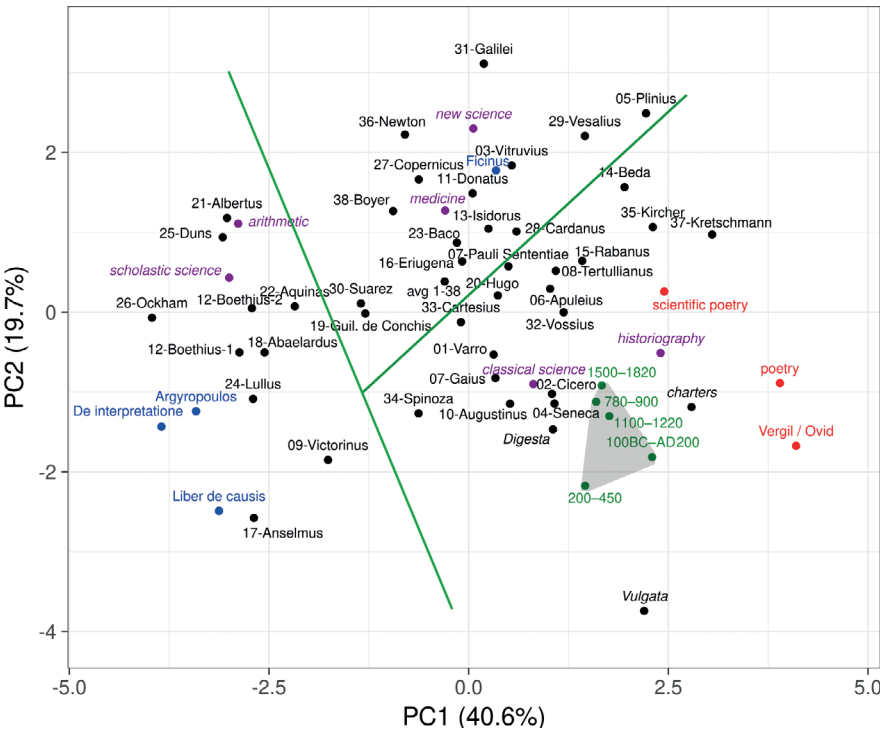

Fig. 1: Plot from Roelli (2021), 435. The figure shows a PCR plot obtained by using ten grammatical parameters that were found to be the most telling for the examined scientific texts compared to the benchmark; these same parameters will also be used below. The numbering of the texts is chronological. The plot shows the five benchmark samples (green and shaded) close to some other non-scientific texts: poetry (red) is found diametrically opposite to scholastic and arithmetic texts as well as most translations from the Greek (blue); at the top of the plot in the middle appear texts from the natural sciences and medicine, whereas human sciences like philology and philosophy from the early modern period as well as from late antiquity ended up closer to the benchmark samples. Violet and italicised items are averages for tentative groups of texts. For details about the texts and editions used, see Roelli (2021) 415–419.

early modern times. It was also found that the language of medicine usually shared important features with the 'plain' approach of Pliny. The grammatically most extreme language is that of scholasticism; early modern times mitigated this outlying character and returned to a more "normal" Latin, so the neo-scholastic philosopher Franciscus Suárez appears closer to the middle of the plot in contrast to earlier scholastic authors such as Albertus, Lullus, or Ockham. In general, the various disciplines seem to become more similar in their Latin as time passes, with a few exceptions, especially in mathematics. For not strongly mathematicised sciences,

there is a tendency toward what could be called “early modern academic Latin”. This is the language we would expect scholarly authors in China to use.

This same methodology is applied in this contribution to scholarly and scientific Latin texts from China, especially by Jesuit authors. The main question we try to answer is this: are there differences based on the distribution of grammatical features between texts translated from the Chinese, texts by Chinese Jesuits, texts on China in general, and translated Chinese medicinal texts compared to Western medicine in Latin? As hardly any of these texts were available in digitised and OCRed form,[6] I mostly had to digitise them myself, which put limits on their size and number. Therefore the results achieved here are provisional. Apart from this, it must be stressed that such an approach, focusing on the distribution of grammatical features, is an approach that by design will not be able to detect other, more subtle differences between the texts.

2 Comparison Set of Related Texts

The texts used below are now briefly introduced. These constitute four groups of texts related in one way or another to the Confucian and medical Chinese texts. Here is a list including year of publication and total number of words (rounded to hundreds) for each:[7]

Pre-Jesuit texts about the Far East (all by Franciscans):
- Julianus OFM (fl. 1250), *Epistula de vita Tartarorum*; 2,000 words.
- Gulielmus de Rubruquis OFM († before 1293), *Itinerarium*; 41,600 words.
- Odoricus de Porto Naonis OFM († 1331), *Relatio de mirabilibus orientalium Tatarorum*; 91,600 words.

Texts by Jesuits on topics that have nothing to do with China or Asia:
- Franciscus Suárez SJ, *Disputationes metaphysicae* (published 1597); 1,376,000 words.
- Nicola Orlandini SJ, *Historia Societatis Iesu* (published 1615); 1,387,700 words.
- Carolus Frank SJ, *Philosophia naturalis* (published 1949); 83,100 words.
- Carolus Boyer SJ, *Cursus philosophiae* (published 1952); 291,200 words.

6 Some texts could be found on the *Eurasian Latin Archive* (http://ela.unisi.it) and on *noscemus* (https://wiki.uibk.ac.at/noscemus).

7 The editions used are cited at Corpus Corporum.

Jesuit texts from or on China that are neither medicinal nor translations:
- Mateo Ricci SJ,[8] *Catechismus Sinicus* (written 1603); 3,500 words.[9]
- Martino Martini SJ,[10] *Brevis relatio de numero et qualitate Christianorum apud Sinas* (published 1654); 6,300 words.
- Athanasius Kircher SJ,[11] *China illustrata* (part III only) (published 1667); 14,200 words.
- Philippe Couplet SJ,[12] *Proemialis declaratio* (published 1689); 42,000 words.

Descriptive botany; a work from China, one from ancient Rome:
- Michaelis Boym SJ,[13] *Flora Sinensis* (published 1656);[14] 9,700 words.
- Pliny the Elder, *Naturalis historia* XII–XXVII (ca. AD 79); 165,600 words.

The results for short texts (fewer than c. 10,000 words) will have to be treated with caution. In summary: the first sample I used contains three pre-Jesuit texts about the Far East. These are travel reports from trips to Mongolia and/or China from the 13th century. The second one is made up of four texts on philosophical or historical topics written by Jesuits that have nothing to do with China or Asia. Third, some Jesuit texts from or about China whose content is scholarly but

8 See Pfister (1976) 1, 22–42. Ricci wrote a work in Chinese: *The True Meaning of the Lord of Heaven* (天主實義, *tiānzhǔ shíyì*). He wrote this brief recapitulation in Latin in order to gain the Jesuit *imprimatur*.

9 Transcription by Douglas Lancashire SJ from Roma, Bibliotheca Casanatense, Ms. 2136, f. 1, 2r, 4–10r. Print version in Lancashire (1986) 459–471.

10 On Martini: https://www.martinomartinicenter.org/martino-martini.html and Pfister (1976) 1, 256–262. Martini's book is a short report on the Chinese mission, including numbers of converts, gifts sent to the emperor, and Jesuit books printed in Chinese.

11 Kircher's book was a *summa* of what he could find out about China from Jesuit publications and correspondents. Although Kircher himself never left Europe, he had access to first-hand information at the Jesuit headquarters in Rome. His book was to remain one of the most important sources on China in Europe for at least a century.

12 See Pfister (1976) 1, 307–313. For a biography: Heyndrickx (1990) 17–19. Couplet's introduction to the Confucius translations is «the first broad presentation of some texts of Chinese ancient thought to a Western audience» (Balbo 2022, 119). His aim was: *propositum nobis non est tam servire oblectamento & curiositati eorum qui in Europa degunt, quam utilitati eorum qui ex Europa lucem Evangelicam ultimis hisce terris allaturi navigant* (p. ix). The Confucian classics are said to *longe ante Moysem fuisse conscripta* (xvi). The *litterati* are *philosophi* (xxxiv). Basic philosophic tenets (*yin*/*yang*, the sixty-four hexagrams of the *Yìjīng*) are explained. Some further important matters: accommodation theology (§6), the old Chinese term for God being sought and claimed as *Xam ti* (*Shàngdì*; §8), the neo-Confucians (*neoterici*) being rejected (§11).

13 See Pfister (1976) 1, 269–276.

14 https://wiki.uibk.ac.at/noscemus/Flora_Sinensis. Initial verse parts were removed from the sample.

which are neither medicinal nor translations from the Chinese. After Couplet's *declaratio* used here, the same book contains a short life of Confucius and a translation of the first three of the four Chinese Classics.[15] A final set of comparison are two works of descriptive botany. Pliny's books on botany and medicinal plants and Boym's much shorter book, which introduces the European reader to twenty useful oriental plants, usually including an image and their Chinese name.

3 Chinese Philosophy in Latin

The first specific sample I prepared are Latin translations of Confucian texts. The main Chinese Classics, The Four Books and Five Classics (四書五經; *Sìshū wǔjīng*), were enthusiastically received in Europe when they first became available in Latin translation.[16] Of these I chose to use the *Analects* (论语, *Lúnyǔ*) for this study. There are six known Latin translations, but three of them are of a very late date and are not used:[17]

– Michele Ruggieri (Rogerius),[18] *论语 id est De consideratione* (written around 1592), 24,600 words. The first Western translation of the *Analects*.
– Prospero Intorcetta et al.,[19] *Confucius Sinarum philosophus, sive scientia sinensis latine exposita, Liber tertius* (its own pagination within the book; published 1687), 61,100 words.
– François Noël,[20] *Sinensis imperii libri classici sex, Libri sententiarum* (p. 83–198; published 1711), 38,600 words.[21]

15 *Liber Primus* (*Da xue*), *Liber Secundus* (*Zhong yong*), *Liber Tertius* (*Lun yu*; see below). The fourth classic, *Mencius*, is not included. The book ends with a *tabula chronologica* (on which David E. Mungello, 'Preface to Tabula Chronologica' in Heyndrickx 1990, 183–199) and a map of China.

16 And remained so for more than a century; cf. still Christian Wolff in his *Oratio de Sinarum philosophia practica* of 1721 (ed. Albrecht 1985).

17 See Ferrero (2019b) 73. Ferrero provides further examples for all six translations while studying the rendering of key Chinese terms.

18 Edited by Ferrero (2019a). «Trascrizione a cura di Michele Ferrero del manoscritto conservato nella Biblioteca nazionale Vittorio Emanuele II a Roma (fondo gesuitico n. 1185/3314), scritto tra il 1591 e il 1592». The text was digitised by the Eurasian Latin Archive. On Rogerius: Pfister (1976) 1, 15–21.

19 http://www.fondazioneintorcetta.info/biblioteca-virtuale.html; on this book, see Meynard (2011) and Meynard (2015).

20 Pfister (1976) 2, no. 262.

21 Online scan: http://mdz-nbn-resolving.de/urn:nbn:de:bvb:12-bsb10219788-8.

Rogerius' translation is by far the shortest and is the only one that is shorter than Legge's relatively close English rendering.[22] Intorcetta's, in contrast, is very prolix. A comparison of a passage (1.4) illustrates the great differences in their translation styles; indeed, it provides a glimpse of how much the early European translators struggled with the rendering of this Classical Chinese text. For comparison, the Chinese original and Legge's English translation are also provided:

Original[23]	**English (Legge 1861, 139)**	**Rogerius (114)**	**Intorcetta et al. (3)**	**Noel (83)**
曾子曰:吾日三省吾身: 為人謀而不忠乎? 與朋友交而不信乎? 傳不習乎? [*Céng zǐ yuē: Wú rì sān xǐngwú shēn: Wéi rén móu ér bù zhōng hū? Yǔ péngyǒu jiāo ér bùxìn hū? Chuán bù xí hū?*]	The philosopher Tsang said, 'I daily examine myself on three points: – whether, in transacting business for others, I may have been not faithful; – whether, in intercourse with friends, I may have been not sincere; – whether I may have not mastered and practised the instructions of my teacher.'	*Cencius: Tria haec utrum sim assecutus, in dies singulos diligenter inquiro. Unum, ut improbitatis atque adeo perversitatis famam declinem. Secundum, ne qui mecum agunt, circumveniri se a me putent. Tertium, ne quos doceo falsam se a me doctrinam haurire suspicentur.*	*Discipulus Çem Çù ait: Ego quotidie de tribus maximè rebus examino me ipsum & rationem exigo; an scilicet pro homine quopiam negotium tractandum susceperim, & non tractaverim illud ac conatus sim conficere eâ quâ par erat cum fide & contentione animi, nec ita prorsus ac si mea res ageretur & non aliena: an cum sodalibus & amicis meis familiariter & amicorum more agens, tamen haud egerim eo candore eâque fide quâ oportebat agi, contentus inani quâdam specie benevolentiae observantiaeque, & mendacio veriùs amicitiae quàm amicitiâ. Denique an doctrinam mihi traditam à Magistro meo non recoluerim, eamque exercitaverim impigrè & constanter.*	*Tsem tsu Confucii Discipuli effatum: Ego quotidie in tribus rebus me ipsum discutio: 1. utrùm præstando alteri obsequium, me forum impenderim? 2. utrùm frequentando amicos & socios, candorem servaverim? 3. utrùm excipiendo Magistri doctrinam, eam in praxim redegerim?*

22 Legge's *Analects* contain 28,700 words (counted from this online text: https://www.gutenberg.org/ebooks/409).

23 Source: https://ctext.org/analects/xue-er.

Medieval Latin translators usually used a *verbum de verbo*[24] translation technique when translating Greek, and to some extent also Arabic, into Latin. This method strove always to translate words with the same counterpart in the target language and to preserve the grammatical forms and even the word-order of the original; the aim of this was to make sure that the translator interfered as little as possible in the work he was translating. For a philosophical text in a language that differs as much from European languages as Classical Chinese does, there can be no question of this approach. The result would become completely incomprehensible; it could look like this (first without then with grammatical adjustments and some changes in word order):

> Ceng zi dicere: ego quotidie tres examinare ego corpus. Se gerere conspiratio vel non fides an? Cum amicus frequentare vel non confidens an? Docere non exercitare an?

> Ceng zi dixit: ego quotidie ter examino me ipsum. Utrum me gessi conspirative vel infideliter? Utrum frequentando amicos non fui fidelis? Utrum doctrinam non exercitavi?

The most literal possible translation that is still more or less intelligible would be the second one. But after Renaissance translators had discredited the *verbum de verbo* technique, in the sixteenth and seventeenth centuries translators no longer resorted to this. Instead, translators of Chinese often took to numbering the words in their translations in order to show the reader the original word order, which they did not attempt to preserve in order to avoid bad Latin style.

In the present example, Rogerius did not seem to understand the original sufficiently, Intorcetta reformulated and enhanced strongly, whereas Noel stayed reasonably close to the original while still being readable. Noel's translation is indeed more literal than Legge's English and deserves to be praised. Ferrero (2019b) 74, accurately describes Intorcetta's translation style as typically baroque. We would expect Intorcetta's freely paraphrasing Latin to be the least influenced by the Chinese language in terms of the grammatical features studied below.

4 Chinese Medicine in Latin

As a final sample I used some works on a more strictly scientific topic, in this case sphygmology, the medical discipline of studying the pulse.[25] In general, the Ming

24 On which see Marti (1974) 64–81.

25 As an introduction to this topic, cf. Marié (2011).

dynasty produced some important new medical works.[26] The most important ancient Chinese text on the pulse, however, had been written long before by Wáng Shūhé (王叔和, early Jin or late Han dynasty[27]): namely the *Maìjīng* (脉经, *Pulse Classic*), in ten books. The Chinese text begins by listing twenty-four types of pulse.[28] Wang's terminology for types of pulse has remained standard in Chinese.[29] There is a Persian translation of the text (edited by Guang Shi 2020) and a modern English one (Shouzhong Yang 1997).

By coincidence, the earliest extant classical Western texts on the pulse date from roughly the same time as Wáng Shūhé's, although we know of lost earlier treatments, especially by Archigenes of Apamaea (fl. around AD 100),[30] but «Galen's extant works are the only significant account of Western views surviving from ancient times».[31] Galen's theory of blood movement forms the basis of his understanding of the pulse. For Galen (c. 129–c. 216) the heart is not so much a blood pump as a kind of bellows for the pneuma.[32] Galen differentiated twenty-seven kinds of pulse,[33] determined by three parameters in all possible combinations (*Ad tirones,* Kühn VIII, 455): μῆκος, βάθος, πλάτος; ἐλλείπειν, σύμμετρον, ὑπερβάλλειν; σφοδρότης, σύμμετρον, ἀμυδρότης. He wrote four works comprising four books each on differences, distinctions, causes, and prognostications of the pulse. Kühn edited them and added Latin translations.[34] After these sixteen books, Kühn also prints a *Synopsis* by Galen himself in the translation of the 16th-century editor Agostino Gadaldini, which I will use as a *comparandum* to the translated Chinese texts.[35] The Greek text in Kühn is incomplete. Its final part is extant in some

26 Especially the *Běncǎo Gāngmù* (本草綱目, *Compendium of Materia Medica*) by Lǐ Shízhēn (李时珍), on herbs. Its first draft was completed in 1578, it was printed in Nanjing in 1596. See Angela Ki Che Leung in Petruccioli (2001–2004) 2, 511–516 and Marta Hanson in Petruccioli (2001–2004) 2, 516–531.

27 See Etsuo Shirasugi in Petruccioli (2001–2004) 2, 232 (dating the text to ca. AD 280).

28 Cf. Catherine Despeux in Petruccioli (2001–2004) 2, 241.

29 *Eadem*, in Petruccioli (2001–2004) 2, 437.

30 The most important contender of the pneuma theory, which was en vogue among Stoics, for whom the role of pneuma in the body determined diseases.

31 Cover text of the forthcoming book by Johnston/Papavramidou (2023).

32 Pithis (1983) 28. Galen's view is closer to that of Herophilus of Chalcedon.

33 *De pulsibus ad tirones* VIII.455, similarly in *Synopsis* Cap. III.

34 For *De pulsuum differentiis* the one by Janus Cornarius (c. 1500–1558).

35 Venice: Iunta 1556, vol. 5, see Martínez Manzano/Cortés Gabaudan (2013) 72–77, and cf. 62 on its genuineness. Galen also wrote a *De pulsibus ad tirones,* ed. Kühn VIII/2, 453–492.

manuscripts but seems to be a forgery by Camillo Zanetti, alias Veneto,[36] made by excerpting from Galen's works. Kühn also edited a spurious short introductory text on the pulse, *De pulsibus ad Antonium.* Zipser speaks of a «*aus pneumatischen und galenischen Quellen zusammengesetztes Kompendium*».[37] I also use its Latin translation, produced by René Chartier (1572–1654; Kühn VIII, 333–337).[38]

As for the Chinese side, in 1682 Andreas Cleyer published a Latin translation of several works on the pulse that – although the first and the fifth of which are explicitly ascribed to *Vám Xó Hó*, who is presumably Wáng Shūhé – only occasionally show close parallels to the *Pulse Classic*. Cleyer was a physician and merchant based in Jakarta who collected these anonymous translations but did not master Chinese himself. The translations were apparently made by Europeans in China, with a high likelihood that they were Jesuits such as Couplet or Boym. This book was very successful: in 1846 Pierre Victor Renouard (1846) 1, 47, could still write: «[. . .] *les fragments de la médecine chinoise, traduits en latin par le père Michel Boym et publiés par Cleyer, ont fourni les matériaux de presque tout ce qu'on a écrit jusqu'à présent sur ce pays* (that is, concerning medicine)». The book includes excerpts from three Chinese works, the mentioned *Maìjīng*, the *Huángdì Nèijīng* (黄帝内经; *Inner Canon of the Yellow Emperor*)[39] and the *Nánjīng* (难经, *Canon of Difficult Issues*). It is made up of the following seven independent texts:

– *I. De pulsibus libros quattuor e Sinico translatos / De explanatione pulsuum regulae et discursuum verorum, authore Vam Xo Ho*, in four books (8).[40]
– *II. Tractatus de pulsibus ab erudito Europaeo collectos / . . . ex codice vetustissimo Nuy kim* (56), i.e. the *Nèijīng*.
– *III. Fragmentum operis medici ibidem ab erudito Europaeo conscripti* (72). This fragment contains chapters 17 to 21 of a medical treatise mostly on the pulse, probably translated from the Chinese.
– *IV. Excerpta litteris eruditi Europaei in China* (130). Some excerpts from a collection of anonymous Latin letters about Chinese medicine, some treating the pulse, others e.g. the blood flow.
– *V. Schemata ad meliorum praecedentium intelligentiam:*

36 Martínez Manzano/Cortés Gabaudan (2013) 89.

37 Zipser in Pithis (1983) 31–32. This text was the main source of *Philaretos* (Pithis 1983, 188), a Byzantine treatise on the same topic.

38 http://data.onb.ac.at/rep/10566E30. On his falsifications: Kollesch (1967).

39 *Nèijīng* (内经), a text attributed to the mythical Yellow Emperor. It consists of two parts: *Sùwèn* (素问; *Basic Questions*) and *Língshū* (灵枢; *Spiritual Pivot*). This and the next text go back to the Han dynasty.

40 I add here the page numbers of the *noscemus* online edition, where the work was first digitised, as the print version uses several paginations. First I quote the title given in the index (p. 4), then the usually fuller one at the beginning of each part (if the two differ).

  - (a) *Auctoris Vam Xo Ho pulsibus explanatis medendi regula* (164), a recep(?)tarium,
  - (b) *Medicamenta simplicia quae a Chinensibus ad usum medicum adhibentur* (192), a list of 289 medically relevant items.
- *VI. De indiciis morborum ex linguae coloribus et affectionibus. Cum figuris aeneis et ligneis.* | *De indiciis morborum ex linguae coloribus et affectionibus* (220).

Thus, parts I–III treat the pulse, IV various medical topics, V pharmacology, VI the tongue. Hanson/Pomata (2017) see these texts as a collaboration by Jesuits, possibly including Couplet and Boym (9). The German botanist Georg Eberhard Rumphius (1628–1702) is another candidate for some of the texts' translations (10). The receptarium (Va) seems to be translated by Boym (11); V(b) maybe by Couplet (15). Others (Holler 2001, 795) argue against an attribution to Boym. The book's printing manuscript is extant.[41] Concerning the direct Chinese sources, some similar texts have been identified by Hanson/Pomata (2017), 16–17.

In summary we have these texts on pulse in both cultural spheres:

- Andreas Cleyer, *Specimen medicae Sinicae sive Opuscula medica ad mentem Sinensium* (published 1682), seven works totaling 61,200 words.
- Galen, *Synopsis de pulsibus* (Kühn IX, 431–549), 19,100 words.
- Ps-Galen, *De pulsibus ad Antonium* (Kühn XIX, 629–642), 1,800 words.

We also compare with these texts a diachronic sample of six European medical writers made up of Celsus, Gariopontus, Gordonius, Vesalius, Sennert, and von Bene.[42]

5 Terminology

When the Jesuits arrived in China, there had been no previous contact between European and Chinese intellectuals. Thus, translations for abstract terms from either intellectual environment needed first to be found and agreed upon in the other. As for translating into Chinese, there was the problem that Chinese characters always have their inherent meaning. So, when Ricci wanted to explain how we Europeans refer to "Lord of Heaven" – namely *deus* – he uses: 陡 斯 *dǒu sī* (ed. Meynard 2013, 11). These characters mean "abrupt/steep" and "thus". Other

41 Staatsbibliothek zu Berlin–Preußischer Kulturbesitz, MS Lat. Fol. 95.

42 These were used already in Roelli (2021) 482–504. In total they comprise 856,200 words.

possibilities (with other tones and characters) could have meant “tremble die”, “provoke four”, or other things. Ricci (and other translators) will have chosen characters that did not mean something ridiculous. In some cases Ricci was able to take over existing terminology, especially from Buddhist metaphysics,[43] e.g. 神灵 *shénlíng* for *anima spiritualis* (ed. Meynard 2013, 9), but in other cases he had to resort to coining new character combinations. For instance, *intellectus* becomes *língcái* (灵, “intelligence”; 才, “talent, ability”; 9). This is a combination that does not seem to have remained in use.[44] Kurtz (2001) provides a case study of another difficult Western term and attempts of rendering it into Chinese: *logica* “logics”.

Cleyer’s book on pulse medicine provides examples of difficult translations the other way round. For instance, book 2 begins by explaining the three positions for the wrist pulse and refrains from translating their Chinese names; they are given as *cun, quoan, che,* corresponding to 寸*cùn* (“inch; very short”), 关 *guān* (“barrier, confine”), 尺*chǐ* (“foot, = 10 cùn”). This is surprising, as it would seem that these positions on the wrist should not be too hard to translate and would remain mysterious in their transliterated forms. On the other hand, the technical term 经络 *jīngluò*, “meridian” is translated with the simple Latin *via*, which obscures this medical concept seriously. These early translators clearly still struggled with a basic understanding of their source texts.

These scattered examples show that the problem of translating abstract terminology existed (and sometimes still persists today) in both directions.

6 Grammatical Parameters Most Strongly Differing from the Benchmark

Table 1 shows the automatically determined frequencies of grammatical categories for the texts introduced above. The PoS and the more detailed categories that were found to be telling for scientific texts are shown. The table also indicates whether the categories were found to be higher or lower in the diachronic sample of scientific texts in Roelli (2021) (second row as “+/–”). The lengths of the texts in words and characters are shown in thousands; the characters were counted without spaces or punctuation. Average word lengths do not differ greatly among the texts, except that the texts by Franciscans and many of the Chinese medical ones

43 As an intellectual product of India, expressed in an Indo-European language (Sanskrit or Pali), its concepts are much closer to European ones.

44 I checked in the large online dictionary MDBG (https://www.mdbg.net/chinese/dictionary) as well as the Pleco android app.

exhibit low values whereas some scholastic, not China-related Jesuit texts have relatively long words. The respective word-counts show that some of the texts are rather short and thus that their results should be taken with a pinch of salt. The relative amounts of the seven PoS are shown as percentages, the nominatives (nom) as percents of all nouns, imperatives (imp) and participles (ptc) as percents of all verbs, the entropy in bits of information[45] per word; all other values are simple percentages of all words. "Esse" denotes the frequency of the verb *esse*, "3rd" third-person passive verb forms, "1st" first-person singular verb forms, "poss"/"rel" possessive/relative pronouns, "adj-suf"/"n-suf" a set of representative adjective/nominal suffixes respectively, "modif" sentence-modifying adverbs,[46] and "num" numerals. The values are compared to the five general prose samples (bottom). Colours are used to depict differences of at least one standard deviation within these five samples, while underlining is added in the case of differences of at least three standard deviations. Thus, coloured and (even more strongly) underlined values show a strong deviation from what would seem to be normal values for Latin prose as measured diachronically. Of course, in some cases the topic of a text favours certain word classes; thus Cleyer Va as a receptarium quite naturally uses a lot of imperatives of the kind "take" (this ingredient). The following further categories were also automatically counted, but they did not show conspicuous numbers for our texts and are not printed in the table: abbreviations, interjections, proper names, coordinating vs. subordinating conjunctions, demonstrative and indefinite pronouns, gerunds, gerundives, infinitives, supines, indicatives, subjunctives, and the genitive, accusative, and dative/ablative cases.

At a first glance, it is striking among the PoS that most of the texts studied here display high amounts of adjectives, but low amounts of pronouns and conjunctions. Among the texts in this sample only the medical writings can be considered scientific texts in a strong sense, but many others of these scholarly texts display similar numbers in at least some of the frequencies that are typical of scientific texts: especially low values of possessive pronouns and the first-person singular, high values for adjectives and adjective-suffixes and often for nominatives and third-person passive forms. Other values differ: nouns are frequent (especially in Cleyer, but also in the Jesuits concerned with China; not so in the Confucius translations and the Franciscans), prepositions are not very frequent and are especially rare among the Con-

45 Entropy was only measured for texts longer than some 10,000 words (see Roelli 2021, 407).

46 As already in Roelli (2021), the sample of the common adjective suffixes *-alis/-aris, -bilis, -eus, -icus, -inus, -ivus, -orius, -osus* was used. For nominal suffixes: *-tio/-sio, -tas, -itia, -ntia, -mentum, -tor/-sor, -tudo*. For modifiers: *at, autem, enim, ergo, igitur, nam, vero.*

Tab. 1: Values to be used for the following graphics and argumentation. Further explanations in the main text.

	words	chars	w length	ADJ	ADV	CONJ	N	PREP	PRON	V	nom	esse	3rd	1st	poss	adj-suf	entropy	num	rel	ptc	imp	n-suf	modif
				+				−	+		+	+	+	−	−	+	−						
Julianus OFM	2.0	11.6	5.75	11.56	8.14	8.19	24.47	10.21	13.22	24.11	21.38	1.92	6.02	6.24	1.19	1.66	*	2.38	3.99	27.10	1.29	1.66	2.70
Rubruk OFM	41.6	224.8	5.41	8.32	8.60	10.80	21.31	10.77	16.59	23.51	20.33	3.38	5.03	8.61	1.68	1.64	8.71	1.92	4.06	14.21	0.98	1.64	1.38
Odoricus OFM	91.5	483.9	5.29	12.12	8.36	9.50	23.42	10.48	14.58	21.45	25.94	3.67	9.37	6.28	1.23	2.28	8.76	3.21	3.42	16.88	2.77	2.28	1.85
Suarez SJ	1,376.0	7,845.6	5.70	11.10	11.14	11.89	19.96	10.26	11.95	20.92	28.17	5.24	11.27	1.39	0.47	6.74	8.48	1.44	2.89	16.03	0.48	6.74	2.47
Orlandini SJ	1,387.7	8,634.1	6.22	12.42	10.48	6.59	28.88	8.92	8.65	21.04	17.85	2.21	7.81	1.78	1.00	4.59	9.53	1.00	3.07	27.30	0.73	4.59	0.62
Frank SJ	83.1	515.3	6.20	18.33	8.04	7.29	24.50	9.53	10.78	20.75	29.44	3.29	13.74	3.44	0.57	6.27	9.06	5.00	3.10	22.33	1.06	6.27	1.85
Boyer SJ	291.2	1,798.7	6.18	14.71	8.56	9.29	23.64	9.96	10.56	22.82	33.85	5.01	13.78	3.74	0.60	7.11	9.02	3.43	3.32	16.61	1.15	7.11	2.06
Ricci SJ	3.5	19.4	5.56	11.92	7.52	9.75	25.85	9.03	12.34	23.47	19.30	4.48	18.46	0.90	0.78	3.46	*	2.14	4.06	14.74	0.13	3.46	1.14
Martini SJ	6.3	37.5	5.97	16.66	5.83	6.24	31.01	7.82	11.74	20.58	25.76	2.59	9.02	4.06	1.38	3.73	*	3.51	3.82	21.77	1.41	3.73	0.82
Kircher SJ	14.2	83.5	5.88	15.42	7.16	4.58	28.95	9.77	11.15	22.04	20.16	2.05	7.74	5.49	0.87	2.87	9.63	2.64	3.03	22.28	4.75	2.87	1.09
Couplet SJ	42.0	252.8	6.02	15.55	9.62	7.43	27.19	6.43	12.92	20.53	24.37	2.93	7.92	3.47	1.29	4.14	9.77	2.61	3.84	18.34	1.11	4.14	2.34
Boym SJ	9.7	58.1	5.99	16.24	6.38	5.18	31.62	7.99	8.98	23.11	25.10	2.05	11.30	5.10	0.87	1.94	9.58	1.42	2.69	17.81	3.63	1.94	1.29
Plinius	165.6	960.3	5.80	15.09	6.84	8.78	31.66	8.44	8.20	20.90	19.59	2.06	14.79	2.17	0.27	2.13	9.70	3.38	2.22	25.05	0.89	2.13	1.41
Rogerius SJ	24.6	138.8	5.65	10.34	10.95	7.73	22.54	6.34	11.86	30.12	26.31	4.31	5.54	5.37	0.66	3.28	9.06	1.27	2.65	16.79	2.08	3.28	1.71
Intorcetta SJ	61.1	354.6	5.80	12.86	10.67	7.98	24.99	5.27	13.24	24.64	26.44	3.31	7.82	5.74	1.64	3.13	9.71	1.34	2.87	17.77	2.05	3.13	2.34
Noel SJ	38.6	220.4	5.70	13.95	9.28	5.83	25.45	5.31	12.29	27.47	28.05	2.25	5.44	5.93	1.29	3.30	9.60	1.72	2.05	17.90	2.86	3.30	1.97
Cleyer (all)	61.2	341.3	5.58	16.66	5.72	6.16	31.72	8.56	5.96	24.78	25.95	3.82	11.13	2.59	0.26	2.50	9.14	4.06	1.97	18.61	2.98	2.50	0.84
I	14.1	82.6	5.86	17.14	5.40	6.02	31.92	8.05	4.45	26.68	28.01	4.35	10.67	1.14	0.12	2.86	*	3.59	1.10	21.18	2.38	2.86	0.48
II	3.6	21.5	5.96	15.97	7.87	7.50	30.30	8.71	11.13	18.39	22.72	2.05	12.80	2.19	1.14	3.70	*	3.16	4.34	16.82	2.19	3.70	1.95
III	22.4	121.9	5.44	15.18	6.28	7.54	31.15	8.87	6.48	24.12	26.94	3.15	11.94	2.18	0.26	2.63	*	3.55	2.38	18.65	2.09	2.63	1.22
IV	8.3	47.1	5.65	15.64	6.29	7.14	31.71	11.19	7.14	20.74	22.22	3.54	11.46	6.08	0.40	3.18	*	3.96	2.60	22.28	0.85	3.18	1.07
Va	4.7	21.5	4.59	20.01	5.96	2.64	29.73	12.05	4.65	23.42	16.02	1.31	1.77	4.35	0.10	0.70	*	6.85	0.64	19.59	19.05	0.70	0.13
Vb	6.1	35.1	5.76	20.14	2.56	2.58	33.64	3.30	4.74	32.33	27.62	7.85	13.49	3.17	0.11	0.97	*	6.49	1.42	10.73	1.70	0.97	0.06
VI	2.0	11.6	5.78	16.81	5.39	4.46	36.41	7.83	3.13	25.45	33.33	3.65	9.79	0.46	0.00	1.97	*	1.57	0.93	20.05	1.37	1.97	0.29
Galenus	19.1	113.3	5.92	12.63	13.78	10.94	21.09	8.70	11.62	21.22	21.60	3.95	9.31	3.55	0.06	5.89	8.44	1.93	4.01	21.93	1.42	5.89	6.76
Ps-Galenus	1.8	10.7	5.88	13.91	9.37	11.61	25.00	9.14	10.06	20.86	28.24	3.51	15.15	3.86	0.00	5.86	*	2.41	3.33	26.45	0.55	5.86	7.30
Avg 6 Medical Authors			6.25	**14.06**	**10.01**	**12.00**	**25.04**	**8.41**	**8.15**	**21.96**	**26.44**	**3.70**	**13.81**	**2.35**	**0.20**	**1.62**	**8.80**	**2.19**	2.56	19.53	2.21	2.96	2.15
Stdev			0.56	3.13	0.82	3.77	3.34	1.33	2.18	2.07	3.91	1.64	3.37	1.10	0.08	0.97	0.26	1.18	0.83	6.36	1.19	0.12	0.66
Avg 5 Benchmark Samples			**6.09**	**10.06**	**8.95**	**9.93**	**25.69**	**8.30**	**14.13**	**22.93**	**23.71**	**3.72**	**9.14**	**4.44**	**1.57**	**1.25**	**9.15**	**1.43**	**3.53**	**18.64**	**1.86**	**4.19**	**1.46**
Stdev			0.43	0.87	0.53	0.43	1.40	0.77	1.12	1.03	1.10	0.26	0.97	1.94	0.21	0.18	0.20	0.41	0.53	1.71	0.41	0.51	0.28

fucius translations. The *verbum essendi* is for the most part no more common than average, and the same goes for entropy. Among the other values, high frequencies of numerals are conspicuous.[47] Suffixes and modifiers are very high for Galen and Ps-Galen (both translated from the Greek), to a lesser degree for Jesuits not concerned with China – in contrast to texts concerned with China. Both of these features (suffixation and sentence-modifying adverbs) do not exist in Chinese, so this will be expected. It also looks as if texts concerned with China have higher entropy; this would indicate an unexpected and non-monotonous vocabulary – in contrast to most texts of the science sample in Roelli (2021).

Now, in order to identify grammatical parameters for which text groups differ clearly from the Latin prose benchmarks, I have divided the texts into the following five groups and averaged their values:

- Franciscans who travelled to Asia (3#): Julianus, Rubruk, Odoricus;
- Jesuits not in China (4#): Kircher, Suarez, Frank, Boyer;
- Jesuits in China (7#): Couplet, Ricci, Martini, Boym, Rogerius, Intorcetta, Noel;[48]
- Confucius translations (3#): Rogerius, Intorcetta, Noel;
- Translated Chinese medicine (7#): the seven works in Cleyer's book.

Table 2 lists those grammatical parameters that differ significantly for at least one of these groups; besides this, all ten parameters that were found to be indicative of scientific Latin in Roelli (2021) are included.

Especially striking cases are the following: in all samples adjectives are more common, conjunctions less so. The Confucius translations and the Chinese medical texts often exhibit the opposite: the latter tend to follow the ten parameters for scientific Latin. For instance, possessive pronouns are much more frequent in the former than in the latter; the third-person passive is more common in Cleyer and the Jesuits, but rarer in the Confucius translations. The first-person singular, adjective suffixes, and entropy behave similarly. Only a few differences between Jesuits in Europe and in China can be detected: Jesuits in general seem to be fond of suffixes, which are a typical feature of scholastic terminology, but Jesuit texts from China incline much less in this direction. Besides their entropy values are much higher.

47 They were also high for the forty scientific texts in Roelli (2021), but their standard deviation was very high (2.07±1.30), so these values were not used for the calculations there. Some but not all sciences have a propensity for numbers.

48 Although Kircher contains many quotations from Chinese Jesuits and Cleyer is likely also written by Jesuits, these texts are not included.

Tab. 2: Sharply divergent grammatical features for five groups of texts (defined above) compared to variation within the five benchmark samples. Differences are given in standard deviations from the benchmarks' averages. The ten typical parameters for scientific texts (as found in Roelli 2021) are italicised. Values more/less than three are highlighted (bold).

Category	Franciscans in Asia	Jesuits not in China	Jesuits in China	Confucius translations	Chinese medicine
Adjectives	+0.8	**+5.6**	**+4.5**	+2.7	**+8.3**
Adverbs	−1.0	−0.3	−0.6	+2.7	**−6.1**
Modifiers	+1.8	+1.4	+0.7	+1.9	−2.5
Conjunctions	−0.9	**−3.8**	**−6.3**	**−6.3**	**−10.2**
Nouns	−1.0	−0.9	+1.0	−0.8	**+4.6**
Nominatives (among N)	−1.0	**+3.8**	+1.2	**+**2.9	+1.5
Numerals	+2.6	**+4.1**	+1.4	+0.0	**+6.6**
Prepositions	+0.4	+2.1	−1.8	**−3.4**	+0.4
Pronouns	+0.7	−2.7	−1.9	−1.4	**−7.3**
Relative Pronouns	+0.6	−0.8	−0.7	−1.9	**−3.0**
Possessive Pronouns	−0.9	**−4.4**	−2.0	−1.7	**−6.0**
Verbs	+0.2	−1.1	+1.5	**+4.5**	+1.7
Imperatives (among V)	−0.4	+0.0	+0.1	+1.1	**+5.4**
The verb esse	−2.8	+0.6	−2.2	−1.6	−0.0
3rd Pers. Pass.	−2.4	+2.6	+0.2	**−3.0**	+1.3
1st Pers. Sing.	+1.3	−0.5	−0.0	+0.6	−0.8
ADJ Suffixes	−1.4	**+8.6**	+0.0	−0.9	+2.3
N Suffixes	**−4.6**	**+3.1**	−1.8	−1.8	**−3.7**
Entropy	−2.1	−0.5	+2.0	+1.5	−0.0

If we compare the average of the Chinese medical texts to that of the sample of the six Latin medical texts mentioned above, we find that they differ in many respects. Compared to the latter, the former are conspicuous in having more adjectives (differing by +3.0 benchmark standard deviations), nouns (+4.8), and verbs (+2.8), especially imperatives (+2.6), but on the other hand a lot less adverbs (−8.2), conjunctions (−13.6), modifiers (−4.6), and less pronouns (−2.0) and third-person passives (−2.7). Modifiers do not exist in Chinese as they do in Greek; the imperatives show that the reader is often directly addressed in the texts, in contrast to Western medical works. So these differences make some sense intuitively. It would be interesting to compare the PoS distributions of Chinese medical texts in Chinese.[49] The seven Cleyer texts differ among themselves quite strongly on some parameters: V(b) is very high on *esse* (definitions!), and only II is not very

49 This is not easy to check, as even the definitions of PoS in Chinese are disputed. See Giannino (2014) for details.

low in possessive and relative pronouns, nominal suffixes, and modifiers. In the PoS plot below (Fig. 3), the list-like VI and V(b) are far out in the plot, but also I and V(a).

Two-dimensional plots are presented below, in which all of the mentioned texts (including the six Western medical Latin ones) are depicted. Cleyer's texts II, V(a) and VI are a bit short for providing reliable data, so in all cases the Cleyer texts, taken together, are also depicted. A first simple graphic (Fig. 2) shows the percentages of nouns versus verbs. My earlier study showed that scientific, especially scholastic, texts tended to use fewer nouns than the benchmark samples. Poetry, on the other hand, used both more verbs and nouns. Especially the texts in Cleyer contain a lot more nouns. So do Pliny and two of the Jesuits in China, the botanist Boym and the 'statistician' Martini. The Confucius translations use more verbs than other texts (the freely translating Intorcetta less so).

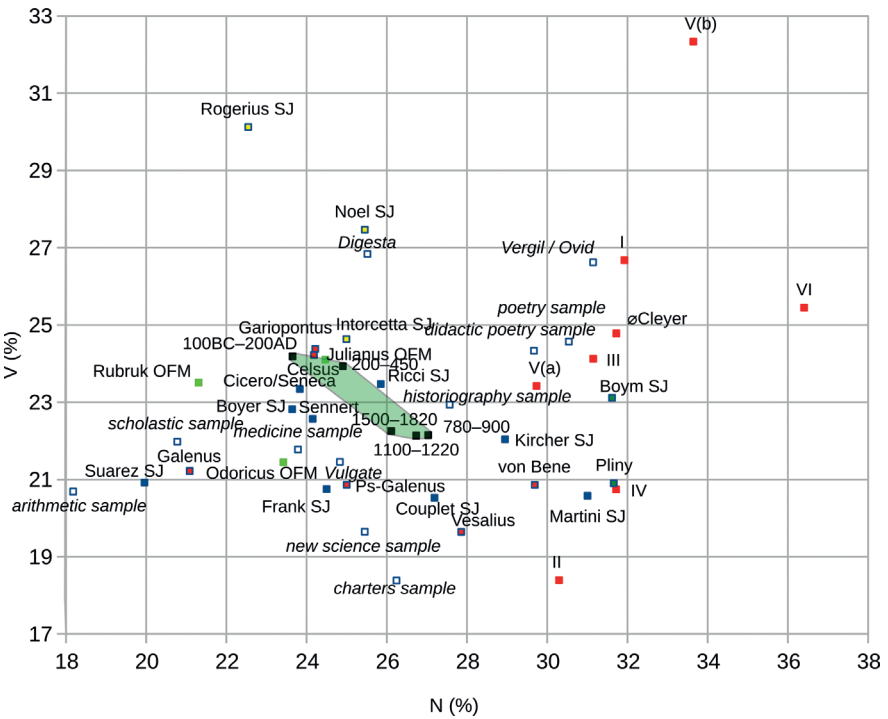

Fig. 2: Nouns vs. verbs plot for the texts in question (values in %). Various colours are used to differentiate the groups of texts: red denotes Cleyer's medical treatises, red-in-blue other medical texts, yellow the three Confucius translations, green the Franciscan texts on Asia. White-in-blue with italicised name tags are groups of texts from Roelli (2021) that were meant to illustrate the Latin of certain types of texts.

A second plot considers all seven PoS (Fig. 3). The same PCA parameters that were optimal for the sample of forty scientific texts (Roelli 2021) were used.[50] The Cleyer texts here demonstrate an even greater variance, the Confucius translations somewhat less so (except Intorcetta, again), but in another direction. Among the medical texts not related to China, the medical compendium by the 19th-century Hungarian physician von Bene lies closest in both of these plots to Cleyer's texts. Cleyer's texts differ greatly among themselves: the list-like V(b) is somewhat of an outlier, while the non-translated letters in IV (but even more so the translation II) are closer to other Latin texts, especially Pliny.

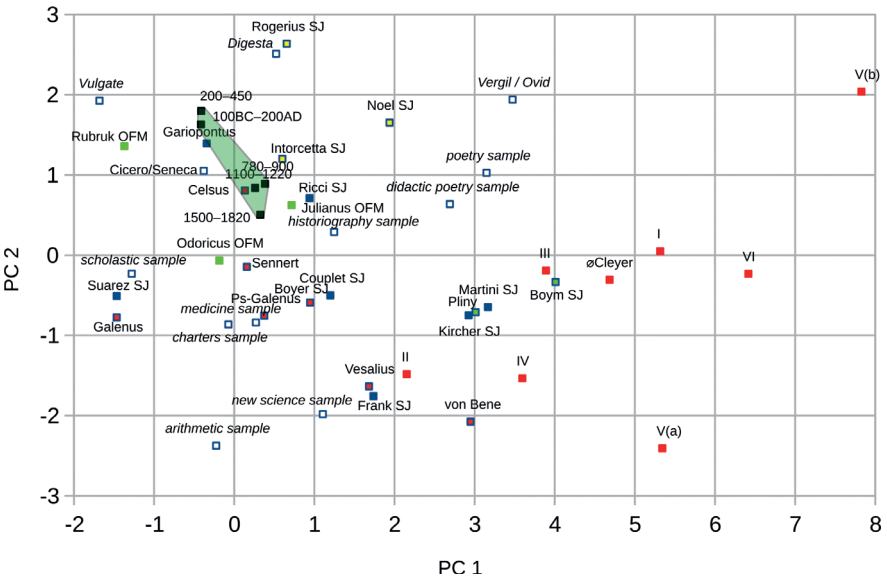

Fig. 3: PCA plot for the seven PoS. The PCA vector for the forty scientific texts (from Roelli 2021) is used. Note that the numbers do not have an intuitive meaning; the distances between items simply express their differences in PoS composition, optimised for the forty scientific texts.

Finally, the ten parameters found to be most telling for scientific texts are used for another PCA plot (Fig. 4).[51] This plot is meant to depict to what extent these texts are typically scientific texts. Many of the texts are relatively close to the benchmark samples; thus their parameters are not very typical for science texts.

50 The values for the PCA vectors are (for ADJ, ADV, CONJ, N, PREP, PRON, V): PC1 0.23, -0.46, -0.43, 0.53, -0.10, -0.48, 0.18; PC2 0.58, 0.21, -0.09, -0.10, 0.39, -0.26, -0.62.

51 The values: (for ADJ, N, PREP, nom, esse, 3rd, 1st, poss, adj-suf, entropy): PC1 0.03, 0.39, -0.23, -0.42, -0.44, -0.25, 0.28, 0.26, -0.21, 0.43; PC2, -0.47, -0.20, -0.22, 0.22, 0.26, -0.41, 0.12, 0.41, -0.42, -0.19.

The Cleyer texts, which are again closest to von Bene, as well as some Jesuit texts that have a (in some cases a strong) tendency towards scholastic Latin, are the conspicuous exception, but Kircher, Boym, Martini, and Couplet as well as the Confucius translations stay close to the benchmark samples and therefore to ordinary non-scientific Latin prose, as do the Franciscans except Rubruk. Unexpectedly, the most literal Confucius translation by Rogerius remains closest to the benchmark, while the other two have a tendency toward the poetry samples. It is unclear why this is so.

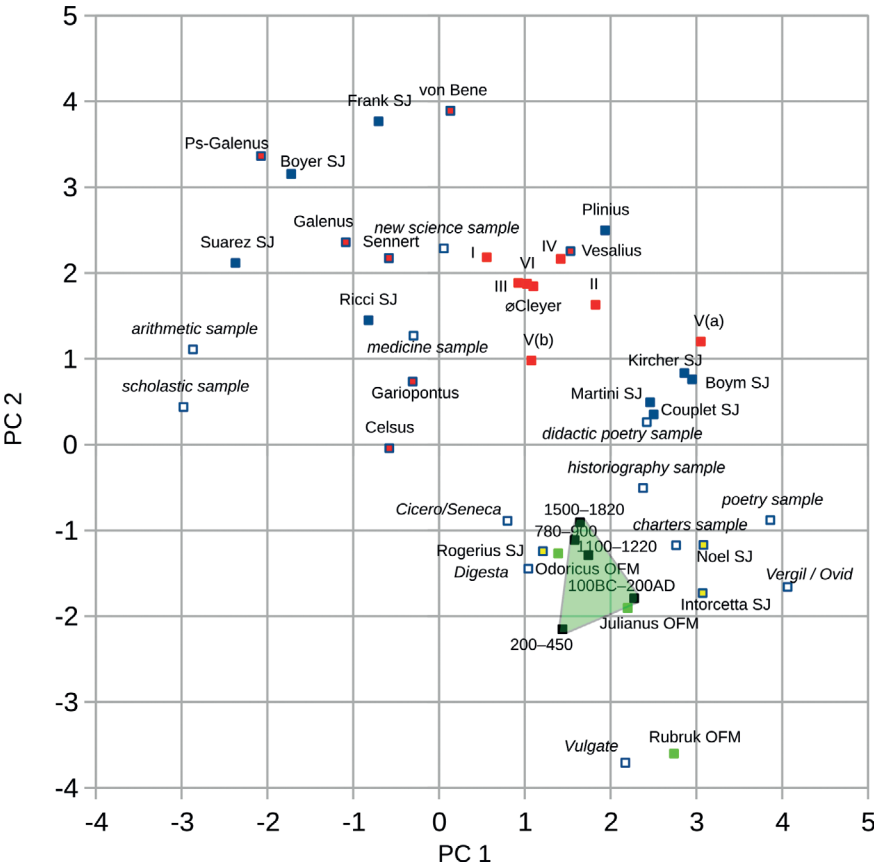

Fig. 4: PCA plot for the ten parameters for scientific Latin as described in the main text. For the colours, see. Fig. 2.

In order to improve the validity of these findings, more and better annotated data would help. I have used what is currently available. The future will certainly provide more digitised and encoded texts, for instance at the ongoing projects *SERICA* and *noscemus*, and at Corpus Corporum we are working on an improved POS tagging and lemmatisation tool upon which the annotation is based. Despite these caveats, the results seem reasonable overall.

7 Conclusion

We have studied the Latin of some groups of texts related to China by automatically analysing the frequencies of their grammatical categories. By and large, the Latin used by Jesuits in China could not be found to differ greatly from other kinds of scholarly or scientific Latin in this respect. The Confucius translations, and even more Cleyer's collection of Chinese medicine texts, differed more strongly from other Latin in our samples. The more verbatim the Confucius translations the more they differed in the composition of PoS. Cleyer's texts differed to some extent among one another: the two list-like parts of V were most conspicuous. In general, Cleyer's texts tended to have numbers similar to those of Pliny's botanical Latin and differed strongly from the Galenic texts on the same topic. At least some of these differences have clearly to do with the differences between Chinese and Latin/Greek, for instance the high numbers of suffixes and modifiers compared to low incidences of these in Cleyer's texts.

These methods of statistically studying grammatical features of texts have as yet not been used widely and certainly still need some refinement, but they do seem to have the potential to broadly group various types of Latin texts surprisingly well. In the texts' vocabulary, the most conspicuous differences were terms that seemed hard to translate and that were left in transliteration. This could be observed in both directions of translating, illustrating the considerable gap between the two cultures that had first to be bridged. From Chinese to Latin we mentioned cases of rendering basic sphygmological terms by just transliterating them, the other way round in Ricci's theology for instance the word *deus*.

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