On the origin of patterning in movable Latin type : Renaissance standardisation, systematisation, and unitisation of textura and roman type

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APPENDICES

The appendices contain information supplemental to the chapters to which they refer. To get the big picture in case of type it is inevitable to look at historical and technical details. The theoretical models and measurements described in the previous chapters are placed in their historic context and they are extrapolated and combined with descriptions of the underlying patterns and structures which I distilled from the archetypes.

Although meant to be supplemental, the appendices that provide detailed information about structures and patterns in type form together a cookbook for the (parametrised) designing of type. Although there is an almost endless list of books on the history of Western type and typography, there are not many books – if any– defining the elementary structures of type on a molecular level. Most attempts ground in a comparison of details of commonly used typefaces. Hence, the following appendices fill a rather remarkable lacuna in the available literature on type and typography.

APPENDIX I: TYPOGRAPHIC CONVENTIONS AND CONDITIONING

AI.1 Introduction

This appendix is supplemental to the Chapter 2 and is referred to in Section 2.6. It provides additional information in the form of notes on what exactly forms the basis for typographic conventions and how the latter relates to conditioning. Typographic conventions are not universal but vary per script. The differences between the scripts in use all over the world suggest that it is plausible that the requirements for the translation of spoken language into visible form are mostly cultural and historical, as are the languages themselves.

The translations into visible forms, graphemes, and the calligraphic and typographic transformations of these forms are the result of a number of developments and events that directed typographic conventions. There were (local) evolutions ('these forms developed still further in character, in different countries, according to the national genius')[247] and direct interferences by scholars ('[…] under the rule of Alcuin of York, who was abbot of St. Martin's from 796 to 804, was specially developed the exact hand which has received the name of the Carolingian Minuscule.')[248], besides changes in taste ('Typography is closely allied to the fine arts, and types have always reflected the taste or feeling of their time').[249] Also technical innovations, such as the invention of movable type played a role.

AI.2 Conventions

Few terms are as vaguely described, misused, or even abused as 'convention' in relation to typography. The term is used as synonym for tradition, as a fig-leaf for conservatism, but is above all generalised and commonly undefined. Some consider typographic conventions to be vague by definition.[250] If this were true, then the typographic concurrences would be arbitrary, and subsequently one could even state that this is the case for the conventions for type design. Morison dismissed the latter by stating that the infinity and complexity of today's reading public makes our alphabet as rigid and irreformable as the very gold standard.[251]

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[247] Updike, *Printing Types*, Vol.1, p.56.
[248] Thompson, *An Introduction to Greek and Latin Palaeography*, p.367.
[249] Updike, *Printing Types*, Vol.1, p.xxxviii.
[250] Unger, *While You're Reading*, p.85.
[251] Morison, *Type Designs of the Past and Present*, p.62.

It is, of course, tempting to use quotes like those by Morison to dismiss any form of deviation from the conventions. On the other hand, such quotes also provide ammunition for those who want to object to any form of tradition under the motto of modernism. These Dadaists in the type world may argue that the conventions determine the conditioning, and that the conditioning preserves the conventions. Hence conventions too strongly restrict the type designer who wants to deviate from historically formed templates.

One could state that conventions for typography are relative to the nature, i.e., the structure and properties, of specific type and not per se interchangeable with other forms of type. This implies that for instance conventions for typefaces meant for setting texts do not have to be identical for type meant for display purposes. After all, the criteria and therefore rules for composing a text clearly differ from the criteria of, for instance, lettering a book jacket. One could state that the conventions become proportionally less strict with the increase in the point size (Figure AI.I).

Figure AI.I Conventions become less strict if the point size increases.

Typographic conventions are defined by their purpose and hence this determines the nature of the applied typeface. If a serifed typeface is meant for composing text, it is by definition related to the archetypal models from Jenson and Griffo. Hence, its anatomy and details, which are proportions, weight, contrast, contrast-flow and idiom, can be compared with, and mapped against, the archetypal models.

Harmonic and rhythmic effects in typography will always be judged –directly or indirectly– against text composed with the early Renaissance roman types. A typeface that widely deviates from the anatomy of the archetypal models is not incorrect by definition. Actually, it should be judged against new rules defined by the anatomy of the typeface itself. If the typeface in question is used on a certain scale and the rules are subsequently followed by typographers, these rules may become generally accepted over time and as a result will become conventions.

It is a fact that typography is solidly anchored in history, which alone is proven by the today use of revivals today. Also it is a fact that the technical transformation of foundry type into digital type via hot metal and photo composing machines did not change the nature of type for text composing in the past one and a half centuries. This makes it most likely that deviations will be mostly reserved for the larger point sizes. The developments since the introduction of desktop publishing in the 1980s, which resulted in an increase of all sorts of display type, seem to underline the restricted usefulness of such deviations.

A1.3 Deviations

Wim Crouwel's typeface 'New Alphabet' from 1967 (Figure A1.2) cannot be compared with the archetypal models. The type constructed with only straight vertical and horizontal strokes underlines the fact that Crouwel's concept was not restricted by historical conventions. He formulated this fact in 1970 as follows: 'The letter-type for our time will, therefore, certainly not be based on the written or drawn examples of the past. The type which will now come into existence will be determined by the contemporary man who is familiar with the computer and knows how to live with it.'[252]

Figure A1.2 Wim Crouwel's New Alphabet (1967).

This statement contradicts with Hermann Zapf's view on the future of type, which he described also in 1970: 'The type of the future will surely more and more strip away the historic style elements of the past, yet without descending to a geometric-abstract form of letters. For the optical requirements remain the same so long as the letter-images are still received by the human eye […].'[253]

In *While You're Reading* Gerard Unger comments on Crouwel's New Alphabet: 'A series of characters such as those proposed by Wim Crouwel in 1967 looks at first sight more consistent than the alphabet, using as it does nothing but straight horizontal and vertical elements, but in fact this too is arbitrary. In fact there are no-iron arguments for bringing in changes.'[254] This statement seems to imply that the letterforms in use since the invention of movable type are by definition better than

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[252] Wim Crouwel, 'Type Design for the Computer Age', *Visible Language*, Volume IV, Number I (Cleveland: the Journal, 1970), pp. 51–58 (p.53).

[253] Zapf, *About Alphabets*, p.66.

[254] Unger, *While You're Reading*, p.93.

Crouwel's, but perhaps they are only are better because the *New Alphabet* is judged here using the conventions defined by roman type. And a comparison with roman type shows many differences. At first sight Crouwel's letters and the division of space seem to have more in common with for instance Hebrew, and (the conventions for) Hebrew type cannot be compared with (the conventions for) Latin type.

It is on the other hand possible that there is room for making improvements to the New Alphabet using the rules defined by its own structures and patterns. As Johnston remarked: 'There are innumerable existing patterns or hands, any one of which the penman may choose to copy closely or choose to modify. But as soon as he has decided just what the letter form shall be, that chosen writing pattern becomes the model which he has set himself to follow, and it becomes a conditioning model till that piece of writing is finished.'[255] That being mentioned, according to Johnston there is no need for a new set of patterns: 'We do not require new forms – in this sense, "that which is new is not true" – but, though we may hope to better their character, we must accept the symbols of present use.'[256]

'What is the norm?', Dick Dooijes asks in his contribution to *Dossier A-Z 1973*, and he proceeds 'It is found in the book types deriving from the Renaissance union of Roman capitals and Carolingian minuscules: in the lettera humanistica and the littera cancelleresca. Why this particular norm? Because it guarantees a recognizability – essential for every booktype – that is firmly based on tradition. […] No matter how far a Bodoni, an Auriol, or a Crouwel may diverge from this norm, each in turn realizing an authentic and legitimate vision, they were and are constantly subject to correction by the eternal and inexorable test of time.'[257]

Although this sounds like a conservative opinion by Dooijes, the development of roman type over time seem to prove that he is correct. The technical developments since the introduction of the computer –especially that of the personal computer and the introduction of the page-description language PostScript– did not change the typography as such and the preference for the Renaissance archetypal models (and their derivatives) for text setting remained. The most recent development of e-books also shows that technology is adapted to reproduce the existing norm. The e-book revolution predicted by some type designers was a velvet one; the current development of rasterizers in combination with the rapidly increasing resolution of

[255] Johnston, *Formal Penmanship and Other Papers*, p.98.

[256] Ibid., p.47.

[257] Dick Dooijes, *Dossier A–Z 73: Association Typographique Internationale* (Belgium: Remy Magrermans, 1973), pp. 78–79 (p.79).

screens, will make the application of existing typefaces possible without adaptations and additional technology, such as (delta) hinting.

The simplification of letterforms that Crouwel applied in his New Alphabet was a way to circumvent the limitations of the Cathode Ray Tube technology. Later Crouwel stated that the New Alphabet was over-the-top and never meant to be really used.[258] In the early sixteenth century a partly comparable attempt to reform the graphemes of the alphabet was made in Thomas More's *Utopia* (1516). The Utopian alphabet (which was used to represent the Utopian language) shows a range of letters (from the n on) in which only horizontal and vertical lines are applied (Figure A1.3). The design of the Utopian alphabet (which is probably the work of More's colleague Peter Giles) did not have a technical background like Crouwel's New Alphabet, but an ideological one. A version of the Utopian alphabet is also shown in Geofroy Tory's *Champ Fleury* from 1529.

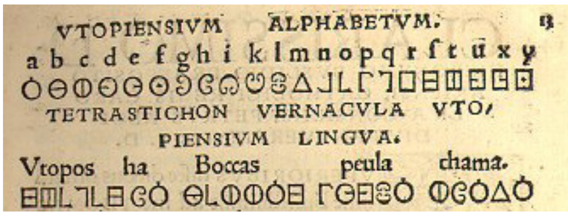

Figure A1.3 Thomas More's *Utopian alphabet.*

Crouwel's New Alphabet (and More's Utopian Alphabet) did not replace the archetypal model for roman type. Instead the Cathode Ray Tube technology was improved to support the model from Jenson and consorts.

A1.4 Typographical microcosm

Typographic conventions are inherent to the structure of the applied letters and not by definition exchangeable between scripts. In the typographical microcosm the parts of the letters are the smallest elements and as building blocks directly responsible for the hierarchical system of spacing, which respectively consists out of counters, letter space, word space, line space and margins. If a building block in one of the letters is changed, automatically all letters and subsequently the hierarchic system, i.e., the (rules for) typography will change. Everything in the typographical microcosm is interconnected and everything interacts.

[258] <http://www.design.nl/item/wim_crouwel_on_his_80th_birthday>

AI.5 Conditioning

Every collection of graphemes representing an alphabet has its own rules, defined by their specific harmonics, patterns, and dynamics. The shapes of the graphemes can be the result of either a long or a short evolution; their dominance can be the result of a fixation at a certain moment in history. When the graphemes are commonly accepted they define the rules for the conditioning of their users, i.e., readers, and producers, i.e., designers.

One wonders whether Fournier was aware of the fact that what the eye sees is merely the result of conditioning when he mentioned that 'the eye, [is] the supreme judge' in his *Manuel Typographique*. A child's mind is blank before it is conditioned: 'The Reader converts characters into systematic phonemes; the child must learn to do so. The Reader knows the rules that relate one set of abstract entities to another; the child does not. The Reader is a decoder; the child must become one. [...] what is necessary for the child to learn to read is that he be provided with a set of pairs of messages known to be equivalent, one in ciphertext (writing) and one in plaintext (speech).'[259] This implies that a child can learn to combine any set of abstract entities, i.e., graphemes, with certain phonemes: it is just a matter of conditioning.

The mind of a starting graphic design student is basically as blank as a child's mind when it comes to the patterns of type. He has to be conditioned too before he understands the details of the abstract entities used in typography. Most of the freshmen I taught at the Graphic Design department of the Royal Academy of Art in The Hague over a period of almost 30 years did not see any difference between for instance Bembo and Baskerville, or Garamond and Spectrum. The very few who noticed differences had already completed a graphic-school education.

And even after a thorough study, a brief glance at certain typefaces by the students was not enough to recognize them. Most students looked for details, like the bending of the second stem of the n in Bembo, or the 'open' g of Baskerville. More subtle differences, like those between for instance Monotype Plantin and Times New Roman (the latter is based on proportions and fitting of the former) were still difficult to distinguish even by more trained students.[260]

Within the borders of the conventions there is room for different forms of conditioning; those who are trained to judge type against calligraphy will apply other

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259 Philip B. Gough 'One Second of Reading', *Visible Language*, Volume VI, Number 4 (Cleveland: the Journal, 1972), pp.291–320 (p.310).

260 Tracy, *Letters of Credit*, p.197.

rules than those who see printed lettering as an aspect of epigraphy or chalcography. The followed doctrine determines the way graphic design students will look at type and how they will interpret details. In *Art and Illusion* Gombrich writes on the psychology of the artist's perception: 'The distinction between what we really see and what we infer through the intellect is as old as human thought on perception. Pliny had succinctly summed up the position in classical antiquity when he wrote that "the mind is the real instrument of sight and observation, the eyes act as a sort of vessel receiving and transmitting the visible portion of the consciousness."'[261] Although Gombrich was not referring to the arts of the typographer or the type designer, the parallel can be drawn here.

The same 'eye' used for judging roman type cannot be used for judging 'foreign' graphemes such as for instance those from Arabic or Indic scripts. These scripts have their own rules based on their specific harmonics, patterns and dynamics, which completely differ from the ones for roman type. Hence the conventions for Arabic and Indic scripts differ from these for Latin scripts, and the 'blank' mind of the child has to deal with different sets of abstract entities.

Conditioning is based on conventions and conditioning preserves conventions. Thus the snake bites its own tail; to be able to use one's 'eye' like Fournier advocated, one has to be educated to look at type in the same way. What is considered to be harmonic, rhythmic and æsthetic in type is largely the result of conditioning, i.e., cultural habituation. Familiarity is an important factor for the preservation of conventions; the appreciation of certain structures in for instance fine arts, architecture, typography or music partly depends on this. As Rameau states in his *Treatise on Harmony*: 'How, for example, could we prove that our music is more perfect than that of the Ancients, since it no longer appears to produce the same effects they attributed to theirs? Should we answer that the more things become familiar the less they cause surprise [. . .]?'

[261] Gombrich, *Art and Illusion*, p.12.

A2.1 Introduction

This appendix is supplemental to the third chapter and is referred to in Section 2 of Chapter 3. It provides additional information on Jenson's roman type and its relation to the typefaces of his Italian-Renaissance precursors, contemporaries, and successors.

A2.2 Roman type

The type Nicolas Jenson made in 1470 for the tractate *De Præparatione Evangelica* of the historian, exegete and polemicist Eusebius of Caesarea (ca.263–339) is generally accepted as the first highly refined roman type (Figure A2.1). The term 'roman type' as such is younger and it seems that the Italian calligrapher Giovanni Battista Palatino (ca.1515–ca.1575) was the first to use the term 'Lettere Romane', instead of 'antique' or 'antiqua', or 'antiche' employed by Pacioli and other writers.[262]

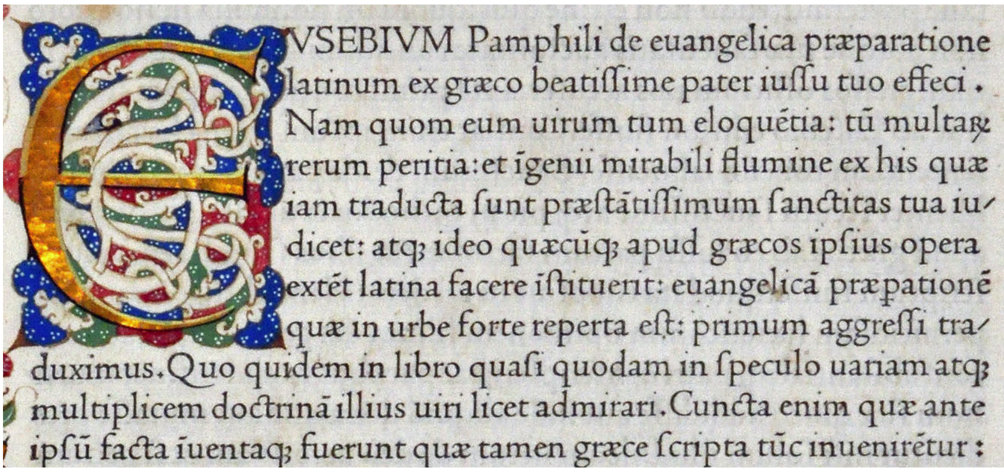
EVSEBIVM Pamphili de euangelica præparatione
latinum ex græco beatiſſime pater iuſſu tuo effeci.
Nam quom eum uirum tum eloquētia: tū multaꝝ
rerum peritia: et īgenii mirabili flumine ex his quæ
iam traducta ſunt præſtātiſſimum ſanctitas tua iu-
dicet: atq; ideo quæcūq; apud græcos ipſius opera
extēt latina facere īſtituerit: euangelicā præpationē
quæ in urbe forte reperta eſt: primum aggreſſi tra-
duximus. Quo quidem in libro quaſi quodam in ſpeculo uariam atq;
multiplicem doctrinā illius uiri licet admirari. Cuncta enim quæ ante
ipſū facta īuentaq; fuerunt quæ tamen græce ſcripta tūc inueniētur:

Figure A2.1 Jenson's roman type in *De Evangelica Præparatione* from 1470 (Bridwell Library col.).[263]

A2.3 Jenson's ground plan and Griffo

The 'Eusebius' type is inspired by the best Humanist manuscripts of Jenson's time, as shown in Figure A2.2, but also largely deviates from handwriting due to standardisation required for the production of movable type.[264] Francesco da Bologna's (better known as Francesco Griffo) roman types were designed on the ground plan of Jenson's roman type. He made these 25 years after Jenson for the

[262] Morison, *Pacioli's Classic Roman Alphabet*, p.81.
[263] <http://www.codex99.com/typography/127.html>
[264] Updike, *Printing Types*, Vol.1, p.73.

books *De Aetna* and *Hypnerotomachia Poliphili*, which were published respectively in 1495 and 1499 by the Venetian printer Aldus Manutius. Because Griffo's roman types formed the basis for the French Renaissance ones, their details became dominant. It is possible that Griffo's types became familiar with Jenson's model because Manutius' father-in-law, the printer Andrea de Torresani of Asola, owned and applied Jenson's roman type.[265]

In *Four Centuries of Fine Printing* Morison mentions the importance of Griffo's *De Aetna* type, which centuries later formed the basis for Monotype Bembo. He notes that the type of the *De Aetna* equally marks the new epoch in typography, and that it was copied in France by Garamont, Colines, and others. Later Griffo's model made its reappearance in Venice cast from French punches, '[…] with an added note of conscious elegance and technical perfection.'[266]

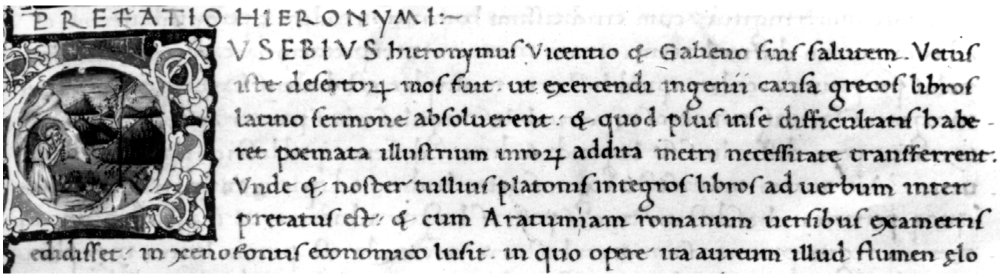

Figure A2.2 Humanistic minuscule (Italy, fifteenth century [Museum Meermanno col.]).

Both Jenson and Griffo cut their famous roman types for relatively small point sizes. As Morison stated, Griffo's type formed the basis for further development and refinement by his French and Dutch successors. The French and Dutch punchcutters copied the proportions of Griffo's roman, and this way Jenson's ground plan found its way through history.

Furthermore, the types Griffo made for *De Aetna* and *Hypnerotomachia Poliphili* (Figure A2.3) were revived in the first half of the twentieth century and are in full use in our digital and eclectic era, as are the (revived) types of Garamont, Granjon, Van Dijck, and Caslon. Jenson's and Griffo's roman types are the archetypal models, i.e., the prototypes; they form the basis and points of reference for any text typeface since the Renaissance.

[265] Brown, *The Venetian Printing Press*, pp.33,46.

[266] Morison, *Four Centuries of Fine Printing*, p.26.

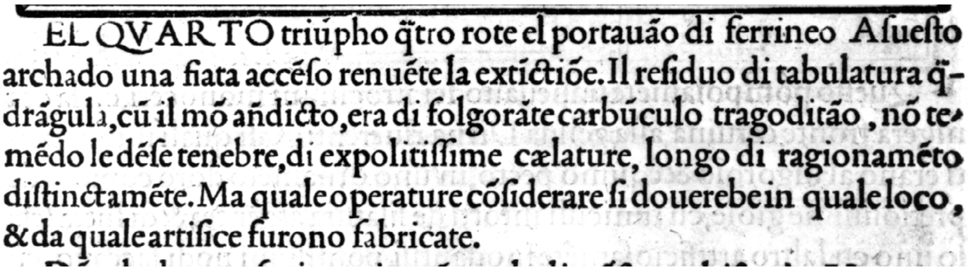
EL QVARTO triũpho q̃tro rote el portauão di ferrineo Asuesto
archado una fiata accẽso renuẽte la extĩctiõe. Il residuo di tabulatura q̃-
drágula, cũ il mõ añdicto, era di folgorãte carbũculo tragoditão, nõ te-
mẽdo le dẽse tenebre, di expolitissime cælature, longo di ragionaméto
distinctaméte. Ma quale operature cõsiderare si douerebe in quale loco,
& da quale artifice furono fabricate.

Figure A2.3 Griffo's type as applied in *Hypnerotomachia Poliphili* from 1499 (Museum Meermanno col.).

A2.4 Variants on a theme

Neither Jenson nor Manutius made use of display type in the aforenamed publications. There was one model and variants on this theme date from later times. For instance the title page of *Hypnerotomachia Poliphili* is typeset in the capitals of the type used for the text. The larger point sizes for display purposes cut by French-Renaissance successors were initially based on letterforms intended for small point sizes. However, at larger sizes optical rules differ, and adaptations of letterforms and spacing are often required.

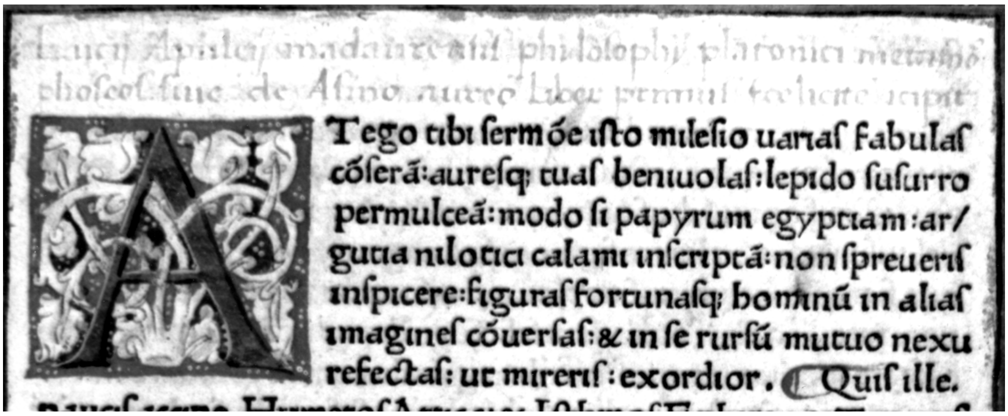
Tego tibi sermõe isto milesio uarias fabulas
cõserã: aurescq; tuas beniuolas: lepido susurro
permulceã: modo si papyrum egyptiam: ar/
gutia nilotici calami inscriptã: non spreueris
inspicere: figuras fortunasq; hominũ in alias
imagines cõuersas: & in se rursũ mutuo nexu
refectas: ut mireris: exordior. Quis ille.

Figure A2.4 Sweynheym and Pannartz's type as used in *Opera* from 1469 (Museum Meermanno col.).

Neither Jenson nor any other Renaissance punchcutter made light, bold, condensed, or sans-serif variants of their roman types. These variants, which we are all used to nowadays, mainly all date from the nineteenth century. Making bold and condensed variants of roman type would have implied a lot of extra work for the punchcutters, but was most probably never considered. After all, there was a morphologically related bold and condensed model already in use: textura type.

Another reason for not cutting bold and condensed variants of roman type could be that the basis for roman type, the Humanistic minuscule, is supposed to be a reaction on the bold and condensed ones of the late Middle Ages that were called 'gothic', labeling them as barbarous.[267]

A2.5 Gothic details and weight reduction

The early development of Renaissance roman type, which culminated in the ones cut by Jenson and Griffo, show a relatively rapid decrease in weight and more and more a suppression of gothic details. Sweynheym and Pannartz's type as used in *Opera* from 1469 looks somewhat heavy still (Figure A2.4). Jenson seems to have reduced the weight in his roman type somewhat more than his colleagues; the colour of his design is lighter than that of contemporaries. Sweynheym and Pannartz in particular made type that is more transitional, i.e., in between gothic and roman type (Figure A2.5).

Although roman type eventually was stripped of gotic details, gothic type was still used during the Renaissance for liturgical works. Jenson cut more gothic type than roman type.

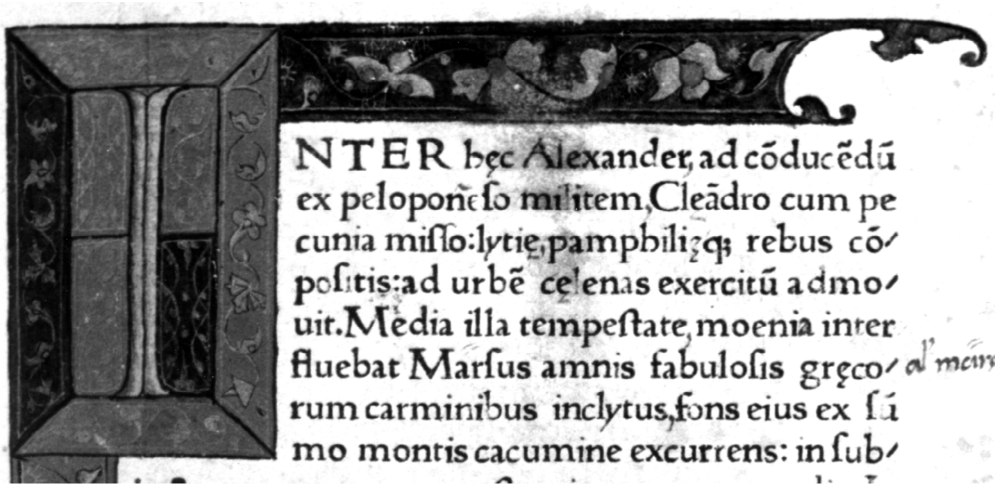
NTER hęc Alexander, ad cōducēdū
ex peloponēſo militem, Cleādro cum pe
cunia miſſo: lytię, pamphiliq; rebus cō
poſitis: ad urbē celenas exercitū admo
uit. Media illa tempeſtate, moenia inter
fluebat Marſus amnis fabuloſis gręco
rum carminibus inclytus, fons eius ex ſū
mo montis cacumine excurrens: in ſub

Figure A2.5 Da Spira's type as used in *Historia Alexandri Magni* from 1473 (Museum Meermanno col.).

The problems with emboldening, condensing, and contrast-reducing (or any combinations of these) of roman type, which type designers have encountered since the introduction of these variants in the nineteenth century, are caused by the fact that these effects are applied on a model that was not developed with the aforenamed deviations and derivatives in mind. As such, light, bold, condensed, and low-contrast variants (slab serifs and sans serifs), are anomalies. In line with this, 'regular' weights

[267] Leonard E. Boyle, 'The Emergence of Gothic Handwriting', *Visible Language*, Volume IV, Number 4 (Cleveland: the Journal, 1970), pp.307–316 (p.309).

are judged by readers as considerably more legible and more pleasing than bold weights'.[268]

A2.6 Standard

The archetypal model from Jenson and its variant from Griffo have set the standard for type, and in the Western world we are all conditioned with these, mainly via Garamont's variant. Rogers writes in an article titled *Progress of Modern Printing in the United States* that by a very general consent the types of the Italian Renaissance have been approved among modern printers as the most beautiful models upon which to base new attempts in letter design.[269] Not surprisingly Rogers based his Centaur type on Jenson's 'Eusebius' type, and this led Van Krimpen to comment in a letter to John Dreyfuss dated 1–2 February 1951: 'he has been so long and deeply imbued with the Jensonian Gospel that his final achievement –Monotype Centaur– is still a rendering of Jenson's type face.'[270]

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[268] Miles Albert Tinker, *Bases for Effective Reading* (Minneapolis: University of Minnesota Press, 1966), p.121.

[269] Rogers, *Pi*, p.17. This article was first published in *The Times* in September 1912.

[270] Mathieu Lommen, *Jan van Krimpen & Bruce Rogers* ('s-Hertogenbosch: Dutch Type Library, 1994), p.10.


en Accenten van de
Pas-Letters

APPENDIX 3: BASIC INGREDIENTS OF LATIN TYPE

A3.1 Introduction

This appendix is supplemental to Chapters 3 and 8 and is referred to in the Sections 3.4 and 8.6. It provides additional information on what the handwritten originals of the ingredients of Latin roman and italic type are in the form of notes. It also shows how these ingredients interact. Knowledge of this is required to understand the basic principles of writing. Together with Appendix 4 this one forms a compact cookbook, which is a source of reference for designing Latin type. It also can be consulted for the parameterization of type-design processes.

A3.2 Alphabet

The Latin alphabet is derived from the Roman alphabet, which finds its origin from a local form of the Greek (the Ionic alphabet). The Greeks derived their alphabet from the Phoenicians.[271] The Greek did call letters 'phoinikeia' ('Phoenician things'): '[…] and the derivation of Greek letters from Phoenician is confirmed by similarities in their names, by the way in which they were written, and by their order from alpha to tau.'[272]

As mentioned in the former section, the graphemes used for representing a particular alphabet can differ from each other. For instance capital, roman and italic letters represent the Latin alphabet in type today. Although these grapheme systems mostly differ from each other, they also share a number of letterforms. Capital, roman and italic are directly related and connected via a historical development, which started with the Roman imperial capital letters (which found their origin in the Greek capitals) and eventually led via the Latin uncial (which found their origin in the Greek uncials) to the Carolingian minuscule and the latter formed the basis for the Humanistic minuscule and italic, which were formalised and standardised by the invention of movable type.

Within a grapheme system the letterforms can change in time. For instance the ancient Greeks made use of different variants of characters: 'Local variations in the forms and meanings of the characters lasted for centuries, but eventually the Ionic alphabet prevailed'.[273] At first the Greeks wrote from right to left like the Phoenicians, but the direction was reversed because of convenience. Some early Greek

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[271] Thompson, *An Introduction to Greek and Latin Palaeography*, p.B.
[272] B.F. Cook, *Greek Inscriptions* (London: British Museum Publications, 1987), pp.8–9.
[273] Ibid., p.10.

inscriptions and vases show the 'boustrophedon' or 'ox-turning' method of writing: '[...] each line begins under the last letter of the previous line and runs in the opposite direction.'[274] In addition the letters were mirrored when written in the opposite direction.

A3.3 Scripts

Scripts often completely differ from each other; for example Latin, Indic and Arabic scripts have no graphemes at all in common. On the other hand, related scripts, such as Latin, Cyrillic, and Greek, can share graphemes to represent either identical or different letters. In digital type this results in having different glyph names and Unicode (an encoding system for currently more than 100.000 graphemes from 93 scripts) scalar values (code points).

Letter forms can be shared among scripts. For representing the Latin capital letter 'A', the Greek capital letter 'Alpha' and the Cyrillic capital letter 'A', in a digital typeface the same glyph normally will be used. The glyph (or 'PostScript') names (respectively 'A', 'Alpha' and 'afii10017') are different however, and different Unicode scalar values (respectively 0041, 0391 and 0410) are used for the identification of the glyphs. The glyph used to identify the Latin capital 'B' is in Greek used for the capital letter 'Beta' and in Cyrillic used for the capital letter 'Ve', and so on.

The shapes of the graphemes used to represent the different scripts are to a certain extent arbitrary. As Noordzij states in *De handen van de zeven zusters* ('The Hands of the Seven Sisters'): 'Script does not exist out of syllables, sounds or grammatical words, but of graphic symbols which we can give any meaning.'[275] And to make matters more complex: writing systems can combine elements of more than one script. The Japanese writing system, as an example, is unique in that it uses four different scripts: Hiragana, Katakana, ideographs (Kanji), and Latin.[276]

A3.4 Alphabet and letterforms

The graphemes used to represent the Latin script can be subdivided into three grapheme systems: Latin capital, Latin bookhand minuscule, and Latin cursive minuscule. Despite their differencing shapes, all three grapheme systems represent the same alphabet and alphabet-derived characters. The Latin bookhand minuscule and Latin cursive minuscule are descendants of the capitals, and are the result of a

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274 Ibid., p.11.

275 Gerrit Noordzij, *De handen van de zeven zusters* (Amsterdam: G.A. van Oorschot, 2000), p.52.

276 Ken Lunde, *CJKV Information Processing* (Sebastopol: O'Reilly, 2008), p.2.

mostly gradual transformation via uncial to Carolingian minuscule: '[...] we can still trace the ancestral capital form in the features of our small letters and there appears reason to suspect that the Roman capitals have always made their dominant influence felt by their wayward descendants.'[277]

A3.5 Form sorts

In an article on 'Pronunciation in Different Nations of Europe' an anonymous author of the nineteenth century describes the adaptations of the Latin alphabet to the modern European languages, which appeared 'after the establishment of the barbaric nations in the provinces of the Roman empire':

> When these new languages came to be spoken in the different countries, new vowels and new consonants were formed, entirely unknown to the Latin alphabet. In the infancy of writing, it would be vain to expect that ignorant monks who were alone the possessors of any knowledge at all should have been masters of a science so refined and subtle as that of grammar in its various elements; therefore, when these new sounds were to be represented, they applied themselves to the task of giving them as representatives certain combinations of letters, which we now discover to be incoherent and full of disorder. [...] Thus every European alphabet presents innumerable inconsistencies and absurdities, the necessary consequences of its unscientific and unphilosophical construction.[278]

By 'Latin alphabet' the anonymous author obviously meant the complete range of adapted and enhanced vowels and consonants, which are part of a writing system. This range can be considered inconvenient not only from the viewpoint of grammar; also the constructions of the graphemes, which represent the basic set of vowels and consonants, i.e., the Latin alphabet, are not at all homogeneous and contain inconsistencies.

In Latin bookhand minuscule and Latin cursive minuscule the diagonal letters k, s, v–z have as their basis a completely different construction than the other letters. The k has an ascender attached and the y a tail, but for the rest their construction is essentially identical to that of their equivalents in the grapheme system capital. The diagonal letters were directly taken from the capitals and calligraphers and type designers will adjust them in such a way that they do not obstruct the rhythmical pattern too much.

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[277] Johnston, *Formal Penmanship and Other Papers*, p.39.

[278] Anonymus, 'Pronunciation in Different Nations of Europe', *The Museum of Foreign Literature and Science*, vol. XXVII (New York, 1836), pp.642–644 (p.643).

It is not new as such to make a subdivision of the alphabet into related groups of letters based on their forms or constructions, like I did above. It is interesting to note that this subdivision is made in different ways by authors on this subject, and that subsequently the resulting listings also differ from each other. For instance Eric Gill also made a distinction between the letterforms in roman type and hence their origin, although he clearly came to a different conclusion than I did about which letters are derived from the Roman capitals:

> The essential differences are obviously between the forms of the letters. The following letters, a b d e f g h k l m n q r s t u and y, are not Roman capitals & that is all about it. [...] The conclusion is obvious; there is a complete alphabet of capital letters, but the lower-case takes 10 letters from the capital alphabet, & the italic takes 10 from the capitals and 12 from the lower-case.[279]

The German type designer, typographer, and author on typography Albert Kapr (1918–1995) made groups of perpendicular, curvilinear and diagonal letters:

> The lowercase characters can also be divided into three groups according to their graphic character: the group of letters with mainly vertical basic strokes l, i, j, m, n, h, u, t, f, r, the group with curved strokes o, b, d, p, q, c, e, a, s, g, the group of characters with diagonal lines v, w, x, y, k, and z.[280]

Tracy used as basis a grouping on round and straight strokes. His division was somewhat complex and confusing because it results in a group of letters ('odd ones') that cannot be directly mapped using round and straight strokes:

> In the roman alphabets, capital and lowercase, most of the letters are formed of straight strokes or round strokes, or a combination of them; and the direction of emphasis is vertical. The letters can be grouped like this:
> letters with a straight upright stroke:
> B D E F H I J K L M N P R U b d h i j k l m n p q r u
> Letters with a round stroke:
> C D G O P Q b c d e o p q
> Triangular letters
> A V W X Y v w x y
> The odd ones:
> S T Z a f g s t z.[281]

[279] Gill, *An Essay on Typography*, p.61.
[280] Kapr, *The Art of Lettering*, p.308.
[281] Tracy, *Letters of Credit*, p.72.

A3.6 Contrast sorts

The historical development of the written letters of the Latin script shows that mainly three pen shapes have been used over time: the monolinear writing tools, such as the single line producing stilus and non-splitting pointed pen, the broad nib, and the flexible-pointed pen. From the Middle Ages until the eighteenth century the broad nib was the main writing tool, and from then on until the end of the nineteenth century the flexible-pointed pen was mostly used.[282] At the end of the nineteenth century the broad nib was rehabilitated by, amongst others, Johnston.

Traditionally, the typefaces that find their (main) origin in the writing with the broad nib are called in English 'Old Style' versus 'Modern' for letters based on the flexible-pointed pen. Noordzij came up with two descriptive terms 'translation' for letters that show the contrast flow of the broad nib (the width of the nib is a vector; the pen is translating the movement over a certain distance and over a certain angle) and 'expansion' for letters that show the contrast flow of the flexible-pointed pen as the result of pressure. Old Style (translation) and Modern (expansion) are contrast sorts. Noordzij uses a sorting based on translation and expansion in combination with contrast for classifying type. A cube (Figure A3.1) can represent his contrast sort and contrast universe. The latter comprises all variants from high to low:

> The ranges of sort of contrast and reduction of contrast can be set out on dimensions of a cube […]. My description of the cube is a mixture of technology, design, cultural history, and psychology with a flavor of cultural anthropology; a square kind of fortune-telling'.[283]

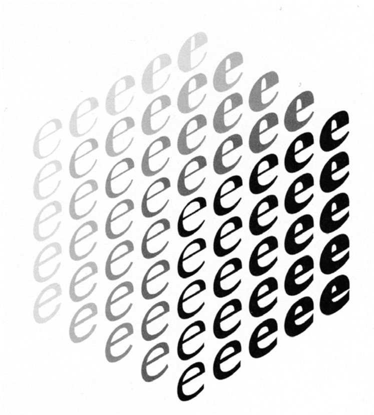

Figure A3.1 Noordzij's cube, showing his contrast-sort and contrast universe.

[282] Noordzij, *The Stroke*, p.72.

[283] Gerrit Noordzij, 'The Shape of the Stroke', *Raster Imaging and Digital Typography* 2 (New York: Cambridge University Press, 1991), pp. 34–42 (p.38).

The cube is an excision of a much larger universe. One can extrapolate in all directions, but the resulting forms will be outside the conventions. There is a corresponding aspect in both contrast sorts: for translation one needs a vector. This is fixed in case of the broad nib, and flexible in case of the pointed pen.

The transition from the broad nib to the pointed pen took place at a time in which the role of the counterpoint in music became less important. Counterpoint is the 'technique of combining musical lines. [...] This relationship is a two-fold one, in which vertical elements are contrasting yet interdependent'.[284] The term comes from the Latin punctus contra punctum: '[...] in earlier times, instead of our modern notes, dots or points were used. Thus one used to call a composition in which point was set against or counter to point, counterpoint [...].'[285]

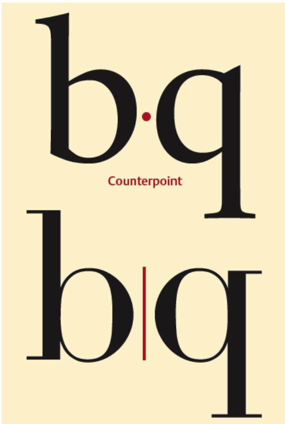

Figure A3.2 Counterpoint defined by point mirroring (top). The bowls of the letters below are line mirrored.

If a parallel with letters is drawn, the counterpoint can be seen as the mirroring point, which is the result of writing mirrored shapes, like the bowls of the b and the d, with a broad nib (Figure A3.2). The bowls are contrasting yet interdependent. The bowls are less contrasting, i.e., more identical, when written with a flexible-pointed pen, as the result of line mirroring. The transition in music from the Baroque into the Classic forms (via the Rococo) paralleled the transition from the broad nib into the flexible-pointed pen: in both cases the role of the counterpoint was diminished.

284 Alan Isaacs and Elizabeth Martin (ed.), Dictionary of Music (London: Hamlyn, 1982), p.86.

285 Johann Joseph Fux, ed. Alfred Mann, *The Study of Counterpoint: from Johann Joseph Fux's Gradus Ad Parnassum* (New York: W. W. Norton & Company, 1971), pp.22,23.

A3.7 Skeleton (heart) line

Monolinear letterforms do not have any contrast; all lines have an equal thickness. They preceded the ones written with a flat-ended reed pen. The Phoenician alphabet was monolinear and so were the letters made with a stilus in waxed tablets. The stone-engraved (lapidary) capitals of the ancient Greeks were constructed out of lines without any contrast. The Roman imperial capitals find their origin in the letters of the inscribed Greek capitals, which were treated as 'skeleton' or 'heart lines' when traced by a flat brush (Figure A3.3). The flat brush has the same shape as a broad nib, hence the Greek skeleton forms were vectored by the Romans.

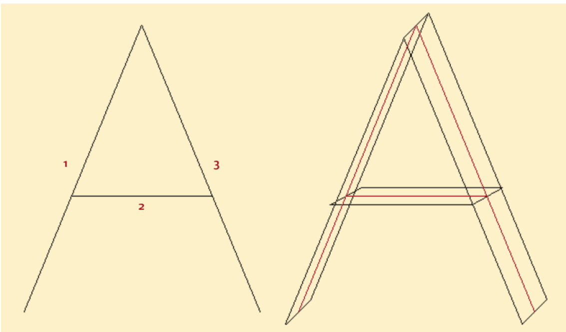

Figure A3.3 Roman imperial capitals found their origin in (Greek) skeleton lines, which were vectored.

There is a proportional relationship between the capitals and lowercase in Renaissance roman type. My conclusion is that the width of the capitals in the type from Jenson, Griffo and Garamont (and probably other punchcutters from that time) was standardised based on the width of the lowercase m, as shown in Figure A3.4.

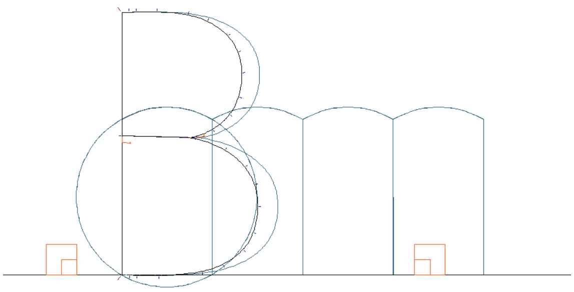

Figure A3.4 Adapting the proportions of the capital B to of the lowercase m (all skeleton lines).

If these capitals find their origin in skeleton lines and one wants to apply the same pen-effect as shows up in the lowercase letters, which find their origin in the broad nib (see next section), then it makes sense to translate the lowercase m to skeleton lines and to adapt the width of the capitals to this monolinear shape (figs.A3.4/5). This has been done with the skeleton-defined capitals in the LetterModeller application.

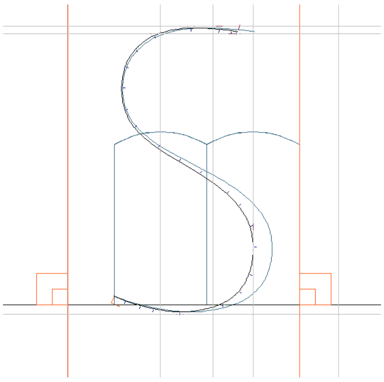

Figure A3.5 Adapting the proportions of the capital S to of the lowercase m (all skeleton lines).

As soon as the proportional relation between the capitals and the lowercase has been established, the capitals can be modified in relation with the lowercase (Figure A3.6).

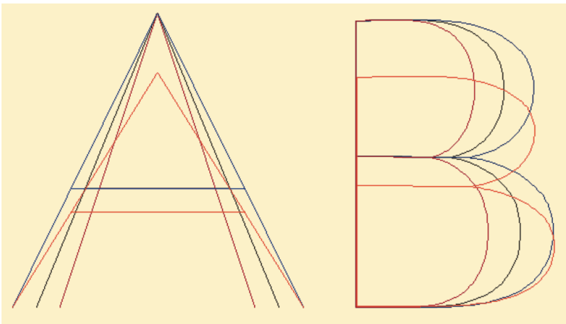

Figure A3.6 Modifying skeleton constructions of capitals.

A3.8 Broad nib

The use of the broad nib dates at least back to the Egyptians, who employed a flat-ended reed pen for writing on papyrus. The Greeks learned the use of the pen from the Egyptians: 'The Egyptians employed the reed, frayed at the end in fashion of a paint-brush; and the Greeks in Egypt no doubt imitated that method in the earliest times, adopting the pen-shaped reed perhaps in the third century B.C.'[286]

The flat-ended reed pen was used for formal writing in the Roman period, such as for the uncial book-hand. The shape of the broad nib added the factor contrast to the letterforms and the factor friction to the movements (the latter partly determined the pen angle). The broad nib translates the movement into a vectored shape , and

[286] Thompson, *An Introduction to Greek and Latin Palaeography*, p.39.

structures (partly because of the friction) and formalises letterforms. For instance the Latin cursive alphabets were formalised by the use of the broad nib in the Middle Ages.

The application of the broad nib using a certain pen angle, which is the angle of the nib (*not* the angle of the pen holder) in relation to the 'baseline', results in a fixation of the contrast flow; for instance the arches of the Humanistic minuscule are connected with their thinnest part (intersection point) to the stems. This standardisation automatically implies that the broad nib is not applied on a more or less arbitrary skeleton construction, but that the skeleton construction itself is the result of the movement made using a certain nib/vector angle. Commonly letters are treated as skeleton forms, on which a certain contrast flow is applied:

> It seems doubtful that Renaissance scribes thought of their letterforms as anything but organic units, but the abstractions to a skeleton form do capture the essence of the letters [...] The concept of an essential linear form is not unknown in the lettering pedagogy of this century. It is mentioned by Edward Johnston in Formal Penmanship, and was used extensively by the Austrian lettering teacher Rudolf Von Larisch and his student Friedrich Neugebauer. Father Catich also used it in his teaching of letterforms'.[287]

Figure A3.7 shows the application of vector angles of respectively fifteen and thirty degrees on a skeleton form of an n (left). The fifteen-degree angle results in a shift of the intersection point away from the stem. The resulting cluttered stem-arch connection has a destructive effect on the shape of the counter.

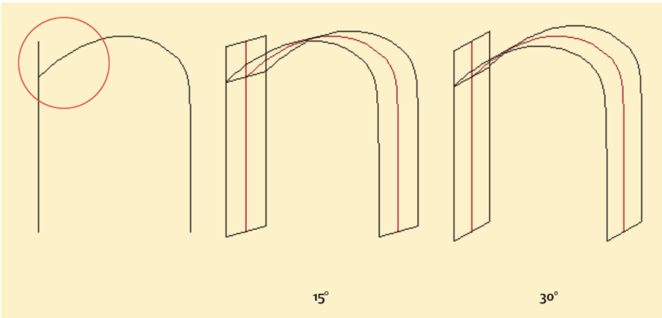

Figure A3.7 Application of a broad nib on a prefixed heart line, using two different vector-angles.

[287] Sumner Stone, 'Hans Eduard Meier's Syntax-Antiqua', *Fine Print on Type*, (London: Lund Humphries, 1989), pp.22–25 (p.22).

The derived heart lines in Figure A3.8 show that the shapes of the letters are the result of the applied vector angle and not vice versa. A change of the pen angle while maintaining the same construction results in different heart lines.

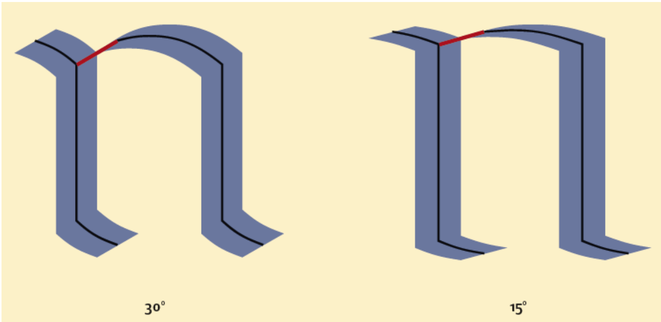

Figure A3.8 The skeleton or heart line is defined by the vector-angle.

A3.9 Flexible-pointed pen

The Romans also used flexible-pointed pens: 'A score of Roman bronze pens, shaped like our ordinary quill-pens, are in existence in various museums of Europe or in private hands'.[288] However, 'such pens [...] were not greatly used'.[289] The British palaeographer and librarian Edward Maunde Thompson (1840–1929) assumed that as soon as vellum came into general use the flexible-pointed pen was applied too, although there is no early mention of this: 'The hard surface of the new material could bear the flexible pressure of the pen which in heavy strokes might have proved too much for the fragile papyrus.'[290]

The flexible-pointed pen became the dominant writing tool in the eighteenth century especially, long after the Romans used it. The flexibility added an extra parameter to writing, namely pressure. Although pressure can be applied on a broad nib too, and was applied in some 'hands', the effect is limited in that case, because there is already a difference in contrast due to the form of the pen. Pressure on a pen also results in more friction, and normally a calligrapher will try to reduce that as much as possible. The Humanistic minuscule was in essence written without any pressure on the broad nib. If no pressure is applied on a flexible-pointed pen, the resulting line is monolinear. If pressure is applied, the line will expand, and this expansion is only possible perpendicular to the heart line, otherwise the pen will be ruined and the ink will spread in an uncontrollable and undesired way.

[288] Ibid. p.40.
[289] David Diringer, *The Book before Printing* (New York: Dover Publications, 1982), p.559.
[290] Thompson, *Introduction to Greek and Latin Palaeography*, pp.40,41.

The flexible-pointed pen can be applied on any heart line and it does not have the structuring effect on the letterform like a broad nib. The letters written with the flexible-pointed pen in the eighteenth century faithfully followed the conventions, i.e., proportions and emphasis on strokes, of the preceding broad nib based letterforms. The heart lines distilled from the preceding broad-nib letters defined the shape of the flexible-pointed pen letters.

The emphasis in broad nib letters is optically mostly on the vertical strokes, despite the applied thirty-degree vector-angle. This emphasis on the vertical strokes is also the case with flexible-pointed pen letters. Because expansion is only possible perpendicularly to the heart line, for the diagonal letters the flexible-pointed pen has to be differently positioned in relation to the baseline. This is, of course, also the case with the cursive variants.

A3.10 Rotation

Rotation is a contrast sort-independent effect that changes the contrast flow. Basically there are two reasons to apply rotation: firstly to reduce the friction and secondly because of æsthetic preferences.

Figure A3.9 Title page of Jan van den Velde's *Spieghel der Schrijfkonste*.[291]

The application of rotation for the avoidance of friction is standard procedure for a calligrapher, as is releasing the broad nib from the paper when making upstrokes in cursive hands, which will be subsequently partly covered by downstrokes. With a flexible-pointed pen stroke, expansion is only possible perpendicularly to the heart line. If expansion has to be applied on (an abundance of) curvilinear forms, like in

291 <http://www.wga.hu/frames-e.html?/html/v/velde2/jan1/spieghel.html>

Spiegel der Schrijfkonste by the Dutch writing master Jan van de Velde, rotation is a prerequisite. *Spiegel der Schrijfkonste* dates from 1605 and shows both broad nib and flexible-pointed pen letterforms (Figure A3.9).

Rotation as found in Van den Velde's work can be quite complex: 'This steep hold, with the fingertips quite close to the nib, allows the most complicated trick: changing the slant of the pen during the stroke by rolling the pen between the fingers'.[292]

[292] Noordzij, *The Stroke of the Pen*, p.41.

APPENDIX 4: DETAILS OF TYPE

A4.1 Introduction

This appendix is supplemental to Chapter 3 and is referred to in Section 3.4. It provides additional information in the form of notes on the details of Latin roman and italic type. Knowledge of this is required to understand the basic principles of type design. Together with Appendix 3 this one forms a compact cookbook for the design of Latin type and also for the parameterization of type-design processes.

A4.2 Sum of particles

Figure A4.1 shows the gradual modification from generic a from the letter model to a formalised variant for roman type.

Figure A4.1 Gradual transformation of the lowercase a, starting from a generic model (top left).

To come to the formalised variant, curves have been smoothened and the 'eye' of the a has clearly changed. These steps are the result of decisions that a type designer makes. Figure A4.2 shows what is involved in the creation of written letters, indicated by 'systems' here (rows 1–4).

By adding the factors 'formalisation' and 'idiom' the result is a formal group of graphemes, which may be a 'typeface'. Of course, the tweaking of the first four systems already creates personal structures and patterns, but type design offers more options for adding sophisticated and refined details, i.e., idiom, than writing with a prefixed or partly customizable tool, such as a broad nib or a flexible-pointed pen.

It must be noted that this mapping in systems and models is my personal one. I see this as a prerequisite for the understanding of the factors a type designer is dealing with. Appendix 9, *Systems and models in type* provides a detailed listing.

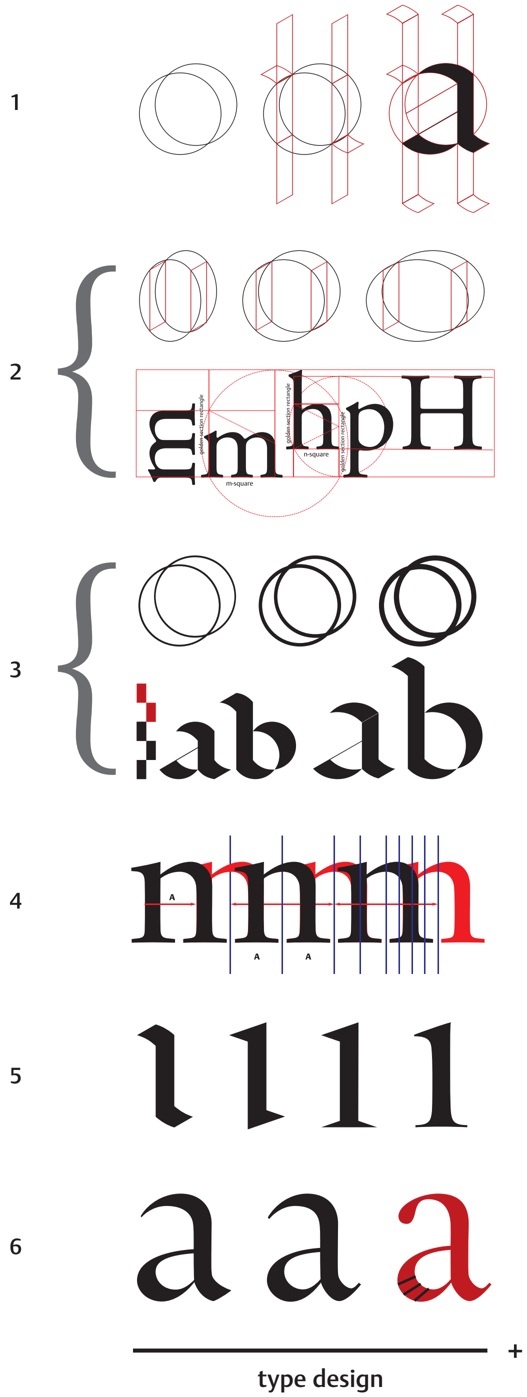

Figure A4.2 Sum of particles.

A4.3 Building blocks

When designing roman type everything is relative to underlying structures and patterns of the archetypal model. A type designer is stacking building blocks when he applies the systems presented in Figs.A4.2. When he makes a design for text setting, he makes variants on the theme fixed by the archetype from Jenson. Figs.A4.3/4 show the repetitive use of the same elements. All these elements contain the personal pattern of the designer and every repetition makes the pattern stronger.

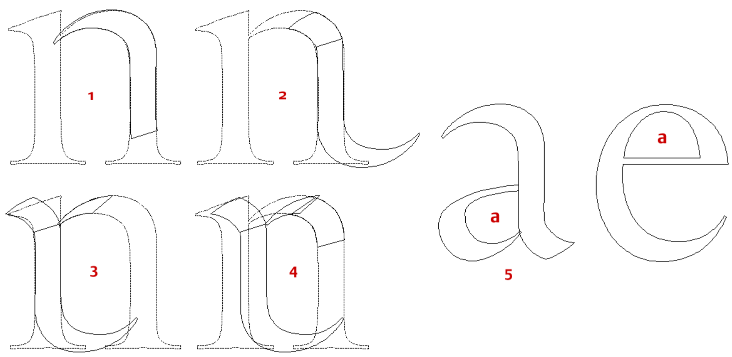

Figure A4.3 The design of the a from the n in five (assembly) steps.

Frederic Goudy describes in *The Alphabet* the personal pattern as follows:

> In the construction of a letter the artist should first determine just what the intrinsic shape of his model is—that is, in what degree are the lines, curves & angles, or the directions the lines take that compose it, fixed or absolutely necessary to that particular letter. His next thought must be for form, which includes proportion and beauty, and the particular form suitable to the place & purpose for which it is intended. His decision here will largely determine the measure of his ability and taste.[293]

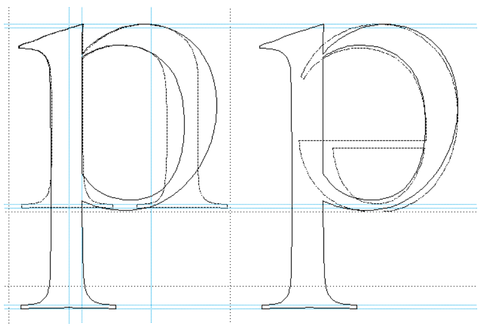

Figure A4.4 The correlation between the n, the p, and the e.

The development of type shows that the archetype of Jenson and especially Griffo model were used as a basis for new types by later punchcutters. These punchcutters, like Claude Garamont in the sixteenth century and Van Dijck in the seventeenth century, altered details; they made the letterforms more personal. Morison wrote about Van Dijck's letters: 'Though they are not as important to the historian as those of Garamond, they are certainly more beautiful. It is often the fact that the faces fashioned after the model of a certain historically important letter are noticeably superior in design to their prototype.'[294]

293 Frederic William Goudy, *The Alphabet: and Elements of Lettering* (London: Dover Publications, 1989), p.90.

294 Morison, *Type Designs of the Past and Present*, p.30.

The changes applied by Garamont on the models by Griffo and later by Van Dijck on the models by Garamont are relatively small and all within the same atmosphere. Details were altered but the overall image remained the same. The details Johann Michael Fleischmann introduced in the eighteenth century diverged much more. Fleischmann was perhaps more of what we nowadays consider to be a *type designer* than his predecessors, who were craftsmen first: 'As a whole, Fleischman's founts represent the first personal, individualist interpretation of Roman and Italic.'[295]

The development of the technologies used for producing type and text, like the introduction of Benton's pantograph in the second half of the nineteenth century never had a dominating lasting effect on the letter forms and hence did not alter the conventions. Nor had the development of the hot metal composing machines, the photo composers and digital type and typography. Over time the technology has always been adapted to represent the standards of the past. That was the case when movable type was invented and is still the case today when type has to be adjusted to for instance, screen resolutions. In *Typography as Vehicle of Science* Gerard Unger notes on the developments of type and typography in the era of desktop publishing: 'In the final decade of the twentieth century typography was subjected to wild and daring experiments. […] After 2000 such design is still done, but much less so, while traditionalism and conventionalism increasingly prevail in typography.'[296]

Type design is still anchored in the same rules, which were fixed by the invention of movable type, and the type designer tries to optimize the patterns and constructions with his idiom. In the foreword of Alan Hutt's *Fournier, the Compleat Typographer* James Moran notes:

> The design of types made by modern methods, therefore, is not inherent in the mode of manufacture. It comes from the nature of the written and hence the printed word, and some indefinable talent in the best punch-cutters and type designers who aimed and continue to aim at optical harmony.[297]

Deviating from 'the nature of the written and hence printed word' will place a type design outside the conventions for text setting.

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[295] Morison, *Letter Forms*, p.34.

[296] Gerard Unger, *Typography as Vehicle of Science* (Amsterdam: De Buitenkant, 2007), p.28.

[297] Hutt, *Fournier*, pp.xi,xii.

A4.4 Consistency

Depending of the uniformity of the building blocks, the repetition of patterns will result in a more or less consistent type design. This consistency is measurable using the models to which the building blocks belong. Theoretically one could say that the more consistent the structure, the better the typeface. After all, as I aim to prove in this dissertation, everything is relative to underlying structures and patterns of the archetypal model.

However, we are dealing with human beings and this implies that what is perceived is subject to different opinions. A typeface, which is theoretically consistent, does not by definition appeal to its reviewer. The reviewer is seldom the reader, as most readers are unconscious of the vehicle used to pass on information. The eyes that are used to judge the quality and beauty of type belong to the type designer and the typographer. Type designers and typographers will always come up with theories, the purpose of which is to prove that there is more to typography than simply applying rules within the boundaries of the conventions in their attempts –if only to underline that their professions belong to the world of arts and not to that of craftsmen. The next section describes deliberate deviations from consistency in type: dissonances.

There is an ongoing discussion between type designers on how much the level of regularization of a type design influences the legibility factor. Peter Karow (1940), who invented the IKARUS system for the digitisation of contours in the 1970s, named this the 'roughness' of the design:

> With "Roughness" we want to approach tentatively an aspect of legibility. Typographers teach that text should color a page as evenly as possible; moreover, the characters of the text should form an even, rhythmically flowing succession of black and white areas. Therefore, it is a bit disturbing if the individual characters in a typeface are very different in blackness.[298]

[298] Peter Karow, *Typeface Statistics* (Hamburg: URW Verlag, 1993), p.297.

Figure A4.5 Inorganic geometric consistency in the Romain du Roi.

Consistency can for instance be achieved by applying artificial structures and patterns. With artificial I mean specific letterforms as the result of a contrast flow, which cannot be distilled from the handwritten broad-nib origin of roman type or from the application of the pointed flexible pen, like some of the letterforms (but not the proportions) of the Romain du Roi. Especially the bowls of the b, d, p and q of the Romain du Roi cannot be traced in handwritten models predating the type (Figure A4.5). Artificial letterforms can be inspired by (or combine) certain patterns from writing with aforementioned pens. Deviating from these patterns does not by definition imply that the resulting letters are incorrect as such, i.e., that these will not conform to the conventions anymore.

Artificially created letterforms will be compared with the (previous) standard for a specific application. The geometrically consistent Romain du Roi was a rigid construction on the foundation of Renaissance type on which patterns derived from Baroque handwriting were applied. Hence a comparison with the precursory letterforms is inevitable: 'The "Romain du Roi" is geometrical throughout. There is nothing personal about it. Designed to accord with the findings of a scientific commission, the face fully preserves the virtues of logic and consistency.'[299]

[299] Morison, *Letter Forms*, p.34.

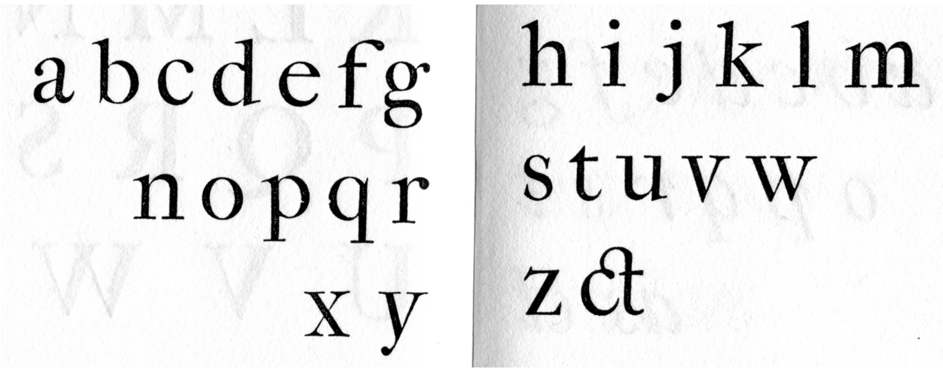

Figure A4.6 French Canon (roman) from the Fell types.[300]

The rather clumsy interpretations by Moxon of Van Dijck's roman type presented in his *Mechanick Exercises* show a different contrast flow than can be found in the 'reproduced' original type of the Dutch punchcutter. Burnhill noted that Moxon's '[…] outline characters and rule-and-compass way of describing the shape of a letter provides little sense of the structure of letterforms.'[301]

Either Moxon was not familiar with effects of the broad nib, or he just engraved what had become a common style in his time. Figure A4.6 shows the roman of the French Canon from the 1693 *Specimen of the Several Sorts of Letter Given to the University by Dr. John Felll*. Morison considered the origin of the larger type shown in the specimen to be of Dutch origin. He was not very positive about the quality: 'None of the faces is cut with any subtlety', and he dated them after 1650.[302] Especially the a, b, d, g, p, q, r, and s of the roman show the vertical stressing, which in later type is attributed to the application of the flexible-pointed pen.

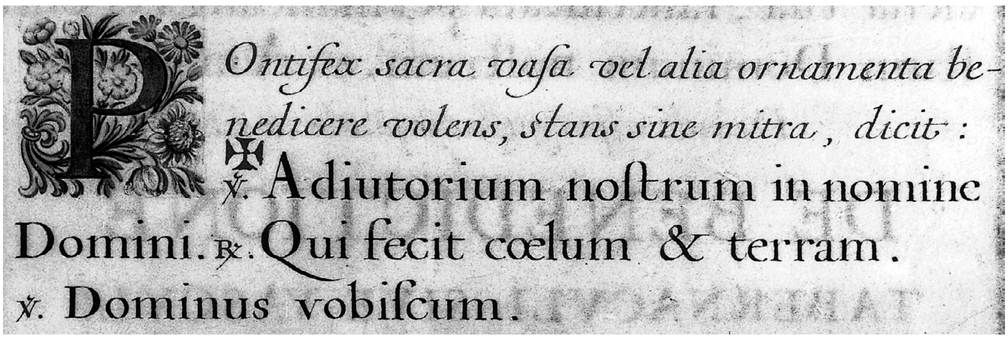

Figure A4.7 Example of Jarry's handwriting dating from 1653.

[300] Morison, *Letter Forms*, pp.24,25.

[301] Burnhill, *Type Spaces*, p.27.

[302] Stanley Morison, *The Fell Types: the Roman, Italic & Black Letter Bequeathed to the University of Oxford by Dr. John Fell* (Oxford: The Typophiles, 1951), p.6.

When it comes to the Romain du Roi there seems to be no complete agreement on what exactly formed the origin of the letterforms. Were the letterforms the result of the formalisation using ruler and compass, or were they a geometric reproduction of existing (handwritten) letters? Hutt called the idea that the design of the Romain du Roi was inspired by the engraver rather than the calligrapher (for instance Morison had this opinion) an over-simplification and he mentioned that 'there were great writing-masters in seventeenth-century France, like Nicolas Jarry and his successors [...].'[303] The immovable calligraphy-oriented Noordzij seemed to have no doubts about the origin of the Romain du Roi:

> The minutes of the commission confirm what anyone can ascertain: the designs follow in detail the handwriting of Nicholas Jarry, who worked around 1650 as calligrapher for the Cabinet du Roi. This history leaves us no other choice than to view the 'romain du roi'–the type– in terms of handwriting of Jarry.'[304]

An example of Jarry's handwriting can be found in Figure A4.7.

Figure A4.8 Plate from George Shelley's *Natural Writing* (1709).[305]

The scientific approach by the Académie des Sciences left its marks in the typefounders' profession. Despite his objections against the application of geometric constructions of letter forms, '[...] Fournier was a profound believer in the application of scientific methods to the measurements of the body upon which type faces were cast', resulting in his standardisation of type bodies.[306]

303 Hutt, *Fournier*, p.x10.

304 Noordzij, *The Stroke*, p.17.

305 Peter Jessen, *Masterpieces of Calligraphy: 261 Examples, 1500–1800* (New York: Dover Publications, 1981), p.92.

306 Morison, *Letter Forms*, pp.39,40.

The use of the Romain du Roi was protected and restricted to the Imprimerie Royale; copying was not allowed.[307] The geometric construction methods for the royal type do not seem to have had much influence on later punchcutters, but the resulting letterforms did. Alexander Lawson commented on this:

> Some authorities have called the Romain du Roi the first modern types, but they seem closer to the transitional classification, which contains features of old style and modern in equal degrees. Whatever theory is followed, however, this French departure from old style greatly influenced designers of printing types during the eighteenth century. There is general agreement that the best-known of these designers, John Baskerville, an English amateur printer and typefounder, be credited with the creation of one of the earliest transitional types.[308]

On the other hand, John Baskerville made type that looked like handwritten letters from his time. In *A Tally of Types* Morison describes Baskerville's type as: '[…] the first appearance in print of the style of native letter common among contemporary English writing masters such as George Shelley […]. John Baskerville of Birmingham had himself been one of these professional writing masters.'[309] Figure A4.8 shows letters drawn by Shelley in the style we all know so well from Baskerville's type. The latter inspired Fournier, Didot and Bodoni, labelled by Morison as 'flattery without plagiary […]'.[310]

Fournier circumvented the copying limitations for the Romain du Roi by making his type less rigid and somewhat more oriented on the developments of earlier type as well as on contemporary type like Baskerville's.[311] James Moran notes about Fournier in the foreword of Alan Hutt's book on this French typefounder: '[…], his genius lay in his ability to modernise the traditional letter forms, and his types are the first of the "transitional" between "old face" and "modern".'[312]

[307] Gustav Bohadti, *Von der Romain du Roi zu den Schriften J.G. Justus Erich Walbaums* (Berlin/Stuttgart: H. Berthold AG, 1957), p.11,14.
[308] Lawson, *Anatomy of a Typeface*, p.184.
[309] Morison, *A Tally of Types*, p.65.
[310] Ibid., p.81.
[311] Bohadti, op. cit., p.14.
[312] Hutt, *Fournier*, p.XII.

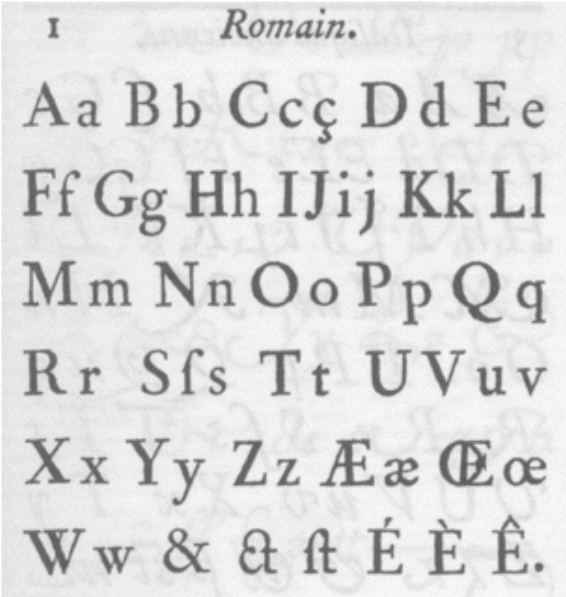

Figure A4.9 Fournier's roman type as shown in his *Manuel Typographique* (p. 187).[313]

The forms of the serifs of the Romain du Roi clearly differ from those applied on preceding type: 'The principal graphic novelty in the 'Romain du Roi' is the serif. Its horizontal and unbracketed structure symbolizes a complete break with the humanist calligraphic tradition.'[314] In Tracy's opinion a new feature in the Romain du Roi was the serif at the foot of the stem of the b, '[…] as though the letter was simply a reversal of the letter d. The style was adopted by many of the later punch-cutters who produced 'modern' faces. It is in Bulmer, but not in Scotch Roman; in Bodoni, but not in Walbaum.'[315] Updike considered the thin serif applied in the Romain du Roi 'dazzling to the eye' and in his opinion it rendered the type 'quite unlike anything that preceded it.'[316] De Vinne called the serifs a 'feminine fashion', which 'added nothing to the beauty of types, but it did largely diminish their legibility and durability.'[317]

A4.5 Dissonances

The development from foundry type via hot metal and photo typesetting to digital text composing has made possible that type can have perfect contours, that can be composed without any deviations from the baseline, and that can be perfectly printed. However, the opinions differ about the extent to which this can be considered an improvement. Rogers, who lived in the era of the hot metal composing

313 <http://jacques-andre.fr/faqtypo/BiViTy/Manuel/f2c06.html>

314 Morison, *Letter Forms*, p.29.

315 Tracy, *Letters of Credit*, p.58.

316 Updike, *Printing Types*, Vol.II, p.159.

317 De Vinne, *The Practice of Typography*, p.87.

machines, did not appreciate too much regularity: 'A mechanically perfect letter is not the ideal letter; the reading eye does not demand cold regularity of execution; but it does gratefully recognize noble proportions combined with flexibility and variety of detail.'[318] Van Krimpen wrote in his famous letter to Philip Hofer dated November 1955: 'It seems likely that the slight irregularities, which the human eye and hand always leave in manual work, are an important element of the charm of handcut type.'[319] However, in the same letter Van Krimpen classified Rogers's attempts to reproduce the effects of foundry type in the Monotype version of *Centaur* as 'dishonest'.[320]

In *Counterpunch* the Dutch type designer and author on typography Fred Smeijers (1961) notes, more or less in line with Rogers and Van Krimpen (he does not specifically refer to hand-cut type, but to the printing):

> Most typefaces – certainly any belonging to the Garamond category – should have optical irregularity and variety if they are to function satisfactorily. […] This quality cannot be explained merely by imperfect printing techniques. Rather it has to do with all the imperfections and irregularities that balance on the border of what can be perceived.[321]

One wonders how Smeijers wants to measure what can be perceived or not; when is it too much or not enough irregularity?

Because typography started with foundry type and the archetypes are still dominant (which Smeijers underlines with reference to his 'Garamond category'), contemporary printed –either in offset or inkjet (in the near future)– type will always be compared with letterpress printing. The best-printed pages in history may have an extra charm because of the impressions of the lead letters in the paper and the subsequent dispersion of ink at the edges, but many, many books were printed rather poorly and one feels pity for their readers.

It is in my opinion an overly romantic attitude to think that the irregularities of letterpress added to the legibility factor. I have yet to see any scientific proof for this assumption. I believe that in general the quality of offset printing is superior to the majority of the historical letterpress-printed counterparts. The contemporary typesetting and printing technologies make it possible to show the typefaces and

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318 Rogers, *Pi*, p.17.

319 Jan van Krimpen, ed. John Dreyfus, *A Letter to Philip Hofer on Certain Problems Connected with the Mechanical Cutting of Punches* (Cambridge, Boston: Harvard College Library, 1972), p.17 of the letter.

320 Ibid., p.18 of the letter.

321 Fred Smeijers, *Counterpunch: Making Type in the Sixteenth Century, Designing Typefaces Now* (London: Hyphen Press, 1996), p.150.

their harmonics, patterns and dynamics as they really are. If monotony has a negative effect on the rhythmic structure, i.e., the proportional system(s), the designers should change the design. However, I do not think it makes sense to deliberately give stems uneven thicknesses, to make contours rough, or to make the x-height flexible. A purposely applied deviation from the rhythmic structure, a dissonance, may perhaps work for certain text sizes and can certainly be used as an extra gimmick for display.

A4.6 Serifs

Serifs are in general considered to be additional elements. For a while the Wikipedia page on serifs even mentioned 'non-structural': 'In typography, serifs are non-structural details on the ends of some of the strokes that make up letters and symbols' before this was replaced by 'semi-structural.' Figure A4.10 shows the accompanying image on Wikipedia with two different definitions of serifs: in the capitals A and C the complete endings of the strokes are indicated as serifs and in the rest of the letters only the parts that are sticking out are emphasized.

Figure A4.10 Serifs according to Wikipedia.

Serifs are structural elements which:

- emphasize the ending of a stroke,
- represent the contrast,
- indicate the contrast sort and contrast flow.

The way stroke endings are emphasized differs per typeface. The lower the contrast, the more the stroke-endings are emphasized. In case of a very low contrast the serifs become basically obsolete, because their thickness becomes equal to the stem thickness. Low-contrast variants with serifs are called 'slab serif' or 'egyptian'. The removal of the serifs results in a sans serif. In *De staart van de kat* Noordzij suggests that the ending of a stroke is by definition a serif, irrespective of whether elements are sticking out or not and he preferably wants to avoid the 'impossible' word 'sans serif'.[322]

[322] Gerrit Noordzij, *De staart van de kat: de vorm van het boek in opstellen.* (Leersum: GHMUitgeverij, 1988), p.99.

The interpolation (which calculates a new contour in between two existing ones) shown in Figure A4.11 seems to underline Noordzij's statement. The two poles were formed by the sans serif typeface DTL Argo designed by Gerard Unger and the serifed DTL Fleischmann, a revival based on type of the seventeenth-century German master. This isomorphic interpolation was made with the IKARUS V4 program, which makes 'intelligent' interpolation possible (the number of contour points is allowed to be different; glyphs will be interpolated as long as their morphology is corresponding). The resulting 'Arfleisch' type raises the question: if DTL Argo has no serifs what has been interpolated here?

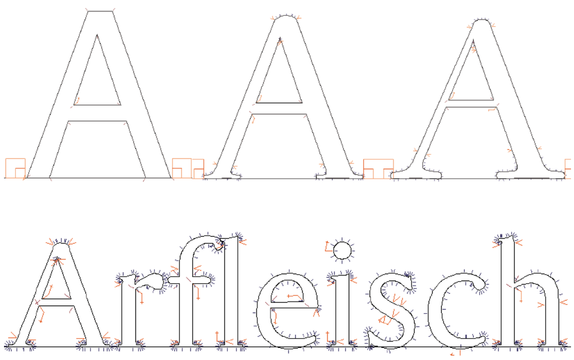

Figure A4.11 Interpolation of a sans serif typeface (DTL Argo) with a serifed one (DTL Fleischmann).

A4.7 Serif structures: broad nib

The types made by Jenson and Griffo were derived from letters written with a broad nib and subsequently had a similar high contrast. The bottom serifs of Jenson's 'Eusebius' type show what is essentially a backstroke. For the production of Centaur Rogers traced photographic enlargements of Jenson's letters with a broad nib and used backstrokes for the serifs, as shown in Figure A4.12. This way he did what Noordzij later described in the eleventh edition of *Letterletter*: 'Jenson interpreted handwriting. The example had lozenges as footings. Jenson could have copied this shape faithfully in his punches, but the extra work would not have paid. [...] rectangular footings are cut more easily than lozenges.'[323] In Centaur also Rogers replaced the backstrokes by more chisel-based serifs, such as the ones that can be found in the Roman Imperial inscriptions.

[323] Gerrit Noordzij, *Letterletter* (Vancouver: Hartley & Marks, 2000), p.96.

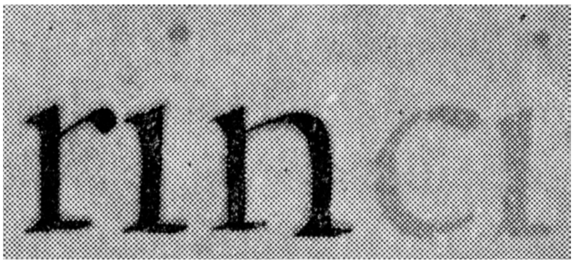

Figure A4.12 Rogers' broad-nib tracing of the 'Eusebius' type for Centaur (The Newberry Library col.).

In Adobe Jenson the backstroke in the bottom serifs of the lowercase is partly preserved. Obviously, Jenson treated the lowercase serifs somewhat differently from the capital serifs by preserving some details from writing. Griffo, however, seems to have copied to a greater extent the structure of the capital serifs to the lowercase letters.

Figure A4.13 Adobe Jenson (left) and Monotype Poliphilus, showing different treatment of the serifs.

Figure A4.14 shows the n's of Adobe Jenson, Monotype Poliphilus (Griffo) and Times New Roman, respectively. In Times New Roman the serifs mostly represent the serif shapes of the Roman imperial capitals.

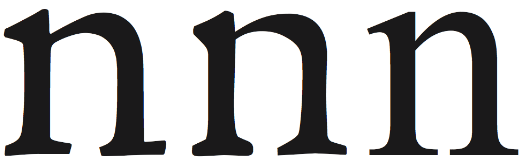

Figure A4.14 Adobe Jenson (left), Monotype Poliphilus (centre) and Times New Roman (right).

There is a direct relation between the weight and shapes of the top and bottom serifs of lowercase letters. The triangular top serif in roman type is a formal representation of the part of the arch, which is used to start and end a stroke (sometimes called 'foot'). Hence the weight of the top serif represents the weight of this curve part (Figure A4.15).

Figure A4.15 The top serif (right) represents the weight in the arches.

The formal triangular top serif is not specific for type; it can also be found in Carolingian minuscules (figs.A4.16/17) and subsequently in the Humanistic minuscules.

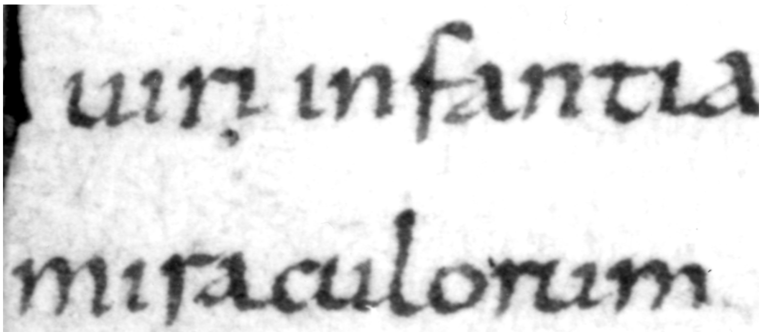

Figure A4.16 Top serifs in Carolingian minuscules (France, ninth/tenth century [National library of the Netherlands col.]).

The triangular top serif seems to have been applied only if a stroke was not followed by a second connected stroke at the same height. The m for instance has a sequence of connected arches, and here the triangular serif was not applied. In case of single stroke letters, like the i and the l, and also on top of the u, the triangular serif was applied, probably to make the letters sturdier.

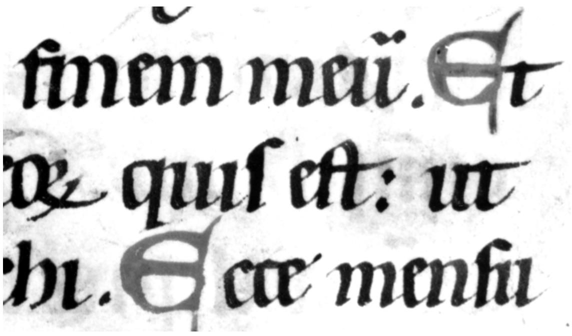

Figure A4.17 Top serifs in Carolingian minuscule letters 'u' (end of twelfth century, origin unknown [Museum Meermanno col.]).

Formal stroke endings, like the ones shown in Rogers's nib tracing of the Eusebius type, were also applied in medieval manuscripts. Figure A4.18 shows a formalised book hand from the twelfth century with subsequent stroke endings. The finest manuscripts from that century show a 'Perfect symmetry of letters, marvelous uniformity in their structure.'[324]

Such formalised Latin minuscule book hands are precursors of the fifteenth-century roman type and are in contrast with statements such as 'Pure, formal written romans are rare if not unknown before 1500'[325] and the allotment of the backstroke to the textura: 'After 400 years we have become accustomed to roman type, but we might yet do well to marvel at the fact that the reversal in the textura foot has been so emphatically adopted'.[326]

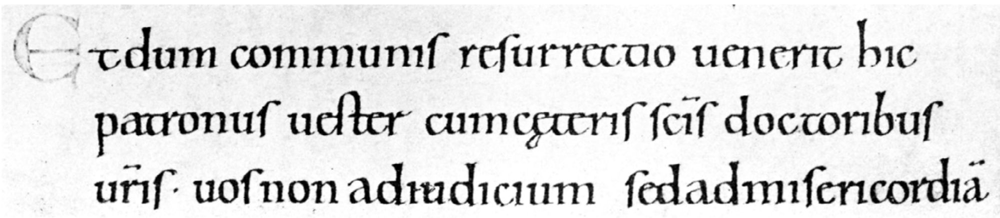

Figure A4.18 English book hand from the early twelfth century, showing formalised bottom serifs.[327]

Figure A4.19 shows how (theoretically) the pen angle is slightly changed to retain the width of the top serif (based on the width of the 'foot') in combination with lining the top with the arch. This way the total weight of the serif still resembles the related part of the arch. The top serifs represent the complete flow of contrast; i.e., from thick to thin.

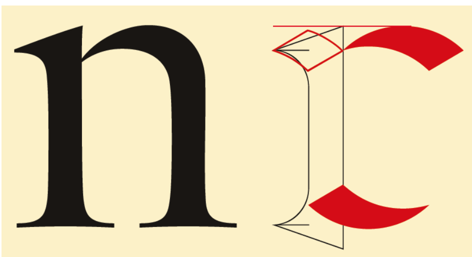

Figure A4.19 Formalisation of the top serif.

[324] Thompson, *An Introduction to Greek and Latin Palaeography*, p.436.
[325] Smeijers, *Counterpunch* p.49.
[326] Noordzij, *The Stroke*, pp.57,58.
[327] Thompson, op. cit., p.435.

There is a simple relation between the top and bottom serifs of the letters. Noordzij indicates that the triangular top serif of for instance the lowercase 'i' can theoretically be divided by a horizontal line into two identical parts.[328] This can be pushed a step further. The bottom serif is in theory made of half of the top serif. If the serifs are straight triangular shapes, the top half of the top serif is identical to the bottom serifs. If the bottom half of the top serif is curved, the bottom serif is a mirrored copy of this curved part (Figure A4.20). To maintain the total weight of the top serif, the top half can be copied to the right side of the stem bottom.

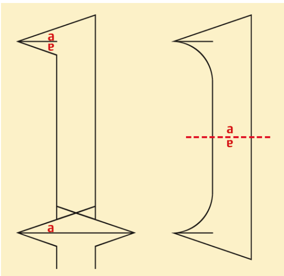

Figure A4.20 Relation between top and bottom serifs.

In case the pen (vector) angle changes, the serifs will change too. The steeper the pen angle, the more weight will consequently be in the arches and the more weight will be in the serifs. Figure A4.21 shows an increase in pen angle reflected in steeper serifs. Increment of the contrast is achieved by making the thick parts of a letter thicker. This can be done in an absolute way, but also in a relative way by decreasing the thickness of the thin parts. In both cases the vector and optical angle will become steeper. If the vector angle changes, the serif angle changes as well.

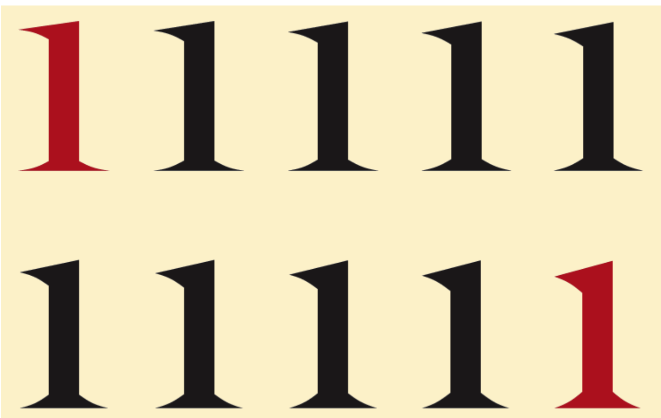

Figure A4.21 An increased pen angle leads to steeper and heavier serifs.

[328] Noordzij, *De staart van de kat*, p.103.

If the contrast is lowered, the angle of the serifs (the bracketing) will become less steep, because the additional weight will otherwise change the relation with the counter part in the arches, but also because the origin of the curved part, i.e., where it is placed against the stem, be widened and therefore this angle also changes. This angle, the optical angle, is by definition smaller than the angle used for the underlying vector. The vector angle can be considered as the factual angle. The optical angle could be represented by a line connecting the origin of the curve with its extreme.

If the contrast is lowered the bottom serif is represented by the triangular shape plus the weight of the thinner parts (Figure A4.22). This results in less steep brackets and the serifs become more horizontal. The level of contrast can be read from the serifs: if the angle is less than 90 degrees, there is by definition a certain amount of contrast.

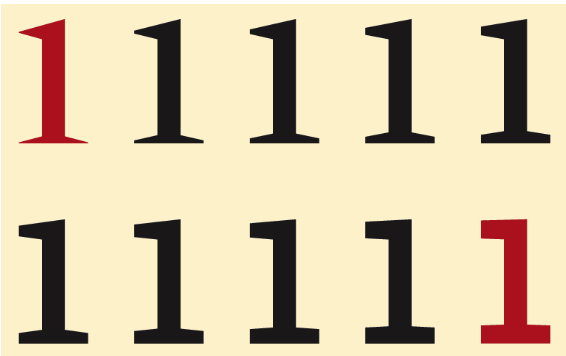

Figure A4.22 Lowering the contrast leads to heavier and more horizontal serifs.

Figure A4.23 shows the (theoretical) steps of the development of the formalised serif, starting from writing.

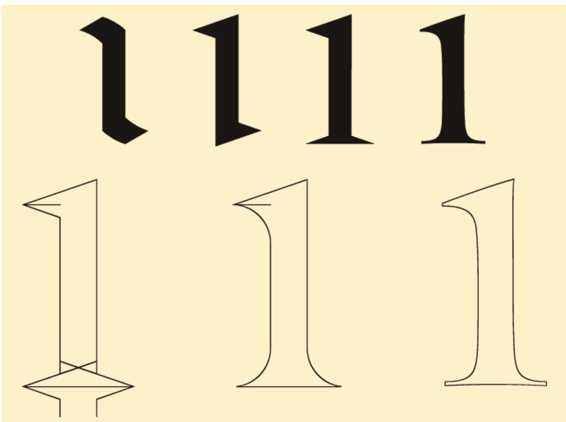

Figure A4.23 Schematic representation of the development of the serif.

The centre and right outlined i's on the bottom line show a different treatment of the stems. In the centred i the stems are defined by straight lines, which are connected to arcs (the taluses of the serifs). The connections of the arcs are quite abrupt and angulated. As a result the stem becomes optically convex, i.e., it bulges outwards and subsequently the serif-connections optically come inwards. The stem of the right i is biconcave and the serifs are fluently connected to the stems. The optical convexity is prevented this way.

Figure A4.24 Biconcavity in the stems of the right n prevents optical convexity as shown in the left n.

Figure A4.24 shows the n's of Times New Roman (left) and DTL Haarlemmer (right). The stems of the Times New Roman's n are straight and not only are the connections of the serifs optically imperfect, but the connection of the arch with the right stem does not look very smooth either. In the n of DTL Haarlemmer the stems are biconcave and the arc-connections more fluent.

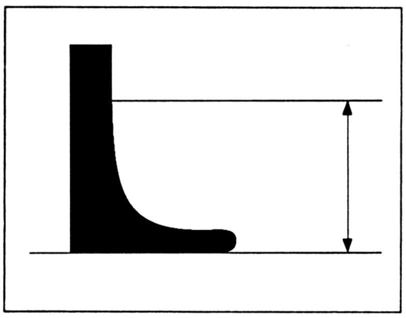

Figure A4.25 Defining the height ('serif leg') of the serif.[329]

In case of an abrupt connection the vertical origin (the height) of the serif can be easily defined. In case of a fluent transition of the stem into the serif, this is much more difficult. In case of biconcave stems one could theoretically state that the serif starts in the centre of the stem and that there actually is no stem, only serifs. In

[329] Karow, *Typeface Statistics*, p.56.

Typeface Statistics the height of serifs (called 'serif leg') is measured, but 'there is also a certain arbitrariness in the selection of the position to measure for the height of the serif leg.'[330] The starting point is defined by vertically descending the stem 'down to a height at which the vertical stem becomes a certain amount thicker.' This seems to be impossible with biconcave stems.

A4.8 Serif structures: flexible-pointed pen

Around the beginning of the eighteenth century the broad nib was generally replaced by the pointed pen. Because of the lack of weight in the horizontal parts of the letters, such as in the arches, the serifs were diminished to (almost) horizontal thin strokes. It is possible to put some weight in the arches by putting pressure on the pen at the top, as is shown in the types of for instance Baskerville. As a consequence the serifs still have an angle. In the types of Bodoni the weight disappeared from the arches, and the angle of the serifs became zero.

If the contrast is lowered in flexible-pointed pen letters like those of Bodoni, the angle of the serifs remains the same. The contrast can be lowered until the serifs become optically as thick as the stems, and the result will be a slab serif or Egyptian, just as is the case with broad-nib letters (Figure A4.22). In the case of slab serifs the contrast sort cannot be distilled anymore from the shape of the serifs because the serifs will be identical for letters that find their origin in broad-nib and flexible-pointed pen letters.

A4.9 Polyform and Monoform

In its simplest form a serif is a monoform, either a rectangle (flexible-pointed pen or slab serif) or a triangle (broad nib), as shown in Figure A4.25. As soon as the contrast of broad-nib letters is lowered, the serifs become polyform, because the lower contrast is represented by a rectangle on which the triangle is stacked. If the contrast is further decreased, at the end the serif always becomes a rectangle, i.e., monoform, irrespective of the contrast sort.

[330] Ibid., p.56.

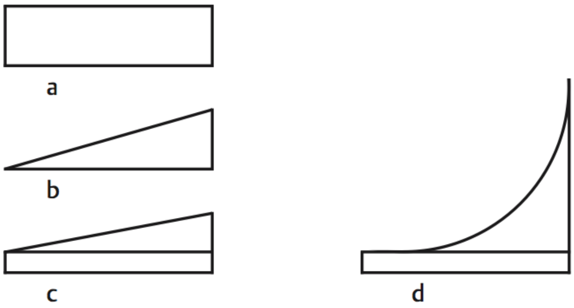

Figure A4.25 Variants a and b are monoform; c and d are polyform.

Serifs emphasize the ending of a stroke, represent the contrast and are an indication of the contrast-sort and contrast flow. Subsequently the shape, talus-angle, weight and contrast of a serif have a direct relation with the shape, applied pen-angle, weight and contrast in the other parts of letters. One could state that the DNA of a typeface can be distilled from the serifs and that subsequently a complete typeface can be built using the proportional system. This on the condition that the designer of the typeface applied serifs according to the structures described above, of course.

This may sound slightly abstract, but the serif-lengths are an indication of the size of the counters and from the applied angle in the top or bottom serif the pen-angle can be distilled. A horizontal serif will indicate that there is no weight difference between the arches and the stems; the only two possibilities are pointed pen-based letters with any possible contrast or slab-serif versions of broad nib-based letters. As soon as the brackets show an angle, the weight in the arches increases.

The stem thickness can be approximately distilled from the pen angle. The bolder the broad nib-based typeface, the steeper the angle will be. In case of flexible-pointed pen letters, the distilling of the stem thickness is more complex, because the horizontal serifs can be applied on both regular and bold letters (and everything in between).

As soon as there is a definition (distilled from a serif) of stems, arches, and counters, harmonic models can be used to define the proportions of the other letters, using the same contrast, contrast sort, and contrast flow.

A4.10 Serifs and spacing

The basic principle of an equal division of space between all letters is the result of the transition from an originally calligraphic system to a typographic mechanism. As lecturer at the KABK I have been in the position of experimenting with different approaches in educating rhythm and spacing. One of the things I have noticed is that explaining the fact that the space between the letters should be equal to the space within the letters does not help students very much when they start writing with a broad nib. One needs to provide a mechanism which forces the students in this rhythm, and in the case of the Latin bookhand minuscule the rhythm/spacing can be largely controlled by the length of the stroke-endings (feet).

The length of serifs is not an arbitrary matter, but a letter width-related factor. In other words, by defining the stem interval within the letters, the lengths of the serifs are a natural result of the stem interval. The stem interval between the letters is normally supposed to be (almost) equal to the width of the counters. Short serifs will cover less space and will result in a tighter spacing, which is basically an obstruction of the rhythm when the width of the counters exceeds the stem interval –a phenomenon that in my opinion makes sans serifs, for instance, by definition more irregular.

Goudy refers in *The Alphabet* to the relation between the lengths of the serifs and the stem intervals when he describes the harmonious quality of Jenson's pages:

> Every letter stands on solid serifs of unusual shape, so planned as to make each letter form coterminous with its type body while maintaining enough white space to set each letter off from its neighbor & preserve to the greatest degree the unity of the word formed by the separate characters. This permits close spacing of words and avoids loose composition.[331]

A4.11 Serif lengths, heights, and thickness

The length of the triangular top serif and hence the length of the bottom serifs of the lowercase of roman type are theoretically directly related to the weight and contrast flow of the arches. The length is a direct result of the applied vector and vector angle. In practice the type designer can deviate from this scheme, for instance because of spacing preferences. In addition for condensed, expanded, light or bold variants (or any combinations of these), which are essentially anomalies, type designers have to adapt the 'rules'. By definition, the clipping of serifs inside the counters or between the letters has to be prevented. There should be enough space dividing the serifs to leave a visible gap between them, especially on small point sizes.

[331] Goudy, *The Alphabet*, p.97.

Figure A4.26 Equal thickness of capital and lowercase serifs (DTL Haarlemmer).

The serifs for capitals in roman type are based on those for the lowercase, and although the counters of the capital letters are much larger than those of the lowercase, the serifs cannot be made longer because this would ruin the spacing with the lowercase. Although not a rule, capital serifs are usually made slightly longer than the lowercase serifs, as the distance to the lowercase is usually also made slightly greater than between the lowercase letters. Furthermore, the brackets of the capital serifs can be made steeper to give the serifs more weight. The capital serif-thickness is usually made the same as those of the lowercase serifs (Figure A4.26), to make the combinations with the lowercase serifs consistent. However, some type designers make the serif-endings of capital letters thicker (Figure A4.27), for instance because all the thin parts in capitals are by definition thicker too than those of the lowercase letters (as are the thick parts).

Figure A4.27 Different thickness of capital and lowercase serifs (Adobe Caslon Pro).

In *Typeface Statistics* the lengths, heights (called 'leg') and thickness (called 'foot') of measured 'roman typefaces' are brought together into statistics. According to the measurements the 'average' serif has the proportions in percentage of the cap height as shown in Figure A4.27. On the left the average capital serif is shown, and on the right the lowercase serif. Obviously the measured relation was unexpected: 'length and height of leg are not at all correlated! That is amazing. The height of the foot and leg are correlated of course, but by no means as strongly as we had expected.'[332]

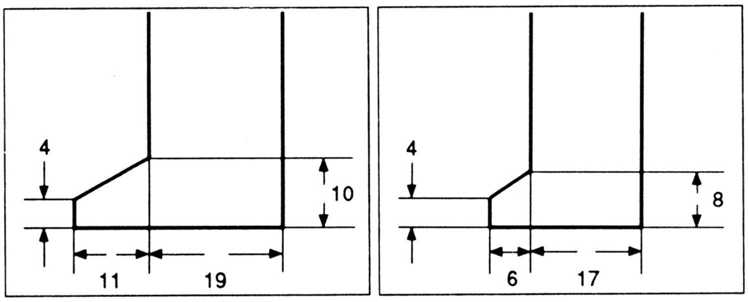

Figure A4.28 Serif proportions in relation to the cap height (in percentages).[333]

A4.12 Classifications

Size, details, weight, contrast and contrast flow are a number of elements in type that can be classified. Before standardised point systems (Didot, Pica) were used, the size of letters was indicated by regionally used names. In the Netherlands for instance 'Augustijn' stood for (what later became) twelve Didot points, 'Ascendonica' for eighteen Didot points, and 'Groot Canon' for thirty-six Didot points. The naming differed per country; for instance Ascendonica was named 'Ascendonica Romain' in France and 'Double Pica' in England.[334]

When there are only limited variants of type in use, such as roman, italic and gothic, there is not much need to classify type based on details. The name of the punchcutter was sometimes was used in addition to the size-name. For instance the Konrad Berner type specimen (Frankfurt, 1592) shows names like 'Romain Parangon de Garamond' and 'Cursiff Parangon de Granjon'. This sort of naming was also practised at Plantin's firm: 'The fact that the name of the French type-cutter Claude Garamond, who died in 1561, was given to one of the founts is another indication that the nomenclature was a recent innovation [...].'[335]

De Vinne explains the need for detailed classifications later on in history in *The practice of typography* as follows:

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332 Karow, *Typeface Statistics*, p.243.

333 Ibid., p.243.

334 Vervliet, *Sixteenth-Century Printing Types of the Low Countries*, p.16.

335 Ibid., p55.

> When the faces of text-types were limited to roman, italic, and blackletter, one or two words described the size, or body, and another word defined the face. The multiplication of faces now compels founders to make names longer and more descriptive. The features are usually given in this order: (1) The body or size of the type, as "Pica." (2) The style or face of the type, as "Pica gothic." (3) The ornament or fashion of the type, as "Pica gothic ornamented." (4) The shape of the type, as "Pica gothic ornamented condensed."[336]

Type can be classified by its various details. These details are related to the time, i.e., style periods, in which type was produced. Certain stylistic details, like proportions, were considered to be specific for a country, such as the 'Dutch taste': 'The "Romain du Roi" was strictly reserved to the imprimerie Royale; Fleischman's Romans and Italics had Europe before them. The Paris trade, therefore, was bound to take notice of the "Goût Hollandais".'[337]

Since the early twentieth century several attempts have been made to come to a classification of type based on details. This has resulted, for example, in the German DIN 16518 classification (similar to the Eastern-German TGL 10-020 classification), one by Maximilian Vox and one by Aldo Novarese. According to Kapr, these classifications 'largely agree' [...] 'All four systems are organized to the graphic characteristics of the typeface, the form of the serifs, the contrast between main strokes and hairlines and the shadow axis of the curves.'[338] This results in vague descriptions such as for 'Old Face' (or named 'Humanes' in Vox's classification, 'Lapidary' in Novarese's, and 'Renaissance-Antiqua' in the German ones): '1. Contrasting strokes with oblique stress in the curves. 2. Less difference in thickness between the strokes. 3. Bracketed serifs.'[339] Such descriptions will help (not more) to categorize type, but they do not give any indication about for instance the style period. As Kapr remarks in *The Art of Lettering*: 'The drawback of the classification systems is that no distinction is made between the roman types of the Renaissance period and those of the twentieth century.'[340]

Noordzij, advocating handwriting as the underlying force for typedesign, made a classification based on the contrast and contrast flow originating from writing with the broad nib ('translation') and with the flexible-pointed pen ('expansion'): 'Contrast is governed by the techniques of handwriting, but it may be modified in design.

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336 De Vinne, *The Practice of Typography*, p.53.
337 Morison, *Letter Forms*, p.35.
338 Kapr, *The Art of Lettering*, p.325.
339 Ibid., p.326.
340 Ibid., p.325.

A range of drawings with gradually increased and reduced contrast reveals all the possibilities of typedesign.'[341] Noordzij's theories eventually culminated in his cube.

Noordzij's models also will not help to identify the style period in which the typeface was made. Like the aforementioned classifications by Kapr, Noordzij's will not help to describe the hand of a specific punchcutter or type designer either. In Appendix 9, *Systems and models in type* I describe a range of models deriving from the underlying structures and patterns of type, such as the harmonic system, harmonic model, proportional model and rhythmic model. The purpose of these systems and models is to describe all underlying structures and patterns of roman and italic type, which makes it possible to describe the details of a style period, together with the details of the punchcutter's hand on top of these. Hence, these will make classification easier.

A4.13 Rotating counter

In the former section Kapr's classification of 'Old Style': 'contrasting strokes with oblique stress in the curves' is quoted. This definition excludes the roman type from the seventeenth century, which in origin is broad-nib based like its precursors but in which the 'oblique stress in the curves' is suppressed. A vertically-stressed counter does not mean by definition that the letters are based on the flexible-pointed pen.

Figure A4.29 Erroneous approach of formalised broad-nib and flexible-pointed pen letters.[342]

Figure A4.29 shows 'two different styles of Roman minuscules', from a 'thorough, practical guide to the art of hand-lettering' by Helm Wotzkow, who is described in the publisher's note as a highly skilful letterer and designer. Wotzkow writes: 'The first (left) letter of each pair naturally belongs to the same alphabet – see the "plume"

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341 Noordzij, 'A Program for Teaching Letterforms', p.86.

342 Helm Wotzkow, *The Art of Hand Lettering* (New York: Dover Publications, 1967), p.108.

form – and the second to the "drawn" form.'[343] A rotated circle with vertically expanding strokes mistakenly represents here the 'plume' (broad nib) form. The 'drawn' form actually shows a variant as can be written with a flexible-pointed pen, unexpectedly combined with curved brackets. Interestingly, Wotzkow correctly combined the lack of weight on top of the 'drawn' bowls with a horizontal serif. The overall wrong interpretation of the effects of the broad nib and flexible-pointed pen in Wotzkow's illustration are representative of many publications on type and lettering.

Figure A4.30 Correct approach of formalised broad-nib and flexible-pointed pen letters.

Figure A4.30 shows a correct representation I made of formalised broad nib and flexible-pointed pen letters. The top of the bowl of the p on the left clearly shows the vector, which results in much more weight in the arch than in Wotzkow's example. The right p shows a completely different construction of the bowl in comparison with the p on the left.

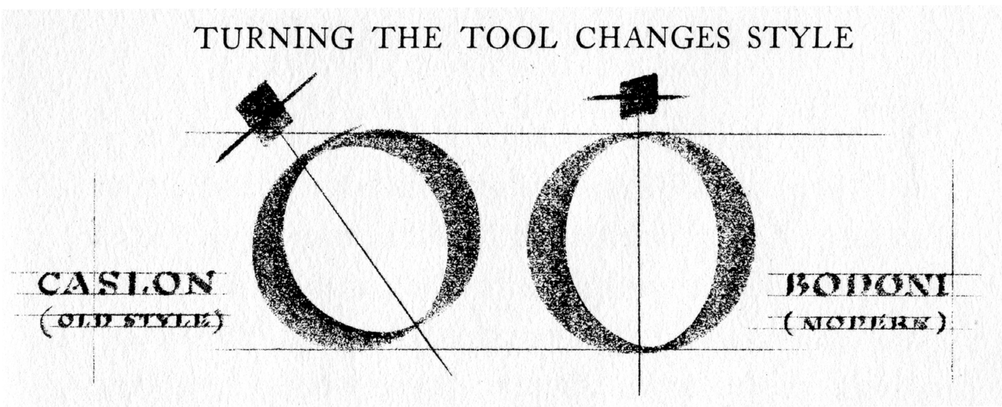

Figure A4.31 Erroneous explanation of contrast-flow in broad-nib and flexible-pointed pen letters.

[343] Wotzkow, *The Art of Hand Lettering*, p.108.

Figure A4.31 shows 'the notable difference between a classic type and a modern type' according to Tommy Thompson in *How to Render Roman letter Forms*. Thompson erroneously explains the difference in contrast flow between the broad nib-based type of Caslon and the flexible-pointed pen-based type of Bodoni as 'the result of the tool being held in the different positions necessary to render them' and he subsequently draws the 'Bodoni' o with a broad nib. In Thompson's opinion, the rotation of the counter was the only difference between 'classic type', i.e., 'old style' and 'modern' type.

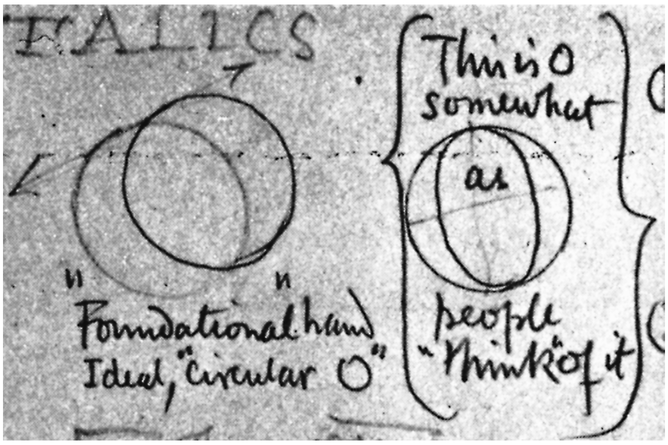

Figure A4.32 Notes from the early 1930s by Johnston on the shape of the o.[344]

The rotated o with vertically applied weight already appears in the roman type from the Renaissance and has nothing to do with the flexible-pointed pen (which became popular a couple of centuries later) as such. The written almond-shaped counter of the o as a result of translated circles (or ellipses) is difficult to retain in a drawn variant and was soon replaced by the Renaissance punchcutters and their followers by a circle (which is by definition smaller than the two translated circles) with a vertical stressing of the weight.

Johnston described the single-circled o as a (mis)interpretation of the 'circular O' (Figure A4.32). One can further read in his notes from the early 1930s: 'This is O somewhat as people "think" of it'. The explanation for the fact that the newly created o was still rotated to a certain extent like the written origin can be found in the rotated ('oblique') counters of the b, d, p and q and the related effect in the e.

[344] Johnston, *Formal Penmanship and Other Papers*, p.160.

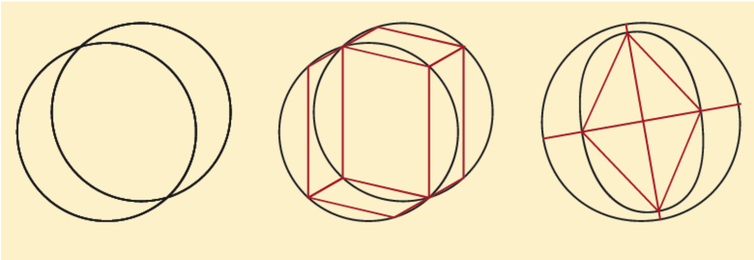

Figure A4.33 The construction of multiple-circled and single-circled o's differ.

The difference in construction between multiple-circled and single-circled o's is shown in Figure A4.33, which is an enhanced version I made based on Johnston's aforementioned drawing. The counter of the translated circular o can be schematically represented by a parallelogram (centre of the figure), and the counter of the single-circled o as a lozenge (right). The optical angle of the counter of the translated circular o is steeper that the one in the counter of the single-circled o. The more horizontal shorter sides of the parallelogram prevent the translated circular o from tumbling to the left. Especially in the seventeenth-century roman type appears in which the counter of the o is no longer rotated, like in the work of Van Dijck and Nicolas Kis.

Figure A4.34 Gradual rotation of the 'eye' of the e.

At a much earlier stage the small counter ('eye') of the e was rotated, which resulted in a horizontal bar. The design of the e in Jenson's type still sticks to the handwritten form as much as possible, but Griffo's type and that of his followers showed a counter as presented on the right in Figure A4.34.

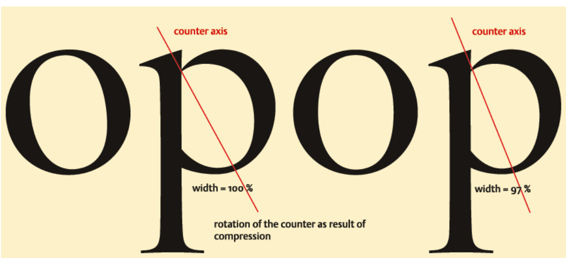

Figure A4.35 Counter rotation as an effect of compression.

Especially the curvilinear letters like b, c, d, e, o, p, and q became more condensed in relation to perpendicular ones in the roman type in the eighteenth century, as result of the 'Dutch style' ('Goût Hollandais'). The effect of this compression is that the counter angles rotate clockwise and as a result the counter looks more vertically stressed (Figure A4.35). The rotation of the counter was followed in the o, of course. This effect was even more applied in the capitals from the seventeenth century, anticipating the later transition from 'old style' to 'modern' type. The suppression of the 'backward tilt to the elliptical counters of curved letters like o' is described by Charles Bigelow as follows: 'As the roman typeface evolved, this virtual angle was flattened and the weights made more balanced.'[345]

According to the hierarchical relation between the space within the letters and the space between the lines, the compression of the 'Dutch style' letterforms in the eighteenth century resulted in shorter ascenders and descenders.

A4.14 Idiom

The signature or recognizable stylistic idiom in the work of type designers can be best described as a personalization of the conventional patterns and structures, or sometimes even as a deviation from the latter. To visually recognize these characteristic and often repetitive patterns, i.e., to identify the hand of a specific type designer, may not be too difficult for the trained eye, but to describe them is much more complex. One can compare the type designs from one hand with those of other type designers, but even then the result will not be much more than a description of deviations. During presentations in the 1980s Adrian Frutiger presented an average image of his typefaces by overlaying transparent sheets containing characters from a couple of his type designs (also shown in *While You're Reading*).[346] This average image showed Frutiger's personalized pattern.

In an article on typefaces by Frutiger, Charles Bigelow wrote: '[…] the interplay of created forms can reveal the personal style of an original designer, if not as an unvarying theme, then as a pattern of family resemblances.'[347] Bigelow also underlines the repetition of personalized patterns: 'Just as individual members of the human species may differ in musculature, proportion, clothing and complexion, but

[345] Charles Bigelow, 'Philosophies of Form in Seriffed Typefaces of Adrian Frutiger', *Fine Print on Type*, (London: Lund Humphries, 1989), pp.140–143 (p.143)

[346] Unger, *While You're Reading*, p.83.

[347] Bigelow, 'Philosophies of Form in Seriffed Typefaces of Adrian Frutiger', p.140.

are alike in possessing a similarly articulated skeleton, so the type designs of Frutiger often share a similar internal architecture.'[348]

The first characteristic of a type designer's idiom is formed by the proportions of his letters. These proportions can be completely new, resulting in a unique framework in combination with one or more proportional models. In the world of book type the 'Garamond model' is mostly applied, which actually means that the proportions of Jenson's and Griffo's roman types are dominant still. Morison writes on Griffo's influence:

> Notwithstanding, it is obvious that the types of both the Aetna and the Polifilo are varieties of the same design. It was destined to have a lasting effect on the trade. Garamond and Granjon accepted it as their prototype; it was their romans, absolutely faithful to the Aldine, that set the style for Van Dijck, and were set by him for Caslon.[349]

Van Dijck for instance based his roman type on Garamont's, and type attributed to him formed the basis of Van Krimpen's Romanée from 1928, which was adapted in the last quarter of the twentieth century by Bram de Does for his Trinité. [350] The proportions of Dutch seventeenth-century type were also used by Gerard Unger for his Hollander type (1983); it 'was to some extent modeled on types attributed to Christoffel van Dijck or Dirk Voskens in that it adopts their generous proportions.'[351]

How difficult it is to describe differences within a certain idiom is proven by Vervliet's description of the details in Garamont's, Granjon's and Van den Keere's type: 'Few Romans are so nearly alike as those cut by these three men. [...] so far nobody has found a clear and constant criterion for telling the Romans of Garamont, Granjon and van den Keere apart.'[352] Vervliet proceeds with describing the differences, like 'Garamont's e finished lower than the others' and 'Van den Keere's b d p q have a slightly backward-tilted counter.'[353]

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[348] Ibid., p.140.

[349] Morison, *A Tally of Types*, p.49.

[350] Jan van Krimpen, *On Designing and Devising Type* (New York: The Typophiles, 1957), p.41 and Huib van Krimpen, *Boek: over het maken van boeken* (Veenendaal: Gaade Uitgevers, 1986), p.284.

[351] <http://www.gerardunger.com/allmytypedesigns/allmytypedesigns06.html>

[352] Vervliet, *Sixteenth-Century Printing Types of the Low Countries*, p.65.

[353] Ibid., p.66.

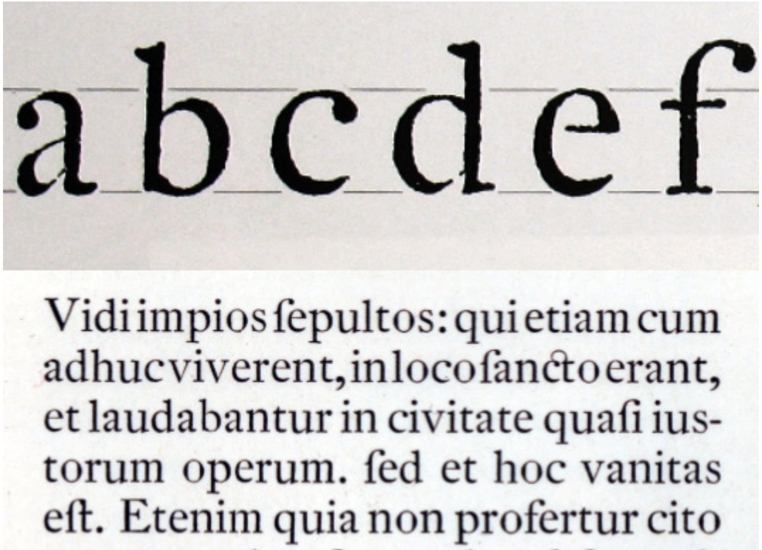

Figure A4.36 Type cut by Johann Michael Fleischmann.

The changes applied by Garamont on the models of Griffo, and by Van Dijck on the models of Garamont, and by William Caslon on the models of Van Dijck are relatively small. The details Johann Michael Fleischmann introduced in the eighteenth century deviated much more and were more abundant. Fleischmann was perhaps more of what we nowadays consider to be a type designer than his predecessors, who were craftsmen first. According to Morison, Fleischmann's designs represent 'the first personal, individualist interpretation of Roman and Italic.'[139]

Fleischmann's typefaces are transitional; they contain elements from writing with the broad nib and with the flexible-pointed pen. The letterforms are clearly late Baroque and predict the gallant style of the Rococo. With the emphasized serifs and teardropped terminals Fleischmann clearly personalized his type and he did this in such a controlled and delicate manner that at text sizes the details are not hampering the homogeneity. Large point sizes reveal Fleischmann's enriching display-like details and how the progression of the details results in a very harmonious grouping of the letters in words.

APPENDIX 5: DETAILS OF THE RENAISSANCE TYPE PRODUCTION

A5.1 Introduction

This appendix is supplemental to Chapter 6 and is referred to in the Sections 6.3 and 6.5. It provides additional information on the production of type in the sixteenth century, and the related standardisation and systematisation of matrices.

A5.2 Production of matrices

Standardisation of the parts of type production is inevitable when the production becomes more professional. In the early days of typography the punchcutters also produced the matrices and even cast type. However,

> By the end of the fifteenth century […] specialization had begun to develop and professional punch-cutters and type-founders appeared. […] there were already type-founders in the sixteenth century who hardly ever created their own type designs but were content to work with matrices prepared by their more skilful colleagues.[354]

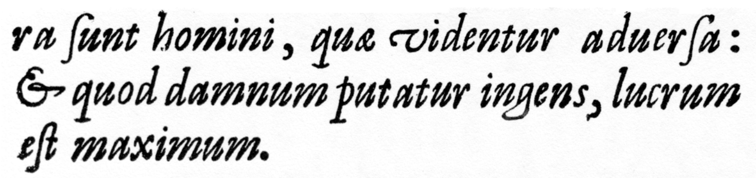
ra ſunt homini, quæ videntur aduerſa:
& quod damnum putatur ingens, lucrum
eſt maximum.

Figure A5.1 Granjon's Ascendonica Cursive in print.[355]

One can imagine that the placement of the punches on the matrices was done empirically. In his *Manuel Typographique* Fournier explains that, after polishing the matrix, the place where the punch should be struck is marked: the exact place of the strike is empirically and gradually found.[356] In *Counterpunch* Smeijers suggests that in the sixteenth century the punch was struck in '[…] a lump of copper with one or two flat sides. Somewhere in this lump there floats a character. Justification in all directions was necessary.'[357] This looks to me much more complex than Fournier's method, in which the *exact place* of the strike is determined, and the statement is in contradiction with the standardisations I found in Garamont's matrices, as described in Chapter 6.

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354 Voet, *The Golden Compasses*, Vol.2, p.64.

355 Vervliet and Carter, *Type Specimen Facsimiles* 2, Plantin's Folio Specimen, no.10.

356 Carter, *Fournier on Typefounding*, pp.82,83.

357 Fred Smeijers, *Counterpunch* (London, 1996) p.120

Figure A5.2 Unjustified matrices of Granjon's Ascendonica Cursive.

The collection of the Museum Plantin-Moretus also contains punches, unjustified matrices (or 'raw strikes'), and justified matrices of Robert Granjon's Ascendonica Cursive (approximately 18 Didot points). This makes it possible to check not only the justified matrices for possible standardisations of widths, but also the unjustified ones. The Ascendonica Cursive was cut in 1570 to Plantin's order and the type seems to have been exclusively used at Plantin's press.[358] Perhaps Plantin purchased these matrices for commercial reasons and maybe he planned to sell them in Frankfurt, but apparently he did not.

Granjon lived from 1513–ca.1590 and was a punchcutter, typefounder and publisher. Like his French countryman and coeval Garamont he ranks amongst the most skilful punchcutters in history. The Ascendonica Cursive has become widely known in our time, because it formed the basis for the italic of ITC Galliard, which was designed by the American type designer Matthew Carter (1937) and released in 1978.

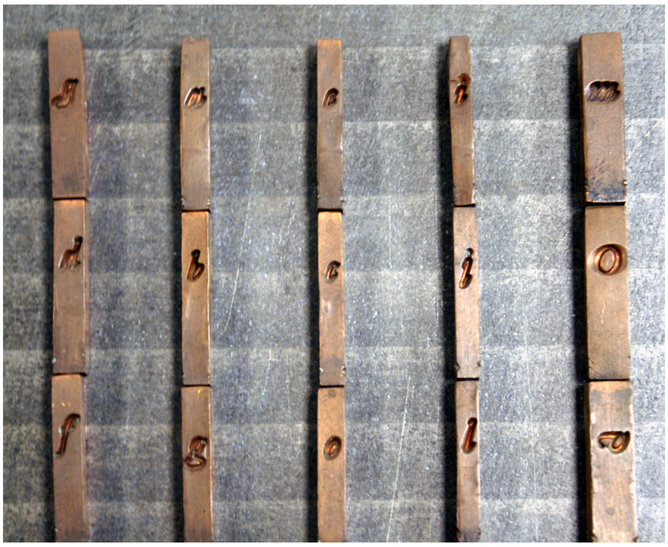

Figure A5.3 Rows of justified matrices of Granjon's Ascendonic Cursive.

[358] Voet, *Inventory of the Plantin-Moretus Museum*, p.56.

Before I measured the widths of the justified matrices, I made rows of matrices to see if I could find the same sort of standardisation of widths that I found in the matrices for Garamont's Gros Canon Romain (Figure A5.3). This was indeed possible. Next I made rows of the unjustified matrices to see if these would also show the same systematisation as the justified ones (Figure A5.4). If so, this would mean that the 'lumps of copper', mentioned by Smeijers in *Counterpunch*, would be easier to justify.

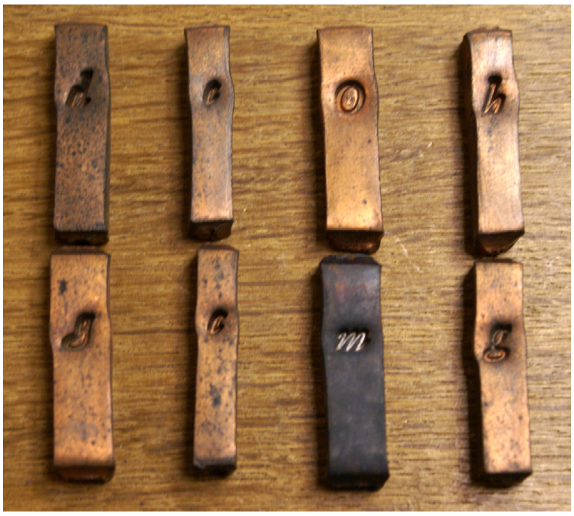

Figure A5.4 Rows of unjustified matrices of Granjon's Ascendonic Cursive.

In his *Manuel Typographique* Fournier writes about the matrices:

> They are small pieces of red copper, from an inch thick, but varying in width according to the nature of the letters […]. The dealer cuts these plates [red copper] into strips with large shears and the founder beats them out into an equal thickness, but making some wider than others for matrices of different widths.[359]

The endings of the unjustified matrices of the Ascendonica Cursive look as these have been prepared with chisel cuts for separation by hand (Figure A5.5). The strings of copper were precut like chocolate bars. Different letters that shared the same character widths could be struck into the standardised strings and the matrices could be disjointed afterwards.

Figure A5.5 Raw matrices that look like the strikes were made in pre-cut copper bars.

[359] Carter, *Fournier on Typefounding*, p.81.

The standardisation of character widths in combination with the standardisation of the widths of the copper strings must have made the justification of the matrices easier when the strikes were exactly positioned. In *Fournier on Type Founding* Carter mentions the later use of '"a striking", in which the punch is held firmly and upright whilst a screw, acting upon the top, presses it gradually into the copper. A vernier scale shows the depth to which the punch has been driven. This puts less strain on the punch than a hammer.'[360] One can imagine that a striking press makes the exact placement of the punch of the matrix easier. When exactly the use of the striking press for the production of matrices started seems to be unclear. In the catalogue of the 1963 exhibition *Printing and the Mind of Man* at the British Museum one can read in a short note on the striking press that 'Until recent times punches were struck into copper with a hammer.'[361] Therefore it is unlikely that the Renaissance punchcutters used such a tool.

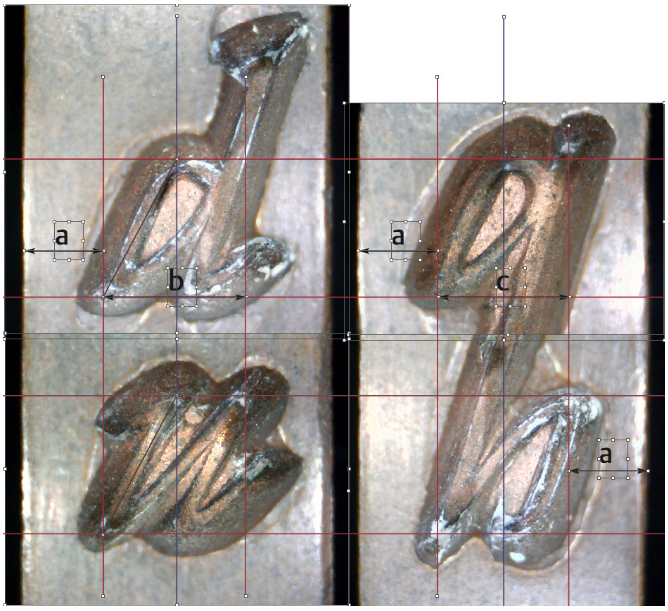

Figure A5.6 Positioning of the strikes on the matrices of the Ascendonica Cursive.

The positioning of the strikes on the matrices of the Ascendonica Cursive (Figure A5.6) is as perfect as that of the matrices of the twice as large Gros Canon Romain of Garamont.

[360] Ibid., p.84.

[361] Nicolas Barker et al., *Printing and the Mind of Man* (London: F. W. Bridges & Sons, 1963), p.20.

Figure A5.7 Excrescences on the sides of the matrices of the Ascendonica Cursive.

Small cuts can be found on the sides of the justified matrices of Garamont, Van den Keere, and Granjon (Figure A5.7). The matrices are not always equally wide everywhere, but placed in the mould they seem to be perfectly perpendicular. The excrescences were used to correct the widths of the matrices to make standardised casting possible. When too much was removed from the side of a matrix, a little sharp chisel was driven into it to raise small excrescences in the copper.[362]

A5.3 Tricks and trade secrets

The placement of the strikes on the matrices from Garamont, Granjon, and Van den Keere, is remarkably precise. Furthermore, the letters seem to fit perfectly on the derived cadence-units, as described in chapter 6. The Renaissance punchcutters were probably technically more advanced than has been assumed so far. Unfortunately here is no documentation on this subject dating from the times of Jenson, Griffo and Garamont.

[362] Carter, *Fournier on Typefounding*, p.94.

Figure A5.8 Rädisch cutting punches at Joh. Enschedé en Zonen in 1951.[363]

Craftsmen use tricks to ease their tasks and often also keep these tricks secret. Paul Helmuth Rädisch (1891–1976), the punchcutter who worked closely together with Van Krimpen at Joh. Enschedé en Zonen (Figure A5.8), revealed in his autobiography a 'trick' he used to transfer the drawings by Van Krimpen to his punches. This is probably generally unknown because only 135 copies of the book *A tot Z* were produced (in Dutch) He describes that first a photo in the right size was made of Van Krimpen's drawings. He used etching on red copper (first he used zinc, but this was not precise enough) to get a good image to subsequently make a soot impression from. This impression was used to transfer the letter to a punch using transparant plastic.[364] Rädisch suggests that this technique was his idea, but it is likely that photographic gravure (probably autotype or heliogravure) was already applied in the same way for the production of type in Germany. In 1952 in Germany a film on how movable type was produced at that time was released together with a small booklet.[365] Film and booklet show exactly the process described by Rädisch (Figure A5.9).

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363 Dreyfus, *The Work of Jan van Krimpen*, p.143.

364 Paul Helmuth Rädisch, *A tot Z: een autobiografie van P.H. Rädisch, staalstempelsnijder* (Haarlem: De Priegelboekerij, 1979), p.46.

365 Martin Hermersdorf, *Wie ein Druckbuchstabe entsteht* (Seebruck am Chiemsee: Heering-Verlag, 1952).

Figure A5.9 Frame from *Wie ein Druckbuchstabe entsteht.*

In an article in *Fine Print on Type* Stan Nelson describes a related method that he used for the production process of punches for Anglo-Saxon characters to be used with Van Krimpen's Romanée: 'One letter was transferred from a sample Romanée type to the polished face of the punch by offsetting a soot impression onto a thin coating of slightly tacky varnish. After the soot transfer the character was outlined on the steel punch with the scribe and it was ready for cutting.'[366] In September 2009 a YouTube video was uploaded in which Stan Nelson demonstrates this process using the capital R from ATF Garamond (Figures A.10–11).[367]

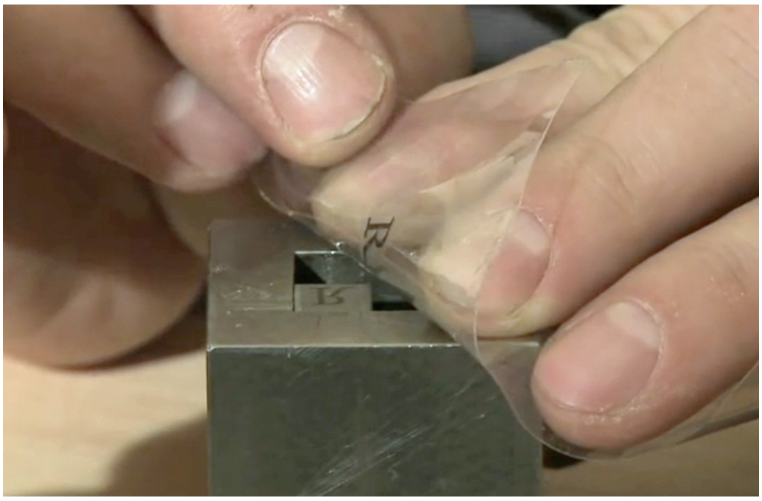

Figure A5.10 The soot transfer to the polished face of the punch by Nelson.

[366] Stan Nelson, 'Cutting Anglo-Saxon Sorts', *Fine Print on Type*, (London: Humphries, 1989), pp. 117–118 (p.118).
[367] <https://www.youtube.com/watch?v=eExllUeGtvc>

Figure A5.11 Magnified image of the newly cut capital R from ATF Garamond by Nelson.

Proportions and details of different historical foundry type, like those of Garamont's and Van den Keere's Parangon Roman, can be so much alike that one expects that special methods were used to transfer the image of existing type to punches, like the one Nelson describes and demonstrates. Initial standardisations required to control the early Renaissance production can in this way simply be copied without knowledge of (the basis for) the standardisation. Vellum can be made transparent for this purpose and in later times there was even a patent granted for a method to acquire the transparency.[368]

A5.4 Emperical testing

At the Museum Plantin-Moretus in Antwerp (December 2010 and January/February 2011) I measured the Gros Canon Romain from Garamont and its sibling the Moyen Canon Romain from Van den Keere using a digital calliper (Figure A5.12). From both typefaces printed material, original movable type, and matrices are present in the inventory of the museum. I also measured the Ascendonica Cursive cut by Granjon. In May 2012 I investigated standardisations in matrices of Van den Keere's Canon Flamande and Parangonne Flamande.

368 <http://cool.conservation-us.org/don/dt/dt2487.html>

Figure A5.12 Digital calliper with Renaissance foundry type.

The best way to test my theory on the need of one set letter per group of letters with the same width, like I found in the Renaissance Gros Canon Romain type, was to cast a number of letters using the original matrices from Garamont and Van den Keere.

On Tuesday 11 January 2011, Hutsebaut, the technical expert at the Museum Plantin-Moretus, and I cast type directly from Garamont's matrices for his Gros Canon Romain, and from Van den Keere's matrices for his related Moyen Canon Romain at the Museum Plantin-Moretus in Antwerp. Type was cast with a limited number of register settings adjusting to groups of matrices.[369] Hutsebaut used one of the 200 moulds from the inventory of the Brussels' type foundry Vanderborght (Figure A5.13), which were acquired by the museum in 1956. The mould in question probably dates from the nineteenth century and was perfectly suitable for the Moyen Canon Romain from Van den Keere; therefore the body was slightly too small (approximately six Didot points) for Garamont's larger type. To test the (standardisation of the) width of the letters, however, this mould was perfectly suitable.

On Wednesday 28 August 2013 Hutsebaut and I tested (again) my theory on the systematisation of the Renaissance font production, culminating in the standardisation of character widths in matrices. This time type was cast from Garamont's Gros Canon Romain lowercase using one fixed setting for the mould's registers using a sixteenth-century mould from Van den Keere.[370]

369 <http://www.youtube.com/watch?v=81ZrfbratSc>
370 <http://www.youtube.com/watch?v=tZKQslge32Y>

On Wednesday 17 June 2015 my Expert class Type design lesson was dedicated to measurements and casting from the matrices of Van den Keere's Gros Canon Romain (1573), which is presented as Canon Romain in the *Folio Specimen* from ca.1580, and Van den Keere's Canon d'Espaigne (1574), which is also shown in aforenamed specimen.

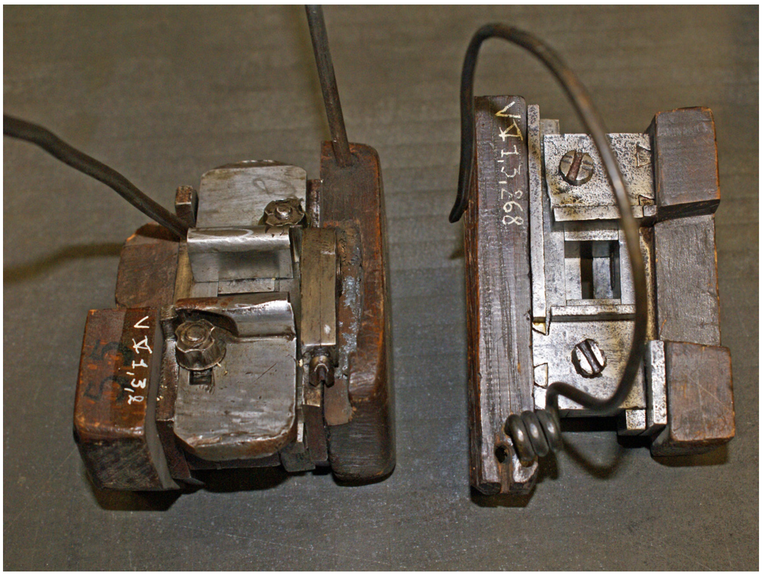

Figure A5.13 Nineteenth-century moulds from the VanderBorght foundry.

During the three sessions Hutsebaut used an alloy named MCP 37, which consists of 54% bismuth and 46% tin (this alloy is stable with 48–55% bismuth; below these percentages the metal shrinks and above it expands. The melting point is 137 degrees and Hutsebaut cast the type at 220–240 degrees. Bismuth has been known since antiquity and was until the eighteenth century often confused with lead and tin, which have more or less the same physical properties. However, bismuth is a heavy metal, which is less toxic than lead and tin.

At Plantin's printing office in about 1580 an alloy was used that contained 82% lead, 9% tin, 6% antimony, and for the rest copper. In the twentieth century a different alloy was used for foundry type: 60% lead, 15% tin, 25% antimony, and a trace of copper.[371]

[371] Lawson, *Anatomy of a Typeface*, p.389.

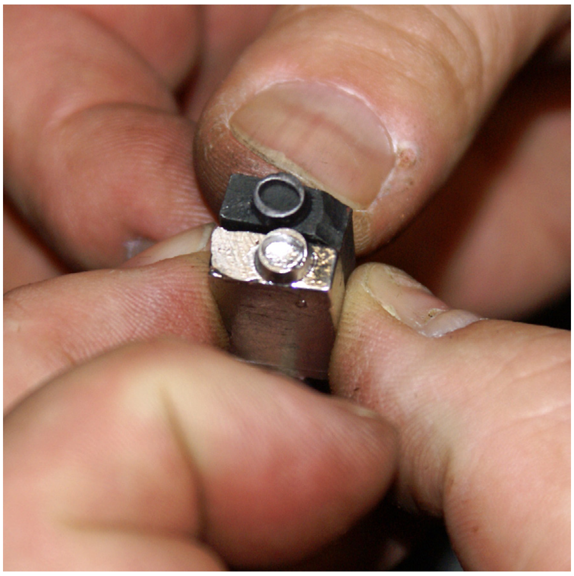

Figure A5.14 Newly cast o of the Gros Canon Romain compared with original foundry (top).

A sixteenth-century cast o of the Gros Canon Romain was used as set pattern and a range of letters from the same width-group (Garamont: g, n, o, q, and Van den Keere: d) were cast. The newly produced type seems indeed to prove that standardised matrices make casting easy.

A5.5 Measurement results

In this section the resulting values of the measurements of Renaissance matrices and foundry type are presented. The measurements were made with a digital calliper.

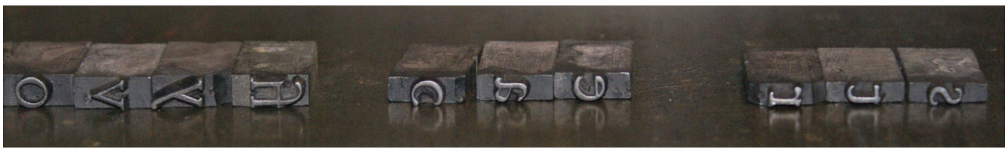

Figure A5.15 Historic foundry type: Garamont's / Van den Keere's Moyen Canon Romain.

Foundry type (sixteenth-century): Moyen Canon Romain (Garamont / Van den Keere) from the inventory of the Museum Plantin-Moretus (Figure A5.15):

(measurements in millimetres)

A	–	a	4,43	Æ	–
B	–	b	5,03	Œ	–
C	–	c	4,38	æ	–
D	8,58	d	4,9	œ	–
E	–	e	4,43	ﬁ	5,19
F	–	f	2,24	ﬂ	–
G	–	g	5.46/5.2	1	3,37
H	–	h	5,45	2	4,1
I	–	i	2,29	3	3,67
J	–	j	2.35/2.29	4	4,37
K	–	k	5,9	5	3,58
L	–	l	2.26/7	6	4,62
M	–	m	8,85	7	5,53
N	–	n	5,45	8	4,32
O	8,66	o	5.32/5.27	9	4,22
P	–	p	5,24	0	5,03
Q	–	q	–	!	–
R	–	r	3,75	?	–
S	–	s	3,4	-	–
T	–	t	3,52	.	–
U	–	u	5,29	,	–
V	–	v	5,27	:	–
W	–	w	–	;	–
X	–	x	–	(	–
Y	–	y	5,25	[	–
Z	–	z	4,92	{	–

The widths of the old foundry type show deviations of approximately 0.2–0.4 mm if letters are measured that can be placed in rows, as shown in Figure A5.15.Taking this tolerance into account, the letters can be sorted in a limited number of groups, like [a, c, e] [b, d, g, h, n, o, p, q, v, ﬁ] [l, j, l] and [r, s, t].

Figure A5.15 Granjon's Ascendonica Romain MA7 matrices.

Matrices: Ascendonica Cursive (Granjon) from the inventory of the Museum Plantin-Moretus, cat. nr. MA7 (Figure A5.15):

(measurements in millimetres)

A	8.09	a	5.53	Æ	–
B	7.25	b	5.07	Œ	–
C	8.01	c	4.60	æ	–
D	8.51	d	5.74	œ	5.92
E	7.32	e	4.72	as	7.42
F	6.40	f	5.24	ct	6.50
G	7.35	g_spec	5.28	fi	5.28
		g_ita	6.00	fl	5.34
H	8.36	h	5.51	ff	5.38
I	5.51	i	4.21	fr	6.21
J	5.34	j	4.28	ffi	6.62
K	7.94	k	5.25	ffl	6.38
L	7.14	l	4.20	ij	5.37
M	matrix is missing	m	7.47	is	5.96
N	8.35	n	5.78	ll	5.36
O	7.48	o	5.05	lgs_lgs	5.96
P	7.39	p	5.03	lgs_i	5.48
Q	13.60	q	5.52	lgs_l	5.61
R	7.86	r	5.06	lgs_p	6.32
S	5.72	s	4.90	lgs_t	5.72
		long_s	4.71	sp	7.46
T	7.63	t	4.75	st	6.82
U	no matrix made	u	5.71	us	7.21
V	6.91	v	8.00	leave	10.33
W	no matrix made	w	no matrix made	1	5.08
X	8.12	x	5.99	2	5.80
Y	6.45	y	4.81	3	5.01
Z	8.08	z	5.95	4	5.97
Z_swa	6.30	z_swa	5.90	5	5.05
&	9.31	ß	5.62	6	5.56
				7	5.58
				8	5.22
				9	5.64
				0	4.89

The tolerances within the groups of matrices with optically identical widths is comparable with the tolerances measured in the foundry type. In case of the foundry type it is plausible that oxidation processes influenced the widths, but in case of the copper matrices this is less likely. What certainly influenced the measurements, is the way the foundry type and matrices were placed between the jaws of the digital calliper. The Renaissance punchcutter did not use such equipment, of course: the matrices were empirically tested between the registers of the mould. Excrescences, as showed in Figure A5.7, were used to adjust the widths of the matrices. Although theoretically the positioning between the registers and the jaws of the calliper is comparable, the pinching by the registers was definitely more fierce –if only because the measurements were made with the utmost care for the precious matrices.

APPENDIX 6: FRAMEWORKS, GRIDS AND UNITS

A6.1 Introduction

This appendix is supplemental to Chapter 7 and is specifically referred to in Section 7.2. It provides additional information on historic grids and unitisations, like those for the Romain du Roi and even earlier by Moxon.

A6.2 Em-and en-square

In the early days of typography the leading was incorporated into the body. In digital type ascenders and descenders can exceed the body without any (physical) problem. Parts are likely to stick outside the em-square in any case, as we see for instance with the diacritics on capitals (there are several entries in digital fonts to preserve the rasterizing of parts outside the em on a screen, or that prevent clipping in some circumstances). Nevertheless, some designers copy the structure of foundry type, just to prevent clipping when zero line spacing is applied.

Present-day digital units are scalable and their size is relative to the bodysize of the type. For example, 10 and 100 point type bodies are both defined by the same number of units, but the units are smaller in case of 10 point. However, when defining the letter contours, the size of the units can be translated into absolute values. In the IKARUS system the units measure 1/100 of a millimetre when an analogue character is either manually digitised or imported via a scanner.

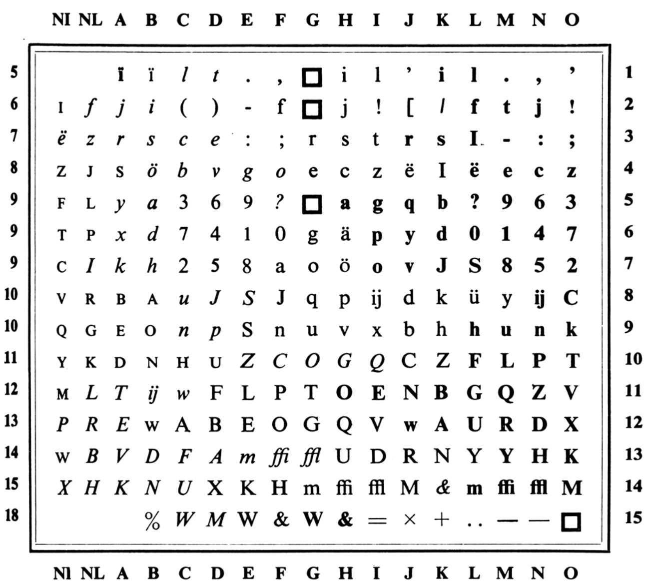

Figure A6.1 Monotype matrix-case arrangement.

In the times of the hot metal and photographic composing machines, the em-square was a rectangle that could be a square, depending on the type design. The proportions were vertically defined by the body size and in horizontal direction by the width of the widest character (normally the M and/or the W). This character width was divided in a certain number of units depending of the system.

The term em-square is especially often connected to the character width of the capital M, which provided the standard for the (division into units of the) em for composing machines. In a manual for operators of the Monotype 'hot metal' composing machines from 1912 one can read that: 'The designer of Monotype faces divides the basic character of the font (the cap M) into eighteen equal parts, using one of these parts as his unit of measurement in determining the width of all the other characters in this font.'[372] However, in Monotype fonts the M is not always the widest letter; in a type family, for instance, the roman M could be placed on fifteen units and the italic M on eighteen units (Figure A6.1). The capital W seems to have been placed by definition on eighteen units and that was obviously part of the original idea: '[…] it was decided that the lower case i, l, full point, etc., could be commonly allotted a thickness of five units, the figures and average letter-thickness nine units, and the capital W, em dash and em quad eighteen units.'[373] The W of for instance Monotype Poliphilus is much wider than the M.

Moxon mentions in *Mechanick Exercises* the 'm Quadrat': '[…] by m thick is meant m Quadrat thick; which is just so thick as the Body is high […]' and mentions n Quadrat as '[…] half as thick as the body is high […].'[374] In *The history and art of printing* from 1771, m and n quadrats and related variants as 'Three to an m' and 'five to an m' are described as blanks used for indenting and spacing.[375] In *An introduction to the study of bibliography* from 1814, the function of the m and n quadrats is described accordingly and further as 'the square of the letter to whatever fount it belong […] n quadrat, is half that size.'[376] Later terms for aforenamed space units are 'em quad' or 'mutton' and 'en quad' or 'nut' space.

For a complete control of the justification of lines, the widths of all characters have to be a multiplication of a standardised unit, like in the Monotype system. This implies that the widths of the spaces should also be part of the same unit

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[372] *The Monotype System* (Philadelphia: Lanston Monotype Machine Company, 1912), p.22.

[373] R.C. Elliot, 'The "Monotype" from infancy to maturity' *the Monotype Recorder*, No. 243 Vol. XXXI (London: The Monotype Corporation Ltd., 1931), pp.21,24.

[374] Moxon, *Mechanick Exercises*, p.103.

[375] P. Luckombe, *The History and Art of Printing* (London: J. Johnson, 1771), p.278.

[376] Thomas Hartwell Horne, *An Introduction to the Study of Bibliography* (London: T. Cadell and W. Davies, 1814), p.265.

arrangement system: 'Monotype justification is perfection; the spacing is mathematically accurate and the length of line exact; hand justification can never be perfect [...].'[377] However, one can accomplish the same control by applying a unit arrangement system on foundry type, such as cadence-units.

If m and n stood and today em and en stand for the full and half size of the body respectively, where does the term originally come from? In Monotype fonts the M is not always the widest letter, but in Moxon's engraving in which he '[...] exhibited to the World the true Shape of Christophel Van Dijcks [...] Letters [...]'[378] the width of the capital M equalizes the height of the body. The N, however, has not been drawn on half the width of the M. Moxon notes '[...] that some few among the Capitals are more than m thick [...]' and he lists Æ, Œ, Q '[...] and most of the Swash Letters [...]'[379] as examples.

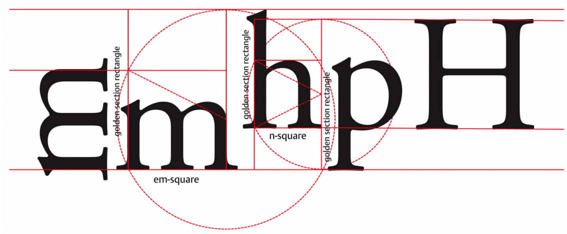

Figure A6.2 Framework for Renaissance type applied on Adobe Garamond.

If the size of the (e)m-square is based on the width of the capital M, why is it not labelled 'M-square' or 'EM-square' by Moxon and the other aforenamed authors? Is it possible that the terms 'm' or 'em' have a different historical background?
A hypothesis: let us assume for a moment that the origin of the (e)m-square lies in the lowercase m. The relation with the n-square seems to make more sense then, because the width of the capital N is never half the width of the M. As stated above, the proportions of the m (and the n) seem to have been the measure of all –or at least many– things in Renaissance type and in addition, Fournier used the M and m as references for the design of all other letters. Figure A6.2 shows an em and en-based framework for Adobe Garamond, which is based on Garamont's Parangon Romain. This framework is discussed in Section 7.3.

[377] *The Monotype System*, p.30.
[378] Moxon, *Mechanick Exercises*, p.124.
[379] Ibid. p.104.

A6.3 Grids

'Ever since the sixteenth century, elaborate diagrams have been published to show how letters should be drawn [...]. Generally a diagram of minute squares was first made, and on this the design and dimension of each letter was determined', according to Updike in *Printing Types*.[380] The application of grids for constructing letter shapes can be found in instruction books on calligraphy and lettering, as Fournier in his *Manuel Typographique* from 1764–1766 states:

> Several scholars and artists, such as Lucas Pacioli, Albert Dürer, J.B. Palatino, Pierre le Bé, the writing master, and many others have left various treatises upon the formation and shape of letters with an eye to the perfection of the art of writing rather than that of typography.[381]

When it comes to punchcutting, the patterns for the construction of a new series of types for exclusive use by the Imprimerie Royale, and which were developed by the Académie des Sciences in eighteenth-century France, are generally considered a unique case. Updike writes about this:

> [...] every Roman capital was to be designed on a framework of 2304 little squares. Grandjean, the first type-cutter who attempted to follow them, is said to have observed sarcastically, that he should certainly accept Jaugeon's dictum that "the eye is the sovereign ruler of taste" and accepting this, should throw the rest of his rules overboard![382]

The Romain du Roi is merely treated as an isolated attempt to regularize and standardise type, and is often disliked. For instance Smeijers notes in *Counterpunch*: 'The best known case of the separation of design from execution is the 'romain du roi'. Here in France at the end of the seventeenth century, intellectual reason struggled in a dialogue with practice and human limitations.'[383] Kapr writes in *The Art of Lettering*:

> A commission was appointed in 1692 to fix the proportions of the romain du roi. Under the chairmanship of the Abbé Nicolas Jaugeon, it went even further in determining the design of typefaces by mathematical rules and diagrams. We need not overrate all these attempts, for artistic success is scarcely achieved through geometric or scientific means.[384]

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[380] Updike, *Printing Types*, Vol.1, p.7.

[381] Carter, *Fournier on Typefounding*, p.4.

[382] Updike, *Printing Types*, Vol.1, p.7.

[383] Smeijers, *Counterpunch*, p.70.

[384] Kapr, *The Art of Lettering*, p.300.

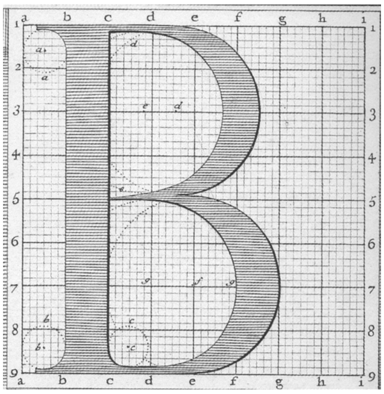

Figure A6.2 For the Romain du Roi a refined grid was defined.

The grid of 2304 little squares for the Romain du Roi (Figure A6.2) was perhaps not as unique as many authors on type want us to believe. The relation between the lowercase letterforms in Moxon's engravings and the plates for the Romain du Roi can be coincidental, but it seems that the Académie des Sciences thoroughly researched publications on type. This makes it is quite possible that Moxon's *Mechanick Exercises* was consulted as well.

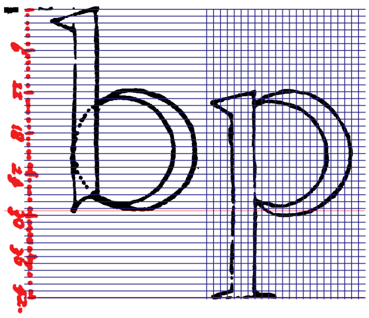

Figure A6.3 Moxon's 42-units grid from *Mechanick Exercises* actually drawn.

Moxon actually shows in his plates a 42-unit grid (Figure A6.3) and this results in a framework of 1764 units, which is also a large number. Moxon remarks on the origin of the grid:

> We shall imagine (for in Practice it cannot well be perform'd, unless in very large Bodies) that the Length of the whole Body is divided into forty and two equal Parts.', and: 'It may indeed be thought impossible to divide a Body into seven equal Parts, and much more difficult to divide each of those seven equal parts into six equal Parts, which are Forty two, […], especially if the Body be but small; but yet it is possible with curious Working […].[385] [386]

[385] Moxon, *Mechanick Exercises*, p.91.
[386] Ibid. p.92.

Just like Moxon, Fournier divided the body into seven parts, but apparently without the subdivision that Moxon mentions: 'I divide the body of the letter which I am to cut into seven equal parts, three for the short, five for the ascending and descending, and seven or the whole for the long letters.'[387]

One wonders why Moxon's grid seems to be overlooked in literature; is it because he did not actually draw the grid lines, like I have done in Figure A6.3? Could it be that the conclusion of Robin Kinross (1949), a British publisher and author on typography, in *Modern Typography* (2004) that the Romain du Roi can be seen as an innocent anticipation of the conditions of type design and text composition in the later twentieth century is incorrect and that unitisations derived from older processes were adapted for the Romain du Roi?[388]

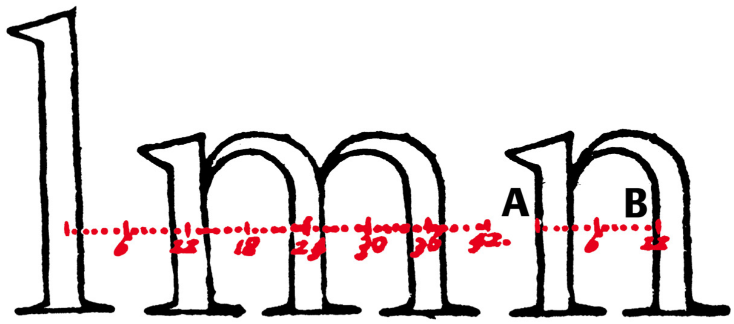

Figure A6.4 Moxon's division into 42 units positioned on the stem-interval.

Moxon's grid does not seem to have been arbitrary; the size of the units can be distilled from the stem interval (Figure A6.4) and hence the units are what I baptised 'cadence units'. Moxon was not trained as punchcutter or caster: 'He himself said that he had never been properly taught the art of type-founding, but had taken it up solely through his interest in the subject—as was the case with many celebrated type-cutters before and since.'[389] This fact suggests that it is not unlikely that Moxon got the idea for his grid from other sources. It is for instance not difficult to define a 42 (square) cadence-units grid for Van den Keere's Gros Canon, of which the lowercase dates from 1573 (Figure A6.5).

[387] Carter, *Fournier on Typefounding*, p.23.
[388] Robin Kinross, *Modern Typography* (London: Hyphen Press, 2004), p.26.
[389] Updike, *Printing types*, Vol.1, p.9.

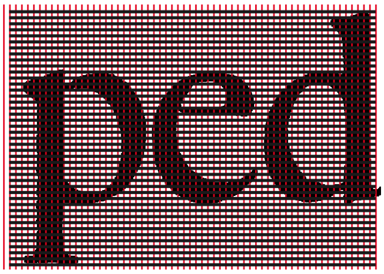

Figure A6.5 Van den Keere's Gros Canon on a 42 cadence-units grid.

A horizontal grid of cadence units for the textura type from Gutenberg's 42-line bible (Figure A6.6), can also be used in the vertical direction (Figure A6.7) and this raises the question of whether grids were not already applied at the cradle of typography.

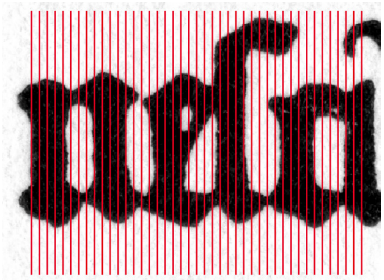

Figure A6.6 Refined cadence-units grid applied on Gutenberg's textura type from his 42-line bible.

Van den Keere's Gros Canon and Gutenberg's textura are both large types, so technically the application of a relatively refined grid should have been possible – taking into account Moxon's consideration that with 'curious Working' the application of a refined grid should be possible on relatively large bodies.

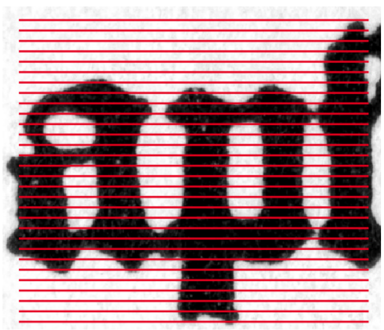

Figure A6.7 The cadence units grid from Figure A6.5 applied in vertical direction.

A6.4 Artificial units

The division into a grid based on the width of the n into 36 units and resulting in an m-square of 48 units at first sight resembles the unit arrangement systems used by Monotype for their hot metal (18 units), photo (48 units) and laser composing (96 units) machines. However the size of the cadence-units is only related to the typeface, whereas for instance the Monotype units were always part of a standardised system, despite the differences of 'set' width:

> Mr. Lanston's early conception of a machine-composed fount was that of characters being designed to some definite thickness, multiples of a thinnest unit dimension. This was essential, as he had, by means of his proposed mechanism, to register the unit-thickness of every character composed, so that all complete lines should contain the same total number of "units". […] Thus was established the unit and em of a one-point "Monotype" fount, and the unit of all larger sizes was to be a multiple of the unit of the one-point fount.[390]

This unit was 1/18 of 1 pica point (1 set), which is 0,0007716 of an inch, which could in turn be subdivided into quarters. The character widths of all other characters in a font were translated into the closest range of units. This adapting process was restricted by the maximum of fifteen rows in a matrix case, each row containing characters of the same number of units, which inevitably resulted in the redrawing of some of the characters. Therefore, this standardisation came with a price:

> In comparing fonts cast according to the old system of irregular sets and those cast on the point-set system, we find that the older font had more than ninety different sets, while the latter has but from thirty to twenty. Something suffers when ninety different adjustments are reduced to from thirteen to twenty […].[391]

It is not impossible that Renaissance punchcutters applied unit-arrangement systems on their type. There are no records from that period that prove this and I had to distil the evidence from historic type and matrices. However, there are records that prove that a unit arrangement system was already being applied on type before the development of the hot metal machines in the second half of the nineteenth century. In Vienna in 1840 a test was made with a unit arrangement system developed by Alois Auer. All the characters of a foundry type were placed on eight, twelve or sixteen units. The purpose of this system was to make the justification of text easier. Because of the restrictions for the type design and the questionable time savings, the project was eventually abandoned.[392] The idea was applied on the hot metal machine type in following decades.

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390 Elliot, 'The "Monotype" from Infancy to Maturity', pp.21,24.

391 Updike, *Printing types*, Vol.1, p.35.

392 Willi Mengel, *Die Linotype erreichte das Ziel* (Berlin/Frankfurt: Linotype GmBH, 1955), p.37.

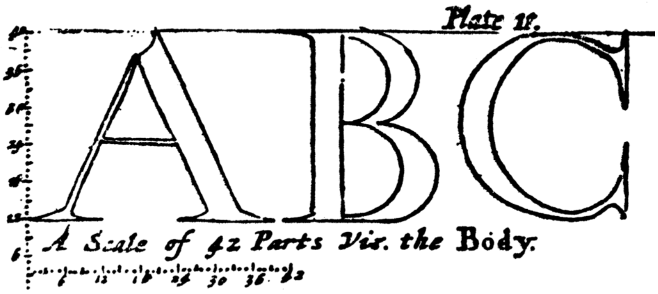


Figure A6.8 Moxon's divison of the 'm Quadrat into 42 units.

Moxon shows in *Mechanick Exercises* a proprietary unit arrangement system in which the em-square was divided into 42 units (Figure A6.8). His previously mentioned engraving of the 'true Shape' of Christoffel van Dijk's letters shows this division on an em that measures an inch. In his notes to the 1896 facsimile of *Mechanick Exercises*, Theodore De Vinne comments on Moxon's measuring rules:

> These nicer subdivisions had to be determined and marked by himself on measuring-rules of his own construction, and he must have done this work very well. To divide the body of English in forty-two equal parts is to make each part equal to about 46/10000 of an inch. One forty-second part of long-primer body would make each part about 33/10000 of an inch.

De Vinne proceeds to mention the division by Moxon of the 'em quadrat' into seven thin spaces: 'The full point or period was one and one sixth of this thin space; the colon, one and two sixths; the comma, one and three sixths; the hyphen, one and four sixths; the semicolon, one and five sixths.'[393]

A6.8 Unitisation and design

There is no documentation about how handwriting was transformed into type by the Renaissance punchcutters. It is not unlikely that there was to some extent an exchange of knowledge between Renaissance calligraphers and punchcutters. The production of type has always been a technically challenging matter, because characters have to be adapted to limitations of the medium. That was the case for movable type, for which originally freely-written characters had to be squeezed into rectangles. More than four centuries later that was also the case for the Monotype 'hot-metal' machines, for which characters had to placed on a limited number of widths, due to the unit-arrangement system.

[393] Joseph Moxon *Mechanick Exercises: or the Doctrine of Handy-Works Applied to the Art of Printing*, ed. Theodore Low De Vinne, (New York: The Typothetæ of the City of New York, 1896), pp.413,414.

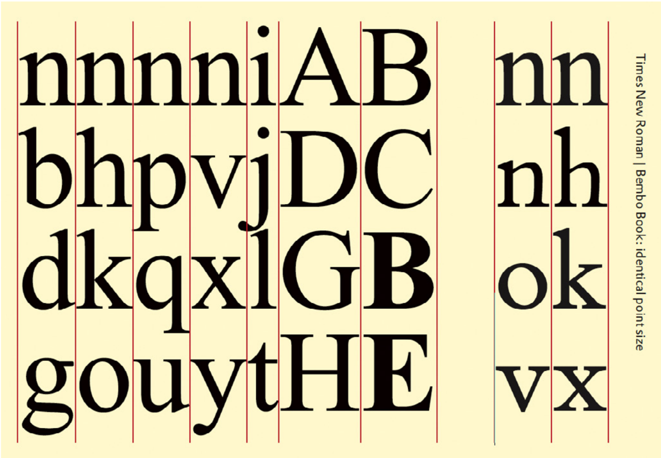


Figure A6.9 Hot-metal standardisation in digital versions of Times New Roman and Bembo Book.

The unitisation of characters for the Monotype 'hot-metal' composing machines was a clear deviation from the nineteenth-century foundry practice, but obviously did not have a notable negative effect on the quality of the designs. In fact, the majority of the fonts produced at the Monotype Works under supervision of the American engineer and type designer Frank Hinman Pierpoint (1860–1937) and with the guidance of Morison in the first half of the twentieth century have always been considered excellent. Pierpoint has been praised for his technical merits and Monotype's Type Drawing Office (TDO) was obviously capable to satisfactorily adapt the designs to the limited widths. Even today the Monotype fonts show their limited widths in digital format (Figure A6.9). The exact number of units depended on the layout of the matrix case, but most likely the range for the top row of Figure A6.9 must have looked like this: n on 10, I on 5, A on 14, and B on 12 units. That this adaptation did not lead to distorted designs could be explained by the fact that similar standardisations were part of the early Renaissance font production.

Monotype's 18-unit arrangement system was applied after the type design was made. A layout was chosen that would require minimal adaptations of the design. In the case of the typefaces from the always highly critical Van Krimpen, Monotype's TDO went to considerable lengths to adjust these. But this inevitably required compromises and in his *Memorandum* to Monotype Van Krimpen described the problems that accompanied this kind of production. He declared himself in favour of designing a typeface directly within a unit arrangement system, but with the proviso that no designer should try to make a design on an existing unit arrangement that does not correspond with his own particular rhythm.[394]

[394] Jan van Krimpen, 'Memorandum', *The Monotype Recorder*, New series/Volume 9 ('s-Hertogenbosch: Dutch Type Library, 1996), p.8.

APPENDIX 7: GEOMETRY IN THE RENAISSANCE

A7.1 Introduction

This appendix is supplemental to the Chapter 7 and is referred to in Section 2.7. It provides additional information about the systematisation by the early punchcutters. The required standardisation for the Renaissance type production in addition to the fact that geometry was used by scholars and artists makes it plausible that the early punchcutters used frameworks like the golden section-based em-square.

A7.2 Theory and practice

In the Quattrocento there was a growing interest in (ancient Greek) geometry. Euclid's description of the golden ratio in his *Elements* is the oldest one known. Euclid's *Elements* was copied in Greek (Figure A7.1) during the Carolingian Renaissance and has been of influence ever since.

Figure A7.1 Ninth-century copy of Euclid's *Elements* in Greek.[395]

[395] <https://www.ibiblio.org/expo/vatican.exhibit/exhibit/d-mathematics/images/math01.jpg>

In Euclid's *Elements* (ca.300 BC) the construction of a golden section rectangle (Figure A7.2) –although not named as such– is explained as follows:

> Let AB be the given straight line. It is required to cut AB so that the rectangle contained by the whole and one of the segments equals the square on the remaining segment.
>
> Describe the square ABDC on AB. Bisect AC at the point E, and join BE. Draw CA through to F, and make EF equal to BE. Describe the square FH on AF, and draw GH through to K. I say that AB has been cut at H so that the rectangle AB by BH equals the square on AH. Since the straight line AC has been bisected at E, and FA is added to it, the rectangle CF by FA together with the square on AE equals the square on EF. But EF equals EB, therefore the rectangle CF by FA together with the square on AE equals the square on EB. But the sum of the squares on BA and AE equals the square on EB, for the angle at A is right, therefore the rectangle CF by FA together with the square on AE equals the sum of the squares on BA and AE. Subtract the square on AE from each.
>
> Therefore the remaining rectangle CF by FA equals the square on AB. Now the rectangle CF by FA is FK, for AF equals FG, and the square on AB is AD, therefore FK equals AD. Subtract AK from each. Therefore FH, which remains, equals HD. And HD is the rectangle AB by BH, for AB equals BD, and FH is the square on AH, therefore the rectangle AB by BH equals the square on HA. Therefore the given straight line AB has been cut at H so that the rectangle AB by BH equals the square on HA.[396]

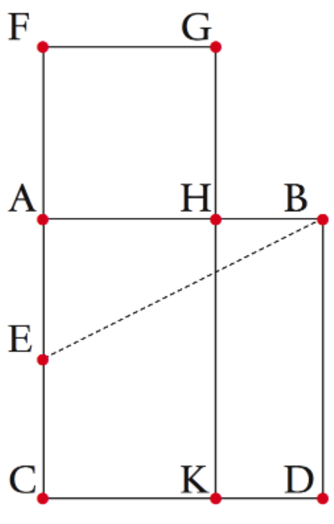


Figure A7.2 Euclid's 'golden-section' rectangle.

Euclid's description of the quadrature of the circle found its application, for example, in the 'Vitruvian man' by Leonardo da Vinci: 'No doubt that a central part of the holy

[396] <http://alepho.clarku.edu/~djoyce/java/elements/bookII/propII11.html>

science of Vitruvius in the Renaissance times derived from Euclid, in the concept of the square inscribed in a circle and the circle inscribed in the square.'[397]

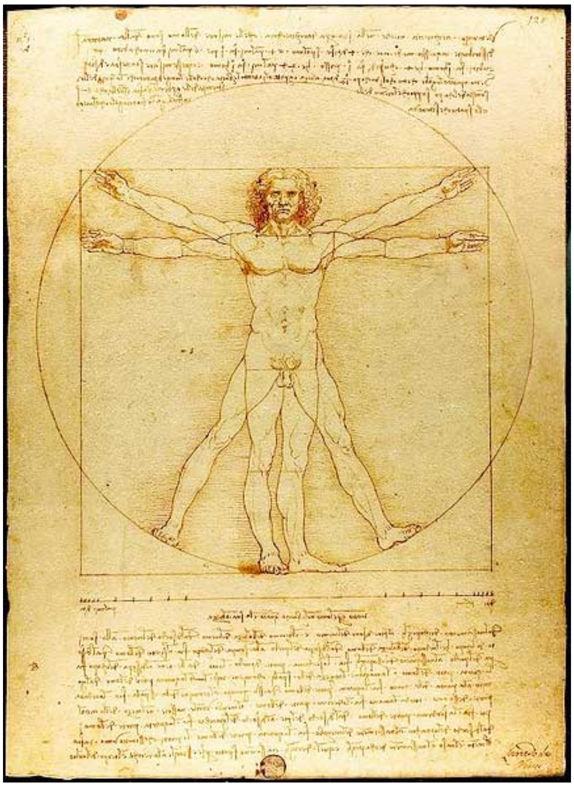


Figure A.7.3 Leonardo da Vinci's 'Vitruvian man'.

One should note here that the famous 'Vitruvian man' drawing (Figure A7.3), which Leonardo da Vinci created around 1487, is often associated with the golden ratio. However, bisecting the rectangle both vertically and horizontally through the navel of the 'Vitruvian man', results in four rectangles and the height of the two lower rectangles is 1 to 0.656 of the two top rectangles. The totalling 1.656 is not the expected 1.618, which means that the outcome is close, but not close enough to consider a deliberate application of the golden section here by Da Vinci.[398]

Vitruvius's ideas about the proportions of the human body found their application in the Renaissance reconstruction of Roman imperial capitals:

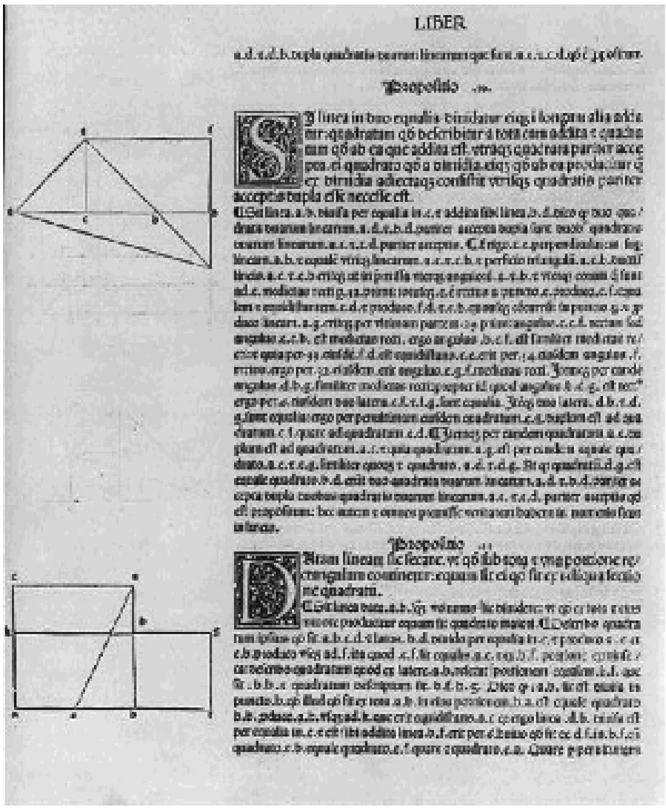
> Tory followed the Vitruvius-Leonardo line of thought in relating the human figure to the square and inscribed circle. […] Tory not only attempted to relate ancient capital letters with Vitruvius but threw in generous portions of classical mythology and any other idea that came to hand'.[399]

[397] Anderson, 'Cresci and His Alphabets', p.337.

[398] <http://www.world-mysteries.com/sci_17_vm.htm>

[399] Anderson, 'Cresci and His Alphabets', pp. 331–352 (p.343).

Morison described Geoffroy Tory's attempts in the *Champs-Fleury* (1529) as 'cabalistic abracadabra'.[400] Besides on Vitruvius and the Kabbalah, Tory's reconstructions of the capitals were based on squares and circles, like the ones made by his predecessors: 'He habitually uses the Compass and the Rule because he is convinced that they are the King and Queen respectively of instruments.'[401]


LIBER

Propositio

Figure A7.4 Page from the Latin translation of *Elements,* published by Ratdolt in 1482.

A printed edition of Euclid's *Elements* was published during the Renaissance. Erhardus Ratdolt (1442–1528) was a German printer working in Venice from 1476 to 1486. In May of 1482, he published the first printed edition of *Elements, Euclid Liber Elementorum in Artem Geometrie* (Figure A7.4). Its contents were based on the medieval translation of the work from Greek to Latin by Campanus (circa 1220–1296).[402]

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400 Morison, *Pacioli's Classic Roman Alphabet,* p.24.

401 Ibid., p.25.

402 <http://www.maa.org/publications/periodicals/convergence/mathematical-treasure-ratdolts-euclids-ielementsi>

A7.3 Geometry and type

Is it really conceivable that the early punchcutters, who were engravers or goldsmiths by origin, only used their eyes in a profession that requires standardisation? Why would they ignore conventions, such as the golden section, that were applied everywhere else in the Renaissance world of arts? Was it because of technical limitations, or did Jenson, Griffo, Garamont, and Granjon have such trained eyes that they applied 'divine' proportions almost instinctively? The measurements I made of the Renaissance matrices and foundry type at the Museum Plantin-Moretus seem to contradict the idea that technical limitations played a role, and the models I applied and which are presented in Chapter 7, seem to refute the 'rely on the eye' dogma.

'Since this [Geometry] is in very truth the foundation of the whole graphic art, it seems to me a good thing to set down for studious beginners a few rudiments', writes Albrecht Dürer in the third book of his *Underweysung der Messung mit dem Zirckel und Richtscheyt* from 1525, which also focuses on the shapes of letters. Dürer's attempt did not stand on its own, but was part of a development that found its origin in the Italian Renaissance:

> A new form of didactic and theoretical writing appeared in the early Renaissance: treatises on the design of the alphabet, which is to say, of course, the roman alphabet. The first of these texts known to us was written by none other than Felice Feliciano, a friend of the painter Andrea Mantegna who recorded the chief events in a famous archeological trip they made together to the Lago di Garda. Feliciano's treatise on the alphabet was followed by similar "trattati delle lettere antiche", one by Damiano Moille, printed at Parma ca. 1480, another by Luca Pacioli, printed in Venice in 1509, and still another by Sigismondo de' Fanti, printed in Venice in 1514. This species of literature was then adopted north of the Alps, appearing first as a section of Dürer's Underweysung der Messung, printed in 1525.[403]

The geometric descriptions of letters by the Renaissance artists and scholars were not a novelty. In an article on the revival of the Roman capital letter Giovanni Mardersteig mentions the existence of '[…] patterns for writing and for making gothic initials', which 'were set to one side at the introduction of the humanistic script and the spread of roman inscriptional capitals.'[404] The earliest specimen that he knows of can be found in the collection of the Bibliotheca Comunale of Mantua: '[…] Each initial is drawn in a large square divided into 16 smaller squares. The four central

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[403] Millard Meiss, 'The First Alphabetical Treatises in the Renaissance', *Visible Language,* Volume III, Number I (Cleveland: the Journal 1969), pp.3–30 (p.3).

[404] Giovanni Mardersteig, 'Alberti and the Revival of the Roman Letter', *Typography Papers 6* (London: Hyphen Press, 2005), pp.49-65 (p.58).

squares contain the design for the letter. Its construction is made with the assistance of many circles and segments'.[405]

Feliciano's aforementioned treatise on the alphabet mentioned is *Alphabetum Romanum* from around 1463, in which he put the emphasis on the theoretical side without becoming too dogmatic: 'Although Feliciano's concern with proportion and geometry is essentially theoretical, it is occasionally bound up with practical and didactic purposes. […] Geometry had, however, only a proximate meaning. Feliciano, for instance, preferred a narrow H and he produced it, even though it does not come near to filling the square with which he began.'[406] Feliciano's publication preceded Jenson's roman type and Moille's *Trattati delle lettere antich* also preceded the type Griffo made for the *Hypnerotomachia Poliphili* and *De Aetna*. The other previously listed books on reconstructions of the Roman imperial capitals are from a later date, but they were all the result of the Renaissance interest in geometry, which in my opinion can hardly have been unnoticed by the punchcutters of that time. The geometric reconstructions of the 'em' and 'en' squares I present in chapter 7 support this theory.

The attempts to capture the construction of the Roman imperial capitals with ruler and compass were followed in history by many others, including Giovan Francesco Cresci, Luca Orfei, Marc' Antonio Rossi, Cesare Domenichi, Leopardo Antonozzi and Frabrizio Badesio.[407] A contemporary of Dürer was Johann Neudörffer (1497–1563), who was a calligrapher and mathematician, and who showed relatively complex construction methods for Roman imperial capitals in his book *Gründlicher Bericht der alten lateinischen Buchstaben; Handschrift unter Benützung van Schablonen* (ca.1538).[408]

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[405] Ibid., p.58.

[406] Meiss, op. cit., p.15.

[407] James Mosley, 'Giovan Francesco Cresci and the Baroque Letter in Rome', *Typography Papers 6* (London: Hyphen Press, 2005), pp.115–155 (p.145).

[408] Werner Doede, *Schön schreiben, eine Kunst: Johann Neudörffer und die Kalligraphie des Barock* (München: Prestel Verlag, 1988), pp.48–50.

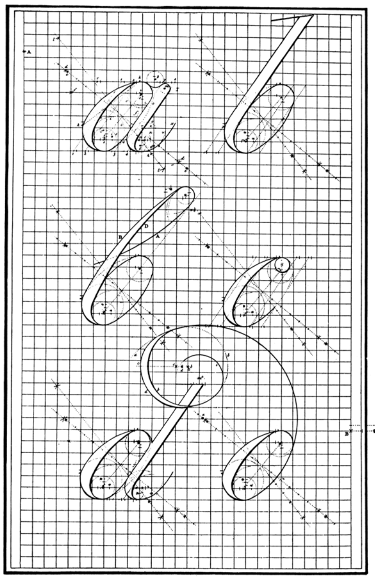

Figure A7.5 Plate from *Mathematische of Wiskundige behandeling der Schrijfkunst, […]* (1773).[409]

Later in history, geometry was also used to (re-)construct letterforms and these attempts were not restricted to the Roman imperial capitals. Mathematical constructions can be found in eighteenth- and nineteenth-century instruction books for calligraphy, such as, for instance, the Dutch publication *Mathematische of Wiskundige behandeling der Schrijfkunst, […] by Jan Pas* from 1773 (Figure A7.5). These geometric rules were criticized, like in *Handleiding tot de Schrijfkunst* ('Manual for the Art of Writing') from 1830 in which the need for perfect uniformity in writing by different people is questioned.[410]

A7.4 Geometry and quality

In *Mechanick Exercises on the Whole Art of Printing* Moxon complains about the fact that there were no quality rules for type designs: '[…] neither the Ancients whom we received the knowledge of these letters from, nor any other authentick Authority have delivered us Rules […].'[411] Moxon developed with a sort of standard for judging the quality of type:

[409] M.R. Groenewege and W.C. de Man, *Schrift Schrijven Schrijfonderwijs: Handleiding voor aanstaande onderwijzers* (Leiden: Spruyt, Van Mantgen & De Does, 1975), p.20.

[410] p.3: 'Het is waar, indien niet iedere trek eener letter zich naar eenen Meetkundige vasten regel schikt, kan men nimmer tusschen verschillende schrijvers eene volmaakte gelijkvormigheid in de zamenstelling hunner letters verwachten. Doch waartoe is ook juist eene naauwgezette gelijkvormigheid in dezen zin noodig?'

[411] Moxon, *Mechanick Exercises*, p.21.

> [. . .] we must conclude that the *Romain Letters* were Originally invented and contrived to be made and consist of Circles, Arches of Circles, and straight Lines; and therefore those *Letters* that have these figures; either entire, or else properly mixt, so as the Course and Progress of the Pen may best admit, may deserve the name of true Shape, rather than those that have not. Besides, Since the late made *Dutch-Letters* are so generally, and indeed most deservedly accounted the best, as for their Shape, consisting so exactly of Mathematical Regular figures as aforesaid, [. . .] therefore I think we may account the rules they were made by, to be the Rules of true shap'd *Letters*.[412]

In *The Alphabet* Frederic W. Goudy quotes the same part from *Mechanick Exercises* and he comments:

> Such an analysis can, at best, only fix and permit the reproduction of the same form at another time; and even then the quality of life and freedom in the original will be in large part lost in reproduction. The mere blending together of geometrical elements common to all letter forms, good or bad, is not enough; 'true shape' is something more subtle than geometry'.[413]

In line with this statement Goudy does not seem to have used any geometric reconstructions for his rendition of the Trajan capitals, known as Goudy Trajan.

A7.5 Divine proportion

The attempts to capture the construction and proportions of the inscribed Roman imperial capitals from the first century into geometric models were made by artists, scholars, and calligraphers. For instance Dürer (1471–1528) was an artist; Fra Luca de Pacioli (1446/7–1517), who published a section on the 'true' shapes and proportions of classical Roman letters in his *De Divina Proportione* from 1509, was a mathematical scholar; and Giambattista Palatino, who was a calligrapher, also made geometric representations of the Roman imperial capitals: 'All these are faithful versions of the letters that symbolized the authority of Augustus and Trajan' writes Morison in *Letter Forms.*[414]

The geometric descriptions of the Roman imperial capitals were relatively crude. According to Catich the geometric approach was a mistake by definition:

> There were even attempts to contrive foolproof geometric formulae for letter making by Fleury, Tory, Moille, Serlio, de' Fanti, Ruano, Dürer, and others– schemes which today are, at most, of interest to typographic

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[412] Ibid., pp.22,23.

[413] Goudy, *The Alphabet*, p.31.

[414] Morison, *Letter Forms*, p.156.

> researchers and calligraphic historians. […] Had there been a vital practice of brush writing in the Renaissance surely these gifted artist-authors would not have submitted such compass-and-square lettering schemes.[415]

However, modern research on the Roman imperial capitals by Richard Grasby and Tom Perkins show complex construction methods (possibly) applied by the Romans on their imperial capitals, such as different root rectangles, golden section rectangles and extended variants of these.[416] The proportions of, for example, capitals like B, E, F and P generally don't seem to be based on split squares anymore, as is shown in the work of the Renaissance researchers, but on root-five rectangles, and the squares are subsequently replaced by doubled root-five rectangles. Perkins emphasizes that the Roman stone carvers were probably more versatile than the approaches from the Renaissance suggest: 'It is quite different from Renaissance theories of constructed classical letters where the rulers and compasses are allowed to dictate every detail of the finished form leading to over-elaborate schemes far removed from any practical application.'[417]

Pacioli's mainstrokes had a thickness of one ninths of the square. The mentioned crudeness of the illustrations probably explains the deviation. Feliciano, Dürer and Tory dictated one tenth of the square, but according to Morison the difference between one-ninth and one-tenth of a square '[…] does not affect the essentials of the design […].'[418] Grasby measured a larger range: 'The ratio 1:10, one stem width to ten of height, is commonly found in capitals from the Augustan period, but ratios of 1:8 and 1:12 are also used.'[419] The 1:10 ratio goes back to Marcus Vitruvius Pollo:

> The Roman engineer-architect […] stated the geometric and numerical canon that "man's anatomical proportions are reducible to the ratio 1 to 10, the circle, and square." In the Renaissance, Felice Feliciano, one of the first "circle-and-square" calligraphers who influenced subsequent letter design, extended this Vitruvian canon […] to capital roman letters.[420]

The geometric translation of the letter shapes and proportions was not followed by everyone; the renowned calligrapher Giovan Francesco Cresci included Roman imperial capitals in his first writing book *Essemplare di pìu sorti lettere* in 1560 and 'he made it clear that it was drawn freehand, without the underlying and (in his view)

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415 Catich, *The Origin of the Serif*, p.270.

416 Tom Perkins, 'The Geometry of Roman lettering', *Font* (Ditchling: Ditchling Museum & the Edward Johnston Foundation, 2000), pp.35–52.

417 Ibid., p.51.

418 Morison, *Pacioli's Classic Roman Alphabet*, p.24.

419 Grasby, *Processes in the Making of Roman Inscriptions*, p.9.

420 Catich, *The Origin of the Serif*, p.112.

restricting geometric construction that had been applied to nearly every alphabet of 'antique' capital letters, manuscript and printed, in Italy since that of Feliciano.'[421] Recent studies however seem to prove that the 'antique capital letters' themselves had a geometric basis: '[…] geometrically constructed and brush-formed letters are found to exist in parallel from the first century onwards […]'[422] and '[…] the structural precision of letter forms derived from a signwriter's brush and their spacing could not be attributed to skills of hand and eye alone […].'[423]

In the professions of the calligrapher and type designer, geometric (re)constructions are also not always welcome in our time. For instance Käch wrote about the geometric reconstructions of the Roman imperial capitals by Feliciano and consorts in *Rhythm and Proportion in Lettering*: 'There began the unhappy measuring of things on the basis of technical science.'[424] In *The Art of Calligraphy* (1980) a page from Ferdinando Ruano's *Sette alphabeti di varie lettere, formati con ragion geometrica* from 1554 has the following caption: '[…] he tried, not very successfully, to give Renaissance hands a geometric basis, for which the cancellaresca is especially unsuited.'[425] The question is whether this acclaimed unsuitedness is really true; if the Humanistic minuscule can be captured in a model, then this should also be possible with the derived italic, from which the cancelleresca was developed: '[…] this increased slope combined with a certain suppleness of form gradually transformed the original plain humanistic cursive into an intricate cursive that was, in terms of currency, comparable with the gothic cursive it had superseded.'[426]

In *Counterpunch* Smeijers comments on the fifteenth-century geometric attempts: 'In the climate of Italian humanism it was possible to come up with strange, super rational creations. […] These letters were rationalized by the geometrical schemes of Felice Feliciano, Luca Pacioli, and others we are familiar with […]. Such schemes tell us more about humanism than they tell us about designing usable letters.'[427]

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421 Mosley, 'Giovan Francesco Cresci and the Baroque Letter in Rome', p.153.

422 Grasby, *Processes in the Making of Roman Inscriptions*, p.3.

423 Ibid., p.5.

424 Walter Käch, *Rhythm and Proportion in Lettering [Rhythmus und Proportion in der Schrift]* (Olten: Otto Walter Ltd., 1956), p.33.

425 Joyce Irene Whalley, *The Art of Calligraphy* (London: Bloomsbury Books, 1980), p.159.

426 Morison, *Letter Forms*, p.143.

427 Smeijers, *Counterpunch*, p.51.

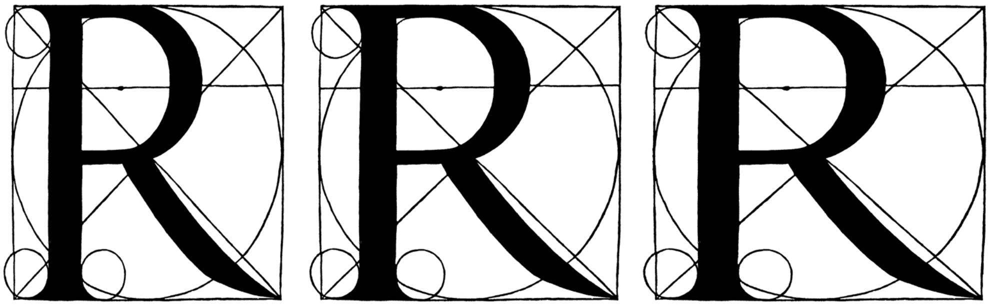

Figure A7.6 Picioli's Roman imperial capital R (centre), flanked by computerized horizontal modifications (90 and 110 percent).

Interestingly, the proportions of the Roman imperial capitals seem to be considered so 'true' that mathematical scholars like Pacioli did not use the square and circle based constructions as a basis for modifications. Although stretching in both directions (condensing and expanding), like I did in Figure A7.6, would have been relatively easy, this was clearly not considered by the scholars. Obviously, geometry was more a way of explaining and reproducing the 'true' and divine classical shapes. Consequently, the outcomes, such as Dürer's capitals, should not be considered type designs.

The fact that Moxon referred to geometry as a sort of standard for the judgment of type does not come as a surprise knowing that he was, besides punchcutter and typefounder, a hydrographer, instrument maker, lexicographer, and printer. Moxon was definitely not an expert on type, as his engravings '[…] to the World the true Shape of Christophel Van Dijcks aforesaid Letters […]' clearly prove.[428] Moxon reproduced the broad nib effect in Van Dijck's letters using two circles different in size, in this way in fact generating a more or less similar effect as the one found in the more elaborate Romain du Roi, which was developed in the following decades (Figure A7.7).

[428] Moxon, *Mechanick Exercises*, pp.124–128.

Figure A7.7 Moxon's engraved interpretation (detail) of Van Dijck's 'true' shapes (top/red) compared with engravings for the Romain du Roi.

A7.6 Golden section/ratio/mean controversy

The golden section/ratio/mean is assumed to be present in many expressions of art, such as fine arts, sculpture, and architecture –either applied deliberately or unconsciously by the artists. Measurements of the dimensions of the Parthenon in Athens, for example, show the influence of the golden rectangle on Greek architecture. The golden ratio can also be found in the works of Renaissance painters like Leonardo da Vinci, Michelangelo, and Rafael. A well-known example of the application of geometry in fine arts is the painting 'The Flagellation of Christ' from ca.1460 (Figure A7.8), which shows an underlying construction based on a root-two rectangle (Figure A7.9).

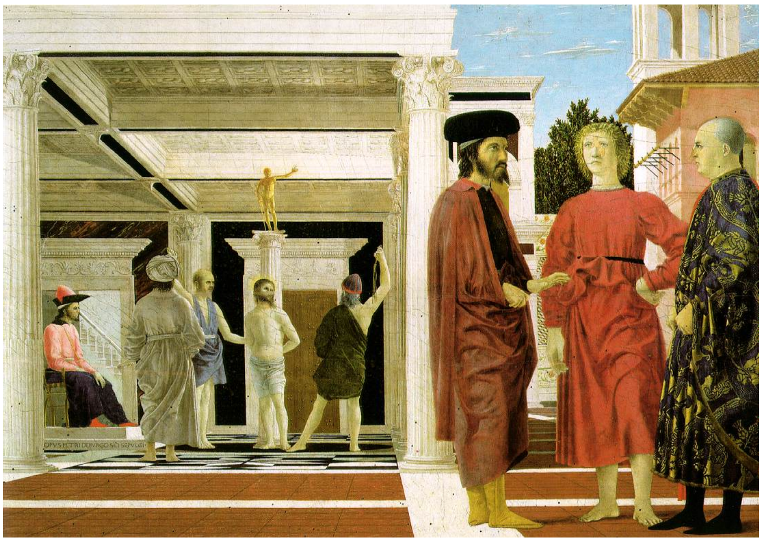

Figure A7.8 Pierro della Francesca's The Flagellation of Christ (ca.1460).

The artist Pierro della Francesca was also a mathematician and geometer, so the application of geometry in 'The Flagellation of Christ' is most likely not a coincidence. The accuracy of the applied geometry in this painting is remarkable: 'This painting has been analyzed to death, and I even have a computer analysis locating the vanishing point to the nearest millimetre [...].'[429]

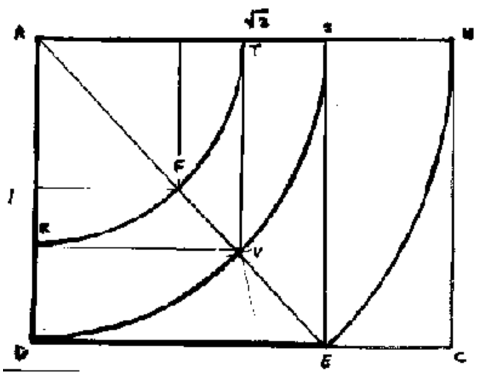

Figure A7.9 Underlying geometry of The Flagellation of Christ, showing a root-two rectangle.

In *The Elements of Typographic Style* Bringhurst dedicates up to six pages to utilizations of the golden section in typography, focusing especially on the sizes of pages and text blocks. And, of course, he describes Fibonacci's related spiral of increase, based on integers which are (after the first two) the sum of the two preceding.[430] The golden rectangle has been applied in incunabula and was used by Pacioli for reconstructing Roman imperial capitals, as mentioned in the previous sections.

The Penguin Dictionary of Art and Artists describes the golden section as follows: '[...] the name given to an irrational proportion, known at least since Euclid, which has often been thought to possess some æsthetic virtue in itself, some hidden harmonic proportion in tune with the universe'.[431] The description ends with 'In practice it works out at about 8:13 and may easily be discovered in most works of art.' The last part of this sentence in particular provides those who question the existence of the golden section in the arts with ammunition.

The golden section may be easily discovered in works of art, but does this provide proof for the argument that the golden ratio has been deliberately applied, or rather for the fact that this ratio can always be distilled one way or another if one is

[429] <http://www.dartmouth.edu/~matc/math5.geometry/unit13/unit13.html>

[430] Bringhurst, *The Elements of Typographic Style*, p.155.

[431] Peter and Linda Murray, *The Penguin Dictionary of Art and Artists* (London: Penguin Books, 1989), p.172.

determined to find it? Huntley mentions the sceptical approach in *The Divine Proportion* and he considers this attitude by some individuals an unfortunate one: 'One of these measured the heights of 65 women and compared the results with heights of their respective navels, obtaining an average of 1.618.'[432] The Vitruvian man may have inspired the focus on the navel (the centre of the circle) in this mockery. Vitruvius's idea that the human body was the principal source of proportion is and was not endorsed by everyone. For example Edmund Burke could not believe that the human figure supplied the architect with any ideas. After ridiculing the posture of the Vitruvian man: '[…] men are very rarely seen in this strained posture; it is not natural to them' he proceeds: '[…] certainly nothing could be more unaccountably whimsical, than for an architect to model his performance by the human figure, since no two things can have less resemblance or analogy […].'[433]

Pacioli applied geometric proportions even on human heads in his *De Divina Proportione* (Figure A7.10).

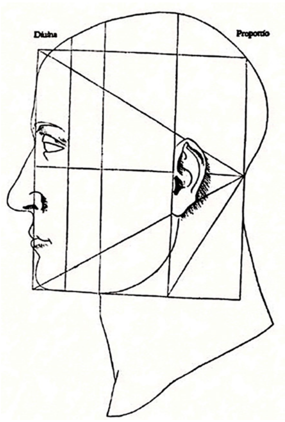

Figure A7.10 Illustration from Pacioli's *De Divina Proportione*, showing geometric proportions projected on a human head.

The golden section seems to be an important factor when it comes to the approval of art, architecture, books or any other objects –including type:

> Curious about the golden section a German psychologist, Gustav Fechner, in the late nineteenth century, investigated the human response to the special æsthetic qualities of the golden section rectangle. Fechner's curiousity was due to the documented evidence of a cross-cultural archetypal æsthetic preference for golden section proportions. Fechner limited his experiment to the man-made world and began by taking measures of thousands of rectangular objects, such as books, boxes,

[432] H.E. Huntley, *The Divine Proportion* (New York: Dover Publications, 1970), p.62.

[433] Edmund Burke, ed. Adam Phillips, *A Philosophical Enquiry into the Origin of our Ideas of the Sublime and Beautiful* (Oxford: Oxford University Press, 2008), p.91.

> buildings, matchbooks, newspapers, etc. He found that the average rectangle ratio was close to a ratio known as the golden section, 1:1.618, and that the majority of people prefer a rectangle whose proportions are close to the golden section. Fechner's thorough yet casual experiments were repeated later in a more scientific manner by Lalo in 1908 and still later by others, and the results were remarkably similar.[434]

But even if one wants to question the deliberate application of the golden ratio in art, the related structures found in for instance paintings, architecture and type can explain why some of the works are considered to be optically appealing. In *The Psychology of Art Appreciation* the author Bjarne Sode Funch mentions a study by Calvin F. Nodine which shows:

> [...] an interesting correspondence between eye movement and the golden section. He compared the pattern of eye movements in work of art with an underlying compositional structure based on the golden section with the eye movements in altered versions of the original works of art where the structure was not ruled by the golden section. He found that seventy-five percent of the subjects preferred the original work of art over the altered versions, and the record of their eye fixations revealed that the arrangement of visual elements directly influences the way a composition is analyzed.[435]

In *Rhythm and Proportion in Lettering* Käch notes that the application of the golden ratio is by definition not an artificial but a natural phenomenon:

> '[...] it must be said that the phenomena of proportion exist in nature without the help of æsthetic research. The artist acts above all emotionally, and when he finds the harmonious effect of the proportion of the golden mean, while correcting his work, he does not take the result as being a scientific perception. For the rhythmic law lives in him, since he too is a part of nature.'[436]

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[434] Kimberly Elam, *Geometry of Design: Studies in Proportion and Composition* (New York: Princeton Architectural Press, 2001), pp.6,7.

[435] Bjarne Sode Funch, *The Psychology of Art Appreciation* (Copenhagen: Museum Tusculanum Press, 1997), p.21.

[436] Käch, *Rhythm and Proportion in Lettering*, p.64.

APPENDIX 8. PROPORTIONS OF CAPITALS IN ROMAN TYPE

A8.1 Introduction

This appendix is supplemental to Chapter 7 and is referred to in Section 7.3. It provides additional information on the relation between the horizontal proportions of the lowercase letters and capitals in Renaissance roman type. Although the letterforms in roman and italic type find their origin in calligraphy, the handwritten letters did not have, nor did they need, the consistency required for the engraving, casting, and setting of letters. For roman type capitals were added and adapted to the lower case that found its origin in the Humanistic minuscule. This required a systematisation of the capitals in line with the standardisation of the lower-case letters.

A8.2 Optical harmony

'Roman capitals, as now made by type-founders, are imitations of the lapidary letters used by the Romans', Theodore Low De Vinne, printer, and author on typography, wrote in *The Practise of Typography* over 100 years ago.[437] 'Roman type consists of two quite different basic parts. The upper case, which does indeed come from Rome, is based on Roman imperial inscriptions', according to Bringhurst in the more recent publication *The Elements of Typographic Style*.[438]

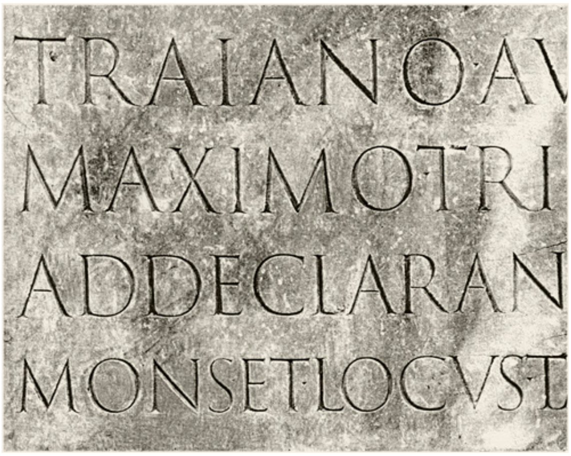

Figure A8.1 Capitalis monumentalis on the Trajan column (AD 113).

[437] De Vinne, *The Practice of Typography*, p.186.
[438] Bringhurst, *The Elements of Typographic Style*, p.124.

These are a generally accepted explanation for the origin of the capitals in roman type, but a comparison of the imperial Roman capitals, like for instance those in the Trajan column (Figure A8.1) with the capitals Jenson made for the type used in *Vitae et Sententiæ Philosophorum* (Figure A8.2), show many differences in proportions and contrast. Jenson's capitals are in general wider and the square-based relations in the Roman inscriptions between small (half-square) letters like B, E, F, L, P and S and square letters like H, N and O, for instance, are not preserved in Renaissance type. The contrast is lower in the archetypes. Jenson clearly did not consider it a good idea to preserve the 'divine' proportions of the Roman imperial capitals and nor, in fact, did Griffo.

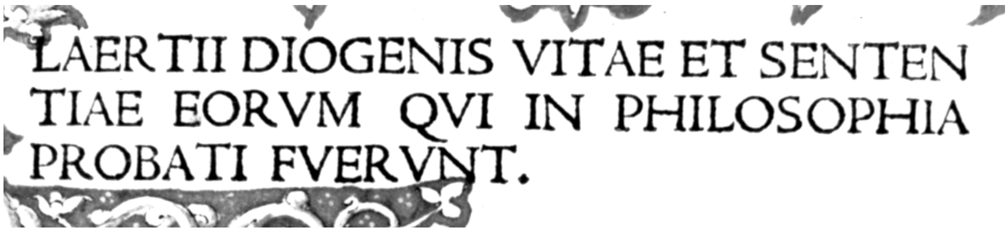

Figure A8.2 Jenson's capitals in *Vitae et Sententiæ Philosophorum* from 1474 (Museum Meermanno col.).

The combination of the capitals with the roman lowercase letters forced Jenson and Griffo to change their proportions accordingly. In addition the fact that the capitals had to be suitable for usage at small point sizes (Jenson's type was around sixteen 'digital' pica points large), forced them to lower the contrast and subsequently to thicken the serifs. The Roman imperial capitals were not developed for typesetting, but for making inscriptions in stone: 'The most conspicuous difference between the lettering derived from the old roman scriptura monumentalis and the uppercase used by present-day printers is the extension of several characters which, according to the classical letter-cutters and their disciples of the Renaissance, occupied half a square', and: 'This was a natural development, for the necessities of architects and sculptors, though analogues, are not identical with those of punch-cutters and printers. Having learned and memorised the true proportions of roman letter as taught in the manuals of Moille, Pacioli and others, the goldsmiths, punchcutters and printers relied on their eyes and not upon their measuring tools.'[439]

Did the goldsmiths, punchcutters, and printers really purely rely on their eyes as Morison suggested, or did they actually use different, regularised, measuring

[439] Morison, *Pacioli's Classic Roman Alphabet*, pp.77,78.

methods, perhaps inspired by the manuals of Moille, Pacioli and others? Morison's statement seems to mystify the qualities required for type design, which are described by Allen Hutt as '[…] some indefinable talent in the best punch-cutters and type designers who aimed and continue to aim at optical harmony.'[440]

According to Morison the proportions of the Renaissance printers' capitals were derived from eighth-century publications:

> Although not always very literally, the bulk of the roman capitals used by fifteenth-century printers derive from titles employed in the books of that earlier Renaissance which Charlemagne had directed in the eight century. Thus, Jenson's capitals are by no means immediately classical; they descend from Caroline models.[441]

But exactly how were these Carolingian capitals, that were 'not always literally' taken, adjusted to the proportions of the roman lowercase by Jenson? The enlarged widths of a couple of the capitals, like B, E, F, K, L, P and S, was explained by Morison as '[…] in order to avoid a contrast between wide and narrow letters', but he provides no clues concerning the measures of things.[442] Catich held the view that the capitals in Latin bookhands had no relation at all to the lapidary capitals of the Romans: 'There seems to be no basis for this assumption. On the contrary it is disproved by the use of thin strokes in the bookhand which do not occur in the monumental letters.'[443]

Goudy points out in *The Alphabet* that although Jenson's '[…] individual forms are in perfect symmetry and accord in combination', 'Jenson had an instinctive sense of exact harmony in types, and he was so intent on legibility that he disregarded conformity to any standard […].'[444] Or did Jenson actually provide the standards for roman type, because it formed the basis '[…] which has been the inspiration for all fine roman types since 1470 […]?'[445]

A8.3 Fence-posting

In *The Psychology of Art Appreciation* Funch refers to Gombrich's claims that the idea of 'the innocent eye' in art is a myth: 'The mind tends to classify and register the seen in terms of what we already know and visual details may be left unnoticed because of

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[440] Hutt, *Fournier*, p.XII.
[441] Morison, *Pacioli's Classic Roman Alphabet*, p.79.
[442] Ibid., p.80.
[443] Catich, *The Origin of the Serif*, p.112.
[444] Goudy, *The Alphabet*, p.77.
[445] Ibid., p.77.

the viewer's lack of knowledge.'[446] One of the visual details that seem to be left unnoticed in the types from the early Renaissance punchcutters is the adjusting of the horizontal proportions of the capitals in roman type to the lowercase. As mentioned in the previous section, Morison's claim that the fifteenth-century printers' capitals were based on Carolingian ones was not accompanied by any information on the adjustment of their proportions.

Figure A8.3 Jenson's capitals horizontally measured using an n-based fence.

Figure A8.3 shows the horizontal proportions of a couple of Jenson's capitals against a rhythmic 'fence' construction of lowercase n's. It looks as if the widths of Jenson's capitals are based on (a repetition of) the width of the n. Morison considered the capitals of Jenson to be too large: '[…] it is in his capitals that Jenson is perhaps most open to criticism; they are too large for the lower case […].'[447] The remaining question is: what are these proportions based on?

Figure A8.4 shows capitals of Adobe Jenson, a fairly faithful rendition (although perhaps somewhat light to accommodate the taste of the twentieth-century typographer) on an n-based fence. Like many other capitals, the C, D, H, and N fit within a doubled n. The B fits within one and a half n, like the E, the F, and the P also, for example, do. The subdivision of the lowercase n in smaller parts may have played a major role in defining the letter spaces too.

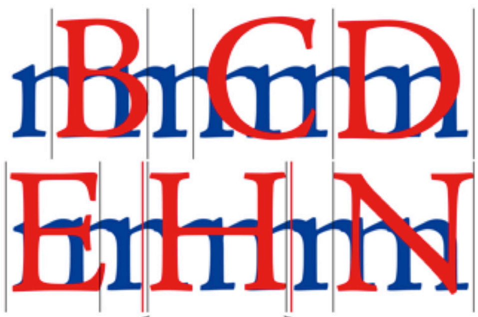

Figure A8.4 Adobe Jenson capitals on an n-based fence.

[446] Funch, *The Psychology of Art Appreciation*, p.82.
[447] Morison, *Type Designs of the Past and Present*, p.19.

Jenson was not the first to cut roman type but he set the standard for quality: 'The general calligraphic scheme of the letter does not differ from that of Da Spira. It is the technical excellence, such as might be expected from an engraver of Jenson's experience, that confers distinction upon his types.'[448] It should be noted that it is not certain that Jenson himself engraved the archetypal roman type model of which he is considered the architect: 'It is not to be assumed as certain that the types of Jenson, either gothic or roman, were cut by his own hand, though he may have brought his own punch-cutter with him.'[449]

If Jenson used n-based proportions, did Griffo follow this scheme? The capitals of Monotype Bembo in Figure A8.5 show the same n-based proportions as the ones in Figure A8.4. The B and C have an identical relation to the n as in Jenson's type, but the H and N deviate somewhat from Jenson's versions, which seems to æsthetically improve the proportions of Griffo's capitals.

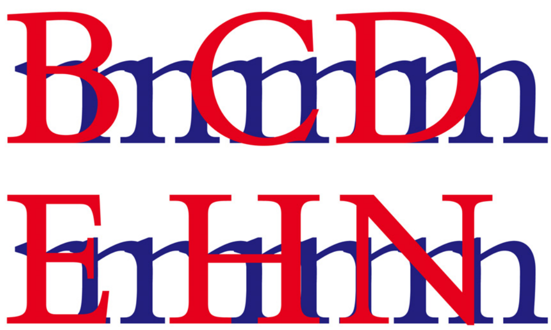

FIGURE A8.5 *Monotype Bembo* capitals on an n-based fence.

The capitals used in the *Hypnerotomachia Poliphili* seem to diverge even more from Jenson's n-based scheme for the capitals. To illustrate this, Monotype's Poliphilus, which is a precise rendition of the historical type, is used in Figure A8.6. Poliphilus was '[…] was recreated, as it stood, from the original […]. The printed letters were one by one reproduced with their outlines as impressed on the paper'[450] in Francesco Colonna's *Hypnerotomachia Poliphili* uit 1499.

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[448] Morison, *Type Designs of the Past and Present*, p.28.

[449] Morison and Day, *The Typographic Book 1450–1935*, p.28.

[450] Morison, *A Tally of Types*, p.54.

Figure A8.6 Monotype Poliphilus capitals on an n-based fence.

The proportions of Garamont's capitals, represented in Figure A8.7 by Garamond Premier, seem to be a mix of the proportions found in Griffo's capitals for the *Hypnerotomachia Poliphili* and *De Aetna*.

Figure A8.7 Capitals of Garamond Premier on an n-based fence.

Because of their different morphology, capitals have their own rhythmic system and hence spacing requirements. For the lowercase the n defines the rhythmic system, while for capitals this is the H. Figure A8.8 shows fence-posting based on the H and the related treatment of the overshoot of the O.

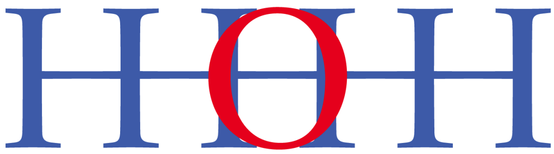


Figure A8.8 Capitals have their own rhythm and hence spacing.

The differences in proportions of the Roman imperial capitals can be explained geometrically using squares and rectangles, something that both Pacioli and Dürer, among others, did, as described in Appendix 7. The adaptation of the capitals to the lowercase of roman type seems to have been influenced by capitals applied in Carolingian books and the proportions of the m. If the standard for the width of the capitals has been defined, the other capitals can be designed within a related rhythm. Figure A8.9 shows a fence of H's using a shift of half the letterform. The other capitals fit in this rhythm and the spacing for the capitals is a direct result of this rhythm; no optical corrections are made.

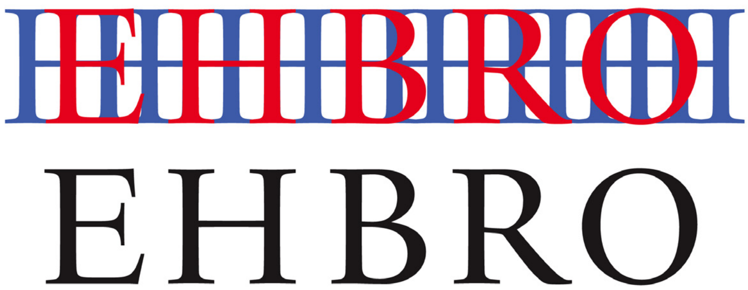


Figure A8.9 Capitals spaced on their rhythmic system.

The capitals Jenson developed for his 'Eusebius' type seem to have been based on the fencing rhythm of the n. Griffo and his followers deviated somewhat from this scheme. Despite the deviation, the spacing of the capitals was in all of these cases based on the stem interval of the lowercase, with which the capitals had to be combined. In roman type capitals are forced in the rhythm of the lowercase (Figure A8.10). After all, there only two cases in foundry type: upper- and lower case: there is not a third case for capitals on adjusted widths. If required, for instance for a capitalized title, the typesetter had to properly space the capitals by eye. This was not different for the 'hot metal' Monotype composing machine or for phototypesetting, although in this case the typographer usually instructed the typesetter. However, in present-day digital type it is possible to put additional information in the fonts for the spacing of capitals relatively to each other.

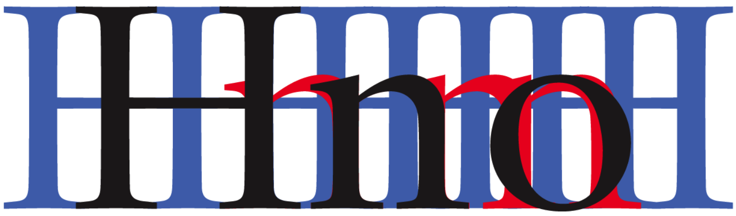


Figure A8.10 In roman type capitals are forced into the rhythmic system of the lowercase.

Figure A8.11 shows a translation of the fence posting rhythm applied on Adobe Jenson into a unit arrangement system. This cadence-unit system is based on the division of the stem interval on the lowercase letter n. The distance from a side bearing to the centre of the letter equals the stem interval. The resulting character width (twice the stem interval) can be divided into smaller units by either bisecting the stem interval or by dividing into in an arbitrary number of units.

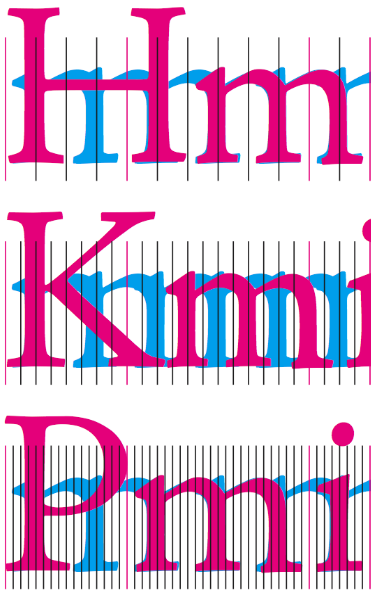


Figure A8.11 Fitting of capitals on n-based spaces.

Please note that in all of these examples digital renditions have been used. However, the initial Italian Renaissance type was made for small point sizes (around sixteen digital pica points) and by definition the deviations in the original printed letters leave some room for interpretation.

APPENDIX 9: SYSTEMS AND MODELS IN TYPE

A9.1 Introduction

This appendix is supplemental to Chapter 4 and is referred to in Section 4.2. It provides additional information on the script-related structures that form the basis of writing and type. To understand the fundamentals of type design all these aspects have to be mapped. This mapping is also a prerequisite for the artificial (re)production of type design processes.

A9.2 Systems and models

The purpose of the systems and models I defined during my research is to map the aspects and elements that together determine the shapes and consistency of the graphemes in use for representing the Latin script, i.e., the letters and characters, and the way they interact. So, the subdivision of scripts into the systems and models, as shown in the diagram in Figure A9.1, is specifically meant to illustrate the Latin script, although (parts of) the subdivision might be applicable for other scripts too. However, this is beyond the scope of my research.

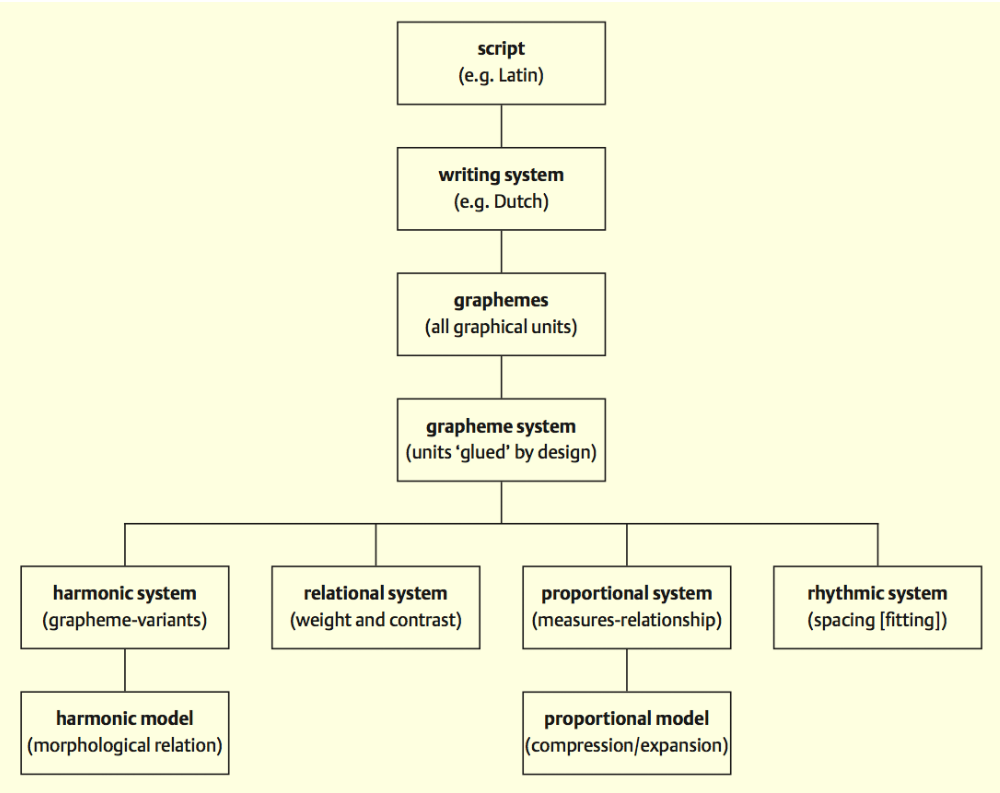


Figure A9.1 Scripts and derived systems and models.

Scripts form the apex of a system that comprises writing systems, graphemes, grapheme systems, harmonic systems (which can be subdivided in harmonic models), relational systems, proportional systems (which can be subdivided in proportional models), and rhythmic systems. Scripts can be related: for example the Cyrillic script shares elements of the Latin and Greek scripts.

Writing system is the orthographic term for a collection of graphemes, and the subsequent rules required to represent one or more (by definition related) languages. Translated into typographic terms, a writing system contains glyphs, which are formalised and fixed (as synonym for incised or engraved) language(s)-specific graphemes.

Graphemes are the units that make up a writing system. They are essentially the graphical equivalents of phonemes, i.e., the basic units of spoken language. Graphemes comprise letters, syllables, characters, numerals, and punctuation marks (of which there are no equivalents in speech). One can consider this collection as a container with all variants of all informal and formal grapheme variants, i.e., grapheme systems, used or in use for a writing system such as for instance capital, uncial, textura, rotunda, Humanistic minuscule, roman type, italic type, fraktur, et cetera.

Graphemes in their written form are by definition modular, because they are the results of the recurrent application of relatively restricted movements made with a certain writing tool. In their typographic form graphemes show the same modularity as a result of the transformation of the handwritten forms to formal variants. The extent to which graphemes form coherent groups depends on how consistent these movements are. For instance some graphemes can be made (unintentionally) smaller or wider than others, which will result to some extent in an obstruction of the rhythm.

Grapheme systems are collections of graphemes which share general constructional aspects. The combined graphemes do not necessarily have to share the same morphological background; they can be 'glued' together by design, i.e., the tweaking of details (see: harmonic models below). The combination of graphemes with different morphologic origins in a grapheme system can for instance be the result of an evolutionary process, but also of the direct interference by scholars, like Alcuin of York's influence on the shaping of the Carolingian minuscule. In the Greek and Latin scripts the core of every grapheme system is formed by the alphabet.

The grapheme systems, either calligraphic or typographic, in use for representing the Latin script since the invention of movable type are capital, uncial, book-hand minuscule, and cursive minuscule. Each grapheme system comprises variants, i.e., harmonic systems, which are often the result of evolutionary processes. These variants share the same overall morphology, but their details are different: for example, inscribed, written, and typographical variants mutually differ.

It has to be noted here that the role of the grapheme system uncial has been relatively small, and its present-day use is restricted to Gaelic, the Celtic language of which Irish and Scottish variants exist.

Harmonic systems are formed by specific variants of grapheme systems. As subdivisions of grapheme systems, harmonic systems by definition share the same basic structure, but differ in proportions and/or details. For instance the grapheme system Latin capital comprises the harmonic systems Roman imperial capitals and roman type capitals. These two harmonic systems differ in proportions and details, like the form of the serifs, but they share the same basic structure. The written Renaissance capitals incorporated in the Humanistic minuscule form a separate harmonic system within the grapheme system capital, because they differ in details from for instance the lapidary and typographic capitals. Still, the written capitals share the same morphology as the regularized and formalised variants. Greek capitals are part of a different grapheme system, due to their different forms.

The same subdivision as for the grapheme system capitals can be made for the grapheme system book-hand minuscules. The minuscules of textura (type), rotunda (type), Humanistic minuscule, and the lowercase part of roman type are harmonic systems within this grapheme system. The minuscules of bastarda, schwabacher, fractur, Humanistic cursive, and cursive type form different harmonic systems, which are all part of the grapheme system cursive minuscule.

Harmonic models are subdivisions of harmonic systems based on the morphological origin of the graphemes combined. The consistency of a harmonic system depends on the number of harmonic models it comprises. For instance the lowercase of roman type contains two harmonic models. There is a primary, i.e., dominant, one for all letters with exception of the k, s, and the v–z range. The letters that are part of the primary harmonic model are all constructed with the same basic elements. The exceptions form the secondary harmonic model; these letters have a different morphological background, because they find their origin in the grapheme system capitals.

Relational systems comprise the (relative) boldness or weight, and the amount of contrast in the graphemes. In terms of the broad nib it describes the relation between the nib-width and the x-height, and the relation between the nib-width and nib-thickness.

Proportional systems describe the relationship between the x-height and the width of the graphemes. It also describes the relationship between the size of the x-height and the lengths of the ascenders and descenders. These aspects are captured in the proportional models (see below). Proportional systems can also comprise cross-grapheme system information, such as the relation between the proportions of the minuscules of a book-hand and the accompanying capitals (or majuscules, if applicable). These aspects are captured in dynamic em-squares (see also Chapter 8).

Proportional models define the degree of compression or expansion in the primary harmonic models. There can be more than one proportional model in a harmonic model, which in theory indicates that there is an inconsistency in the construction (read: design). In that case there is a usually a primary, i.e., dominant, proportional model and a secondary one.

Rhythmic systems define the intervals of stems and the relation between the counters and the space between the graphemes, i.e., the spacing (fitting). This implies for instance that a change in the proportional system will lead to an increase or decrease of the spacing because it will change the rhythmic system. Irrespective of the number of proportional systems there can only be one rhythmic system in a harmonic system, otherwise the spacing will result in separated, i.e., isolated, groups of graphemes.

All systems directly interact with and influence each other. A change in the proportional system will lead to an increase or decrease of the spacing because it will change the rhythmic system. The application of multiple proportional systems will result in different sized counters and will, by definition, consequently obstruct the rhythmic system. Irrespective of the number of proportional systems there can be only one rhythmic system, otherwise the spacing (fitting) will result in separate groups of graphemes.

A9.3 Grapheme system

The graphemes in use for the Latin script can be grouped into four grapheme systems:

- capital;
- uncial;
- Latin bookhand minuscule;
- Latin cursive minuscule.

Each grapheme system comprises variants that share the same morphology, such as for instance inscribed, written, or typographical forms. If the variants contain the same harmonic models and only differ in proportions or details, they belong to the same harmonic system. For instance, the grapheme system 'capital' comprises one harmonic system for both the Roman imperial capitals and the capitals used in roman type, despite the differences in the proportions and details, like the form of the serifs, because they share the same basic structure. The written Renaissance capitals incorporated in the Humanistic minuscule belong to the same harmonic system, although they differ in details from the lapidary and typographic capitals. Still, they share the same morphology as the regularized and formalised variants.

Greek capitals form another harmonic system, because they differ too much from their Roman counterparts to be placed in the same group. So, if the underlying harmonic models differ, like the Humanistic minuscule in comparison with textura, this results in different groupings, i.e., in different harmonic systems within a grapheme system.

The grapheme system 'uncial' contains the harmonic systems uncials and semi-uncials and the uncial-derived gothic majuscules of the textura, rotunda, schwabacher, and bastarda/fraktur.

The 'Latin bookhand minuscule' system comprises the minuscules of the (mostly interrupted) 'book-hands' starting with the Carolingian minuscule. Further it contains the harmonic systems (all derived from the Carolingian minuscule) textura, rotunda, Humanistic minuscule, and roman type (in all cases: only minuscule [calligraphy] or lowercase [typography]). Although the morphology of the gothic book-hands is basically the same as that of the Humanistic minuscule, the differences (especially in the underlying secondary harmonic models [k, s, v, w, x, y, z]) are large enough to place them in different harmonic systems.

The 'Latin cursive minuscule' system comprises the uninterrupted hands, like Humanistic cursives and semi-uninterrupted hands, like the chancery italics ('cancellaresca') and their derived typographic variants.

The fact that capitals or uncials are combined with minuscules in written and printed texts and are adapted for this usage does not mean that their morphology is related to that of the minuscules. For instance the gothic majuscules and minuscules have some shapes in common, but mostly the constructions of these grapheme systems differ. Nevertheless the majuscules and minuscules are combined under single names, like 'textura' and 'rotunda', for the ease of use (and perhaps for classification reasons as well). Renaissance minuscules and capitals are indicated as a single group of letters under the name Humanistic minuscule.

The capitals, majuscules and minuscules on their own do not form completely coherent groups of letters. They often comprise letters from different origin, with subsequent different constructions: 'harmonic models'.

A9.4 Harmonic models

The grapheme systems Latin bookhand minuscule and Latin cursive minuscule contain two harmonic models: the primary harmonic model without any diagonals and the secondary harmonic model, which has been derived from the capitals and of which all letters containing diagonals (k, s, v, w, x, y, z). Consequently the grapheme systems are by definition inconsistent, despite the fact that they are considered unities. This results for instance in the fact that the spacing of the secondary harmonic model is a compromise; these letters are forced to fit as much as possible in the rhythmic system of the primary harmonic model. In the typographic practice the inevitable resulting inconsistencies in the letter spacing are circumvented with kerning pairs.

The vector-based construction of the Humanistic minuscule (and consequently roman type) can be captured in the primary harmonic model that is based on the construction and proportions of the o. Nineteen letterforms (a, b, c, d, e, f, g, h, i, j, l, m, n, p, q, r, long s, t, u) can directly be derived from the o by drawing vertical lines through the intersection points of the two translated circles. Because of the direct relation with the Humanistic cursive, the same grouping of characters can be made for this harmonic system.

A primary harmonic model by definition contains the majority of characters in a harmonic system. It defines the rules for the spacing, i.e., rhythmic system, and for the proportions of the remaining letters, which in case of the Humanistic minuscule (roman type) and Humanistic cursive (italic) are the diagonal letters k, s, v, w, x, y, z. These letters all are derived from the capitals and form together the secondary harmonic model (see next section).

The letters of the primary harmonic model can all be derived from the o, which implies that there is one proportional model within a proportional system. Matters can become more complex when the widths of the letters correspond to more than one proportional model. The rhythmic system will then normally be defined by the n.

If multiple proportional models are applied in the primary harmonic model, the rhythm will be messed up.

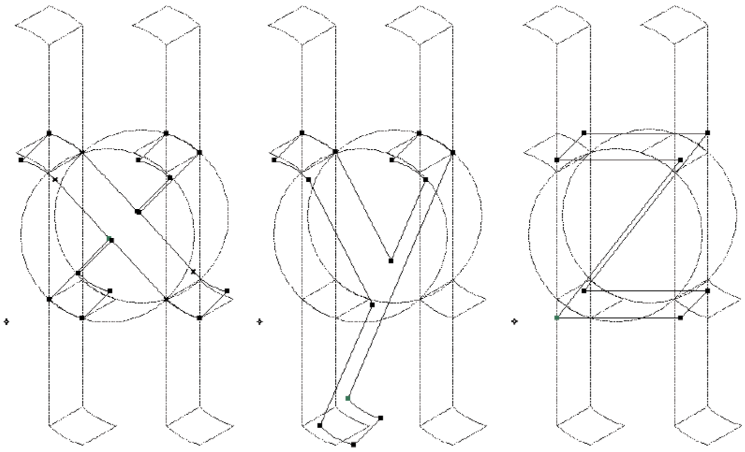


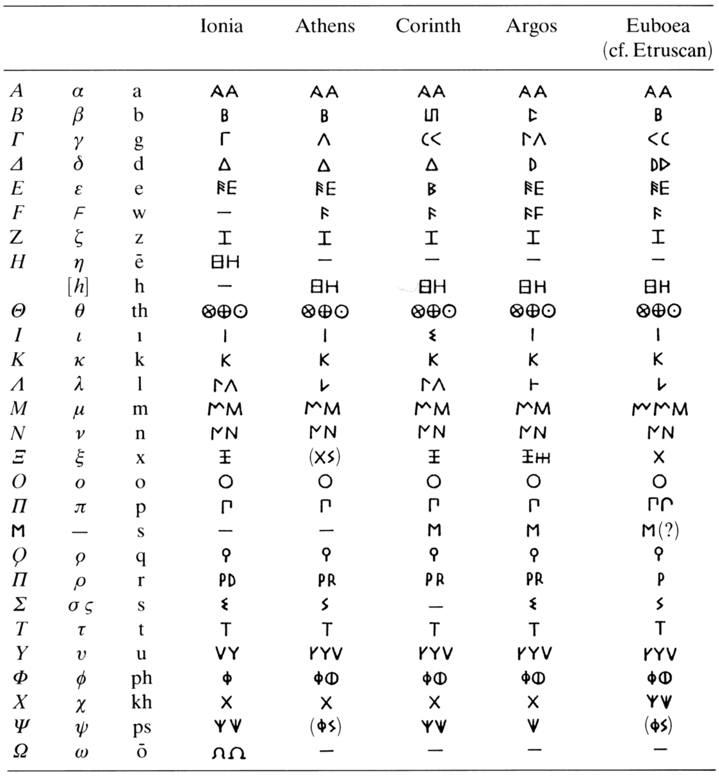
Figure A9.4 Fitting the secondary model using the parameters of the primary one.

As mentioned above, the diagonal letters of the Humanistic minuscule and cursive form together the secondary harmonic model. These letters have a morphology that is unrelated to that of the o-derived letterforms. In practice this means that these letters have to be forced to fit into the system defined by the primary harmonic model. For the Humanistic minuscule this implies that not only the widths of the diagonal letters have to adjusted, but also that elements like the 'feet' have to be added to the k, v, w, x, y (Figure A9.4). The calligrapher will usually also bend the diagonal strokes slightly to make the forms fit better in the atmosphere of the o-based letters.

The diagonal letters are forced into the rhythm of the primary harmonic system. The idea of equally dividing the space between the letters based on the space within the letters, i.e., in the counters, is basically impossible to maintain for the diagonal letters. The calligrapher forces these letters into the rhythm, by adapting and connecting letterforms. The type designer designs the diagonal letters in such a way that they do not obstruct the rhythm too much, for instance by shortening the serifs on the outsides, and, if possible, by adding spacing-corrections for individual letter combinations, the so-called 'kerning pairs'.

A9.5 Capitals

Roman capitals find their origins in the skeleton forms of the Greek's (Figure A9.5). The 'gutter' or ductus of the inscribed Roman capitals actually reveals the original underlying skeleton form. The relatively simple geometric constructions allow the application of a vector, using arbitrary angles. This is in contrast with the construction of the Carolingian and Humanistic minuscules.



			Ionia	Athens	Corinth	Argos	Euboea (cf. Etruscan)
Α	*α*	a	AA	AA	AA	AA	AA
Β	*β*	b	B	B	ᒣ	ᑕ	B
Γ	*γ*	g	Γ	Λ	ᑕ<	ΓΛ	<ᑕ
Δ	*δ*	d	Δ	Δ	Δ	D	DD
Ε	*ε*	e	ƎE	ƎE	B	ƎE	ƎE
F	*F*	w	—	F	F	FF	F
Ζ	*ζ*	z	I	I	I	I	I
Η	*η*	ē	ΒH	—	—	—	—
	[*h*]	h	—	ΒH	ΒH	ΒH	ΒH
Θ	*θ*	th	⊗⊕⊙	⊗⊕⊙	⊗⊕⊙	⊗⊕⊙	⊗⊕⊙
Ι	*ι*	i	I	I	≷	I	I
Κ	*κ*	k	K	K	K	K	K
Λ	*λ*	l	ΓΛ	L	ΓΛ	⊢	L
Μ	*μ*	m	MM	MM	MM	MM	MMM
Ν	*ν*	n	ΝN	ΝN	ΝN	ΝN	ΝN
Ξ	*ξ*	x	Ξ	(XS)	Ξ	ΞH	X
Ο	*ο*	o	O	O	O	O	O
Π	*π*	p	Γ	Γ	Γ	Γ	ΓΓ
M	—	s	—	—	M	M	M(?)
Ϙ	*ϙ*	q	Ϙ	Ϙ	Ϙ	Ϙ	Ϙ
Ρ	*ρ*	r	PD	PR	PR	PR	P
Σ	*σ ς*	s	≷	S	—	≷	S
Τ	*τ*	t	T	T	T	T	T
Υ	*υ*	u	VY	ΥYV	ΥYV	ΥYV	ΥYV
Φ	*φ*	ph	Φ	ΦΦ	ΦΦ	ΦΦ	ΦΦ
Χ	*χ*	kh	X	X	X	X	ΨΨ
Ψ	*ψ*	ps	ΨΨ	(ΦS)	ΨΨ	Ψ	(ΦS)
Ω	*ω*	ō	ΩΩ	—	—	—	—

Figure A9.5 Archaic Greek alphabets.[451]

Figure A9.6 shows two lapidary inscriptions, with Greek monolinear capitals on the left and Roman flat brush-based capitals on the right. The construction of both harmonic systems is closely related, but the details clearly differ. This difference could have been caused by the application of the flat brush by the Romans, as Johnston stated: '[...] it is reasonable to suppose that the use of the pen may have strongly influenced the finished Roman characters.'[452]

[451] Cook, *Greek Inscriptions*, p.8.

[452] Johnston, *Formal Penmanship and Other Papers*, pp.36–37.

Figure A9.6 Greek inscription from the Roman period (left) and Roman imperial capitals (right).

A9.6 Uncial

Thompson writes in *An Introduction to Greek and Latin Palaeography* that:

> The term 'uncial' first appears in St. Jerome's Preface to the book of Job, and is there applied to Latin letters, 'uncialibus, ut vulgo aiunt, litteris,' but the derivation of the word is not decided; we know, however, that it refers to the alphabet of curved forms.[453]

Uncials form the link between the capitals and the later Latin bookhand minuscules. In early Greek cursive specimens on papyrus minuscule forms can also be found.[454] It was the common type used by the Greeks and Romans, and also in the early Middle Ages.

Uncials were a more informal variant of the Capitals: '[…] curves are freely introduced as being more readily inscribed with the pen of soft material such as papyrus.'[455] The shapes of the uncials were further developed when vellum replaced papyrus: '[…] the strong material and smooth surface of prepared vellum were adapted to receive a stronger writing, one in which the scribe could give rein to his skill in calligraphy […].'[456] The dating of early vellum uncial manuscripts seems to be difficult '[…] since few fixed points are available.'[457] The oldest of these manuscripts date back approximately to the first centuries A.D., but the later general use of parchment instead of papyrus for book production was the result of this preference by the Christian Church.[458]

453 Thompson, *An Introduction to Greek and Latin Palaeography*, p.102.
454 Ibid., p.103.
455 Ibid., p.102.
456 Ibid., p.137.
457 Diringer, *The Book before Printing*, p.202.
458 Ibid., p.202.

The blending of the majuscules and minuscules resulted in the Carolingian script at the end of the eighth century.[459] The majuscules of the gothic book-hands from the late twelfth century onwards directly descended from the uncials.

A9.7 Latin book-hand minuscule

The Carolingian minuscule and the derived Humanistic minuscule find their shapes in the broad nib. Figure A9.7 shows a geometric representation of the movements made when writing most of the letters (except the k, s, and v–z range) of the Humanistic minuscule with a broad nib and a vector angle of 30 degrees. Because of the vector-shape pen, the circular movement when making an o results in a translation of the circle. Such twin-point strokes become directly visible when written with a points-level double pencil.

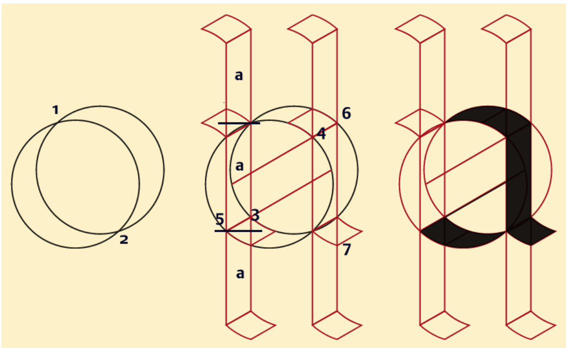


Figure A9.7 Construction of the primary harmonic model of the Humanistic minuscule.

Vertical lines can be drawn through the intersection points *1* and *2* of the circles (labelled 'dimples' by Johnston). These lines intersect with the circles at *3* and *4*. Drawing the vector (which has a constant length, of course) from these intersection points results in intersections with the circles at *5* and *6*. The drawing of vertical lines through these intersections results in the creation of stems. Repeating the stem part (indicated by 'a' inside the circles) results in ascender and descender lengths. The short stroke endings can also be derived from the circles and the intersections with the vertical lines, like at point *7*.

To calculate the stem-width (perpendicularly measured) from a certain vector length in combination with a certain vector-angle, relatively simple mathematics are involved. In case of a translation over 30 degrees, the stem thickness will be the width of the vector multiplied with sin 60 degrees (= 0.87 vector).

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[459] Ibid., p.287.

A9.8 Latin cursive minuscule

In the chapter on *The Roman Cursive Script* in *An Introduction to Greek and Latin Palaeography* Thompson shows a table of Latin cursive alphabets written by Romans with the stilus and with the pen, of which Figure A9.8 shows the monolinear-line alphabets. These Roman cursive alphabets 'represent the ordinary writing of the people for about the first three centuries of the Christian era. The letters are essentially the old Roman letters written with fluency, and undergoing certain modifications in their forms, which eventually developed into the minuscule hand.'[460] According to Thompson the sloped character of the letters is caused by the circumvention of friction: 'The natural tendency, in writing on resisting or clinging surface such as wax, is to turn the point of the writing implement inwards and hence to slope the letters to the left.'[461]

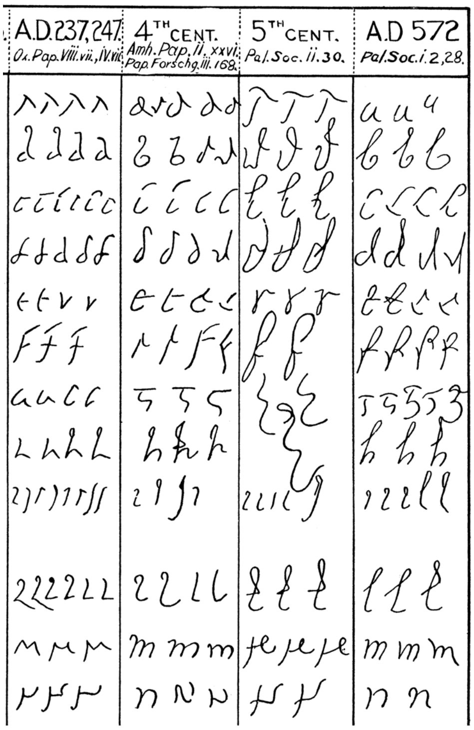

Figure A9.8 Latin cursive alphabets as written with a pen by the Romans.

The part of the table reproduced in Figure A9.8 shows a remarkable diversity in shapes, which foreshadow many of the formal and informal variants that appeared at later times. Especially the sixth-century Roman cursive in the right column does not seem to have diverged much from our modern handwriting.

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[460] Thompson, *An Introduction to Greek and Latin Palaeography*, p.311.

[461] Ibid., p.315.

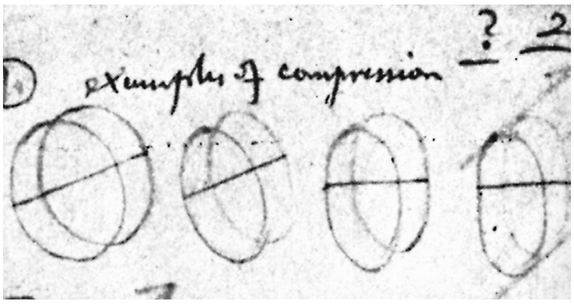

Figure A9.9 Notes from Johnston showing the first step to italic, i.e., compression.[462]

Cursive and italic are terms used interchangeably: 'It is convenient to use the term "Italics" for both the cursive formal writing and the printing resembling it. Italic type was first used in a "Virgil" printed by Aldus Manutius of Venice in 1500. [...] It was counterfeited almost immediately (in German and Holland it was called "cursive") [...].'[463] Noordzij uses in *The Stroke of the Pen* the term 'italic' exclusively for 'hybridized' cursives, which are cursives with an interrupted construction.[464]

The cursive is also sometimes called 'running hand' ('cursive' is derived from the Medieval Latin word 'cursivius', which in finds its origin in the Medieval Latin word 'currere', which means run or gallop).[465] The first condition for writing fast(er) is to cover a smaller area per letter, and therefore the letters have to be compressed. Edward Johnson described this compression as the first step towards italic letters (Figure A9.9). The other prerequisite is uninterrupted writing, i.e., connecting the strokes of a letter without lifting the pen from the paper. If applicable, letters within a word can be connected. Formalisation of the cursive letterforms led to interrupted variants: '[...] we may expect to find hybrids in any situation where writing is intended to be beautiful (e.g. Arrighi's books) [...].'[466] Cursives are from origin informal (meant for ordinary writing), but there are formally written variants, like the gothic bastarda and the Renaissance cancellaresca. The construction of the latter was formalised by interrupting the upstroke.

The vector angle (pen angle) for the Latin bookhand minuscule is generally 30 degrees. If letters are compressed they become relatively bolder. This effect can be tempered by applying a steeper vector-angle, which reduces the stem width. Compressed letters contain less horizontal information and if the arches of formal

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462 Johnston, *Formal Penmanship and Other Papers*, p.160.
463 Edward Johnston, *Writing and Illuminating & Lettering* (London: Sir Isaac Pitman & Sons Ltd., 1945), p.275.
464 Noordzij, *The Stroke of the Pen*, p.33.
465 <http://www.myetymology.com/latin/cursivus.html>
466 Noordzij, op. cit., p.33.

book-hands are replaced by upstrokes, as is done in cursive hands, there are only a couple of horizontal strokes left, like the top of the a (and related letters like b, d, g, p, q) and the z. The steeper angle also helps to reduce the friction; the more the vector-angle is in the direction of the upstroke, the less friction will be encountered.

The angle of the pen is, of course, relative to the slope of the characters. The idea that the angle for cursives is fixed at 45 degrees is a mistake in my opinion. It can be found in almost every book on writing: '[...] when square-edged hard tools are used, a tendency to maintain the same cant throughout a body of writing, to accent the thinnest edge stroke and to write about 45 degrees cant.'[467] To keep the horizontally stressed strokes in balance with the vertical ones, the stem-width should remain the same when perpendicularly measured.

This leads to the equation 's = p x sin (90 – α – β)', where s = stem width, p = pen width, α = pen angle, and β = italic angle, as shown in Figure A9.10. This implies that for slanting the letters a degree, the vector-angle should decrease by a degree. This means that with a 'normal' italic angle of 15 degrees, the vector-angle should be 30 degrees, which is the same as for a Humanistic minuscule. In other words: if a Humanistic minuscule is combined with a related cursive, the same vector-angle can be applied when the cursive is slanted 15 degrees.

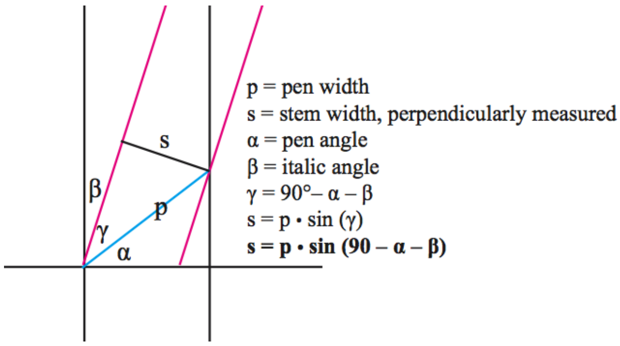

Figure A9.10 Reduction of the pen angle compensates for the slanting-effect on the stem-thickness.

Cursives or italics do not necessarily have to be slanted. Formal cursive hands like bastarda stand straight upwards. The bastarda can hardly be described as a 'running' hand; in this case the construction of the upstrokes reduces the speed of writing. Slanting looks to be a prerequisite for faster writing, because it makes shortcutting easier. The suppression of horizontally-stressed parts at the end of clockwise upstrokes and subsequently at the end of counter-clockwise upstrokes is a prerequisite for making upstrokes.

[467] Catich, *The Origin of the Serif*, p.144.

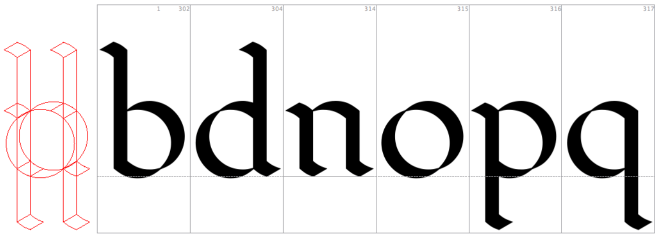

Figure A9.11 Geometric representation of the Humanistic minuscule.

The cursive letterforms from the Renaissance are directly related to the formal minuscules; hence the letters can be similarly mapped in harmonic models. The main differences between the Renaissance formal and informal hands are the compression of the letterforms and the shortcuts, i.e., upstrokes, which suppress the arches in the latter. Due to the compression, the cursive letters lose some of their curvilinearity.

Figure A9.11 shows a geometric representation of the Humanistic minuscule made with a vector-angle of 30 degrees. In Figure A9.12 these letters are compressed and slanted 15 degrees; the vector-angle remains the same.

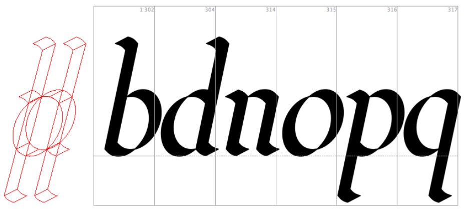

Figure A9.12 Slanted and compressed variant of the Humanistic minuscule.

Figure A9.13 shows a suppression of the arches due to the (shortcutting) upstroke. Let me underline here that this is a purely theoretical representation.

Figure A9.13 Slanted and compressed variant of the Humanistic minuscule with a shortcut.

A9.9 Relational system

The boldness, (weight or density) of a letter is the relation between the pen strokes and the counters. Because of the direct relationship between the size of the counters and the space between the letters (rhythmic system), the boldness has an effect on all white spaces. In the case of a broad nib, emboldening implies the lengthening of the vector, although this only leads to emboldening if the height of the letter is kept unchanged. Lengthening the vector always leads to an increase of contrast (the relation between the width and the thickness of the nib), but an increase of contrast does not by definition lead to an increase of weight.

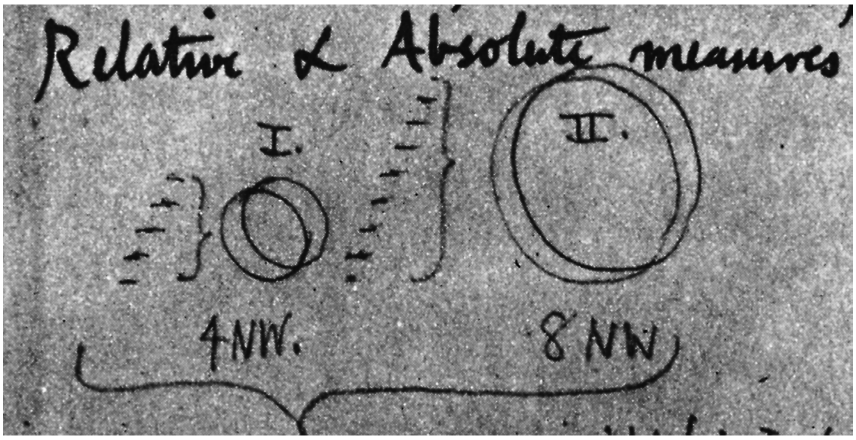

Figure A9.14 Notes from Johnston in which he describes the relation between weight and height.

Weight is therefore a relative matter. Johnston defined weight as follows: 'The weight may be described as the relation of the width of the pen's broadest stroke to the height of the letters. And, as the width of the broadest stroke is given by the breath of the nib, this ratio is most conveniently expressed – and measured – in nib-widths [...].'[468] Noordzij followed Johnston in *The Stroke of the Pen* and also applied the effect onto the flexible-pointed pen ('expansion'): 'The ratio of the translation or the expansion to the x-height of the script could be a figure for the description of weight.'[469]

Both Johnston and Noordzij place the western writing within the 3-5 nib-widths in relation to x-height range. Johnston labelled the 5:1 ratio 'light', the 4:1 ratio 'medium', and the 3:1 ratio 'heavy'. Noordzij used the term 'relative translation' and places the Carolingian and Renaissance scripts in the 5:1 range, the gothic scripts in the 3:1 range, and the Mannerist scripts (sixteenth century) in the 3:1 – 5:1 range.[470]

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[468] Johnston, *Formal Penmanship and Other Papers*, p.91.
[469] Noordzij, *The Stroke of the Pen*, p.12.
[470] Ibid., p.13.

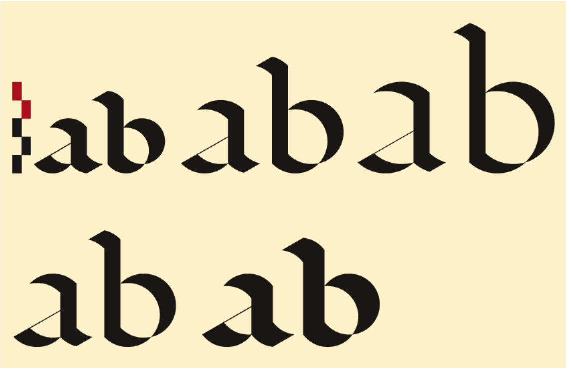

Figure A9.15 Relative (top) and absolute (bottom) increase of weight.

The top row of Figure A9.15 shows an increase of height of the letters and a fixed pen width. The ratio for the x-heights varies from three times the pen width to five times the pen width. The effect of the 3:1 ratio is that the first letters look bolder because of the relatively small counters. The contrast is the same in all three variants, i.e., the relation between the pen width and the pen thickness is unchanged.

In the bottom row, the increase of weight is achieved by lengthening the vector while retaining the x-height. The thickness of the pen is unchanged and this also leads to an increase of the contrast. This effect is applied when a bold version is made for a typeface, although normally the contrast is lowered somewhat as well because optically the thin parts look thinner in relation to a broader nib.

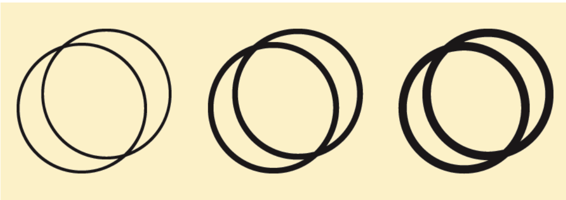

Figure A9.16 Reduction of contrast by emboldening of the twin-points.

The decrease in contrast can be described as an emboldening of the twin points (think of a double-pencil) with which the translated forms are drawn. The ratio of pen-width and pen-thickness can be expressed in the same way as the relation between pen-width and x-height. The relational system comprises two ratios:

– *pen-width : x-height* and

– *pen-width : pen thickness.*

In the case of a translation over 30 degrees, the stem width/thickness (perpendicularly measured) is pen-width x sin 60 degrees, which is 0.87 pen width. This means that with a (x-height:pen-width) ratio of 5:1, the stem width is 1/5.75 of the x-height. Adrian Frutiger's approximation[471] of a 'normal' stem width of a fifth to a sixth leaves some room, but obviously Frutiger took into account that the lowering of the contrast (making the thin parts thicker) increases the total weight. The stem-width of sans serifs, which have a serifed counterpart, usually differs from the latter for that (optical) reason.

A9.10 Proportional system

There is a direct hierarchical relationship between the size of the counters, i.e., the space within the letters, the space between the letters, the word spaces, the space between the lines and even the margins of a text. The more space there is within the characters, the more space between the characters, between the words, between the lines, and around the texts is required.

The consequence of relatively more or less space between the lines as a result of the space within the lines (as a result of the counters) is that there is more or less room for ascenders and descenders as well. Relatively open letters, like the ones by Jenson for instance, will require a considerable amount of space between the lines, and this leaves room for relatively long ascenders and descenders as well. This is especially important for the shape of the g. Condensed letters, like in textura type, should be tightly set in the vertical direction and hence require short ascenders and descenders. Ascenders and descenders should match the proportions within the x-height; too short would mean a distorted relationship and too long would mean that to prevent clipping too much line spacing has to be applied.

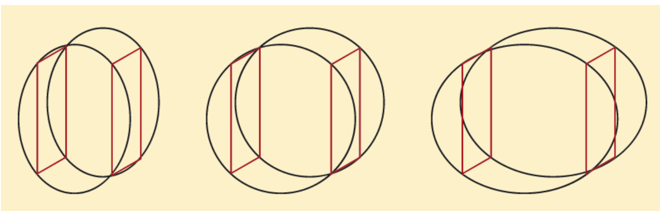

Figure A9.17 Condensing or expanding the circular movement: the stems remain the same.

The relation between x-height, ascenders, and descenders within a harmonic system can be changed by either expanding or compressing the system. The relation in horizontal direction, i.e., letter widths, and the relation between x-height and ascenders and descenders are a direct consequence of the width of the harmonic

[471] Adrian Frutiger, *Zur Geschichte der linearen, serifenlosen Schriften* (Bad Homburg: Linotype AG, ca.1986), p.8.

system, which can be defined as the proportional system. In the main harmonic systems for the Latin minuscule book-hands and Latin cursive minuscule, the relation between the width and the height of the model is evident.

A harmonic system can contain more than one proportional system; the relation between the curved letters b, c, d, e, o, p, q can for instance be based on a different proportional system than the other letters within a harmonic system. In typefaces from different style periods one can find different proportional systems. The way proportional systems are handled within a type design can be considered as characteristic of the designer's idiom.

Because the relational system is in theory the direct result of the proportional system, the relation in writing between the width of the broad nib and the x-height could be considered the *relative proportion*. It is interesting to see that when the relative proportion is changed to 3:1, the counters in the perpendicular letters and curvilinear ones become more equal. The larger the pen width becomes, the greater the difference between the counters of these letters. This effect seems most obvious in the typefaces from the Italian and French Renaissance, which find their origin in the 'relative proportion' 5:1.

A9.11 Monoform and polyform

Typefaces can be based on a single proportional model, like Van den Keere's Parangon Romain (Figure A9.18), or contain multiple proportional models (Figure A9.19), like Van den Keere's Canon Romain.

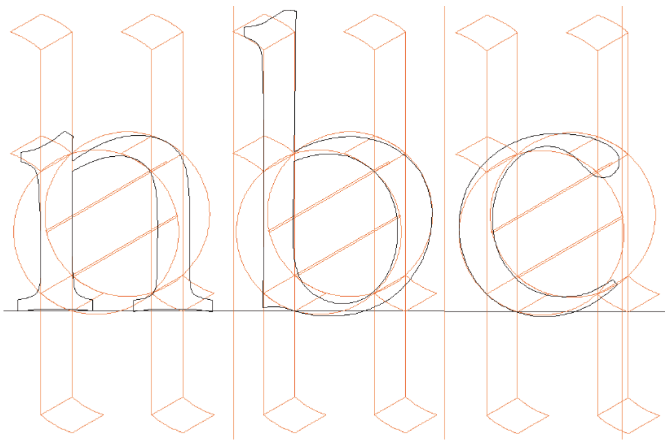

Figure A9.18 Van den Keere's Parangon Romain fits in a single proportional model.

In case of more than one proportional model, the rhythmic system will by definition be a compromise, because the interval of counters will be disturbed. From the research I have done so far in this area, I tentatively conclude that during the Italian Renaissance there were only single proportional models applied in the text typefaces and that in the French Renaissance multiple proportional models were only applied in the display point sizes. The application of multiple proportional models in text sizes seems to appear in the seventeenth century. One wonders if the larger point sizes from the past were used at that time as examples for the smaller type. Further investigations are required to answer this question.

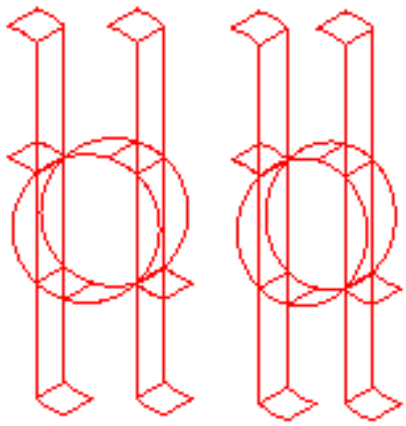

Figure A9.19 Typefaces can contain multiple proportional models.

Condensing the 'round' letters provides a way to make a typeface more economic. Van Krimpen applied this idea clearly in his design for Spectrum, which was originally developed as a bible face. Transferring this to the current technology, one could imagine that for instance adding an alternative set for the 'round' letters to a typeface would give the typographer some more options to control the required space.[472]

The expected relation between the size of the counters and the length of ascenders and descenders is the shortening of the latter in case of compression. Figure A9.19 shows the combination of two proportional models with a fixation of the length of the ascenders and descenders based on one of the applied models, in this case the widest (left). In the compressed version on the right the ascenders and descenders look longer in relation to the size of the counter and have to be shortened for a more balanced shaping.

[472] The OpenType format offers the 'stylistic set' option for this purpose.

A9.12 Relative proportional system

The spacing has to be tighter for larger (display) point sizes in comparison with the spacing for smaller (text) point sizes. The reason for this is that the letters become optically more separated at a larger size if the same spacing is applied as for small point sizes.

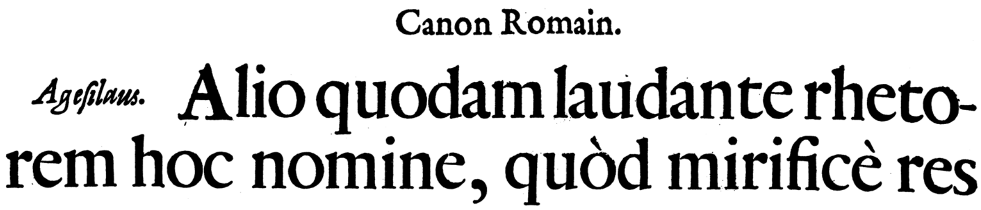

Figure A9.20 Van den Keere's Canon Romain showing condensed perpendicular letters[473]

Corrections for this optical effect can be incorporated in the type design itself; in the time of foundry type (before the application of Benton's pantograph) every point size was a type on its own and had to be cut separately. This made adaptations to the different point sizes a standard practice. For instance Van den Keere compressed the perpendicular letters for his larger point sizes, such as his Canon Romain, and obviously used fence posting based on the n for the spacing.

Figure A9.21 The proportions of the Canon d'Espaigne seem related to those of the rotunda.[474]

The proportions of the Canon Romain seem to be related to the ones in rotunda type, like in Van den Keere's Canon d'Espainge. In both cases the type contains two proportional models and because of the condensed n's, the related spacing is cramped. Vervliet notes on the Canon Romain: 'In the design of this face Van den Keere kept to the regional tradition of bold, fat-faced Romans with a big x-height, comparable for weight with Gothic letters [...].'[475] Not only are the weight and the relatively large x-height in Van den Keere's Canon Romain comparable with the

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[473] Vervliet and Carter, *Type Specimen Facsimiles 2*, p.8.

[474] Ibid., p.8.

[475] Vervliet, *Sixteenth-Century Printing Types of the Low Countries*, p.230.

proportions of the rotunda, but the different proportional systems of the latter are also applied in the roman display type.

A9.13 Using systems and models for measurement

Measuring the proportions of letters, such as the x-height, stem widths, and the length of ascenders and descenders, is not complex. One can simply use a ruler, or when there are digital descriptions of the letters available, one can check the coordinates. The relations between the related parts in the different letters can also be measured. More difficult, however, is the representation of the outcome: if there is no generic model, that can be referred to and that can be used to 'rebuild' and represent the letters using the underlying parameters, the result of the measurements can only be shown by graphs.

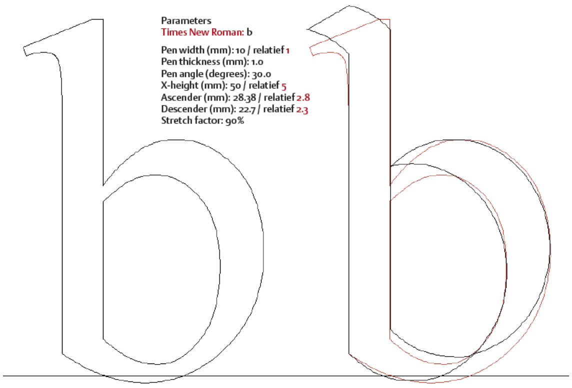

Figure A9.22 Translation of the b of Times New Roman into proportional parameters.

The parameters for the described primary harmonic models for roman and italic type (pen width, pen thickness, pen angle, ascender, descender, stretch factor, italic angle, and curve flattening) can be used to measure typefaces and to translate their underlying patterns into primary harmonic models. Figure A9.22 shows a translation of the lowercase b of Times New Roman into a primary harmonic model. Although the details between the b of Times New Roman and the generic harmonic model differ, the basic characteristics, like character width, stem width, and pen angle, can clearly be visualized.

The measurement of the underlying parameters can be done by software and represented in listings ('pre-sets'), which can be applied in the LetterModeller application, which is described in Chapter 3 Section 2.

APPENDIX 10: SPACING AND CASTING

A10.1 Introduction

This appendix is supplemental to the Chapter 4 and is specifically referred to in Section 1. It provides additional information on the relation between the spacing (fitting) and casting of foundry type.

A10.2 Historical background

One sometimes gets the feeling that the fitting of type is taken for granted in the literature on typography. For instance, in the introduction of *Sixteenth-Century Printing Types of the Low Countries*, Vervliet spends only a few lines on the justification of matrices:

> The strike must be 'justified' to form a matrix. The faces must be filed so as to make the depth of the impression uniform in the whole set of matrices, and so as to make them rectangular and parallel, with margins on either side of the letter calculated to make it look evenly spaced in relation to others and to look upright on the page.[476]

Fournier mentions that matrices should be justified in such a way that after placing them in the mould the subsequently cast type 'has all the accuracy and finish required for printing.' He proceeds with that 'this is called justifying for fixed registers.'[477] Further on Fournier writes on casting: 'The letter m of every fount is taken first, and when this is right it is used as a pattern for the others. Three m's are put in the lining-stick and the first to be cast of every sort is put between them and made to tally with them. The necessary alterations are then made in the mould and the matrix.'[478] This contradicts with the previous statement because if the matrices are justified for fixed registers the checking of the m and other letters in between m's can be skipped. For casting with fixed registers only the position of a single letter has to be checked. Based on my measurements I believe the length of the serifs were an indication for the positioning of the registers in Renaissance roman type. The serifs of the lowercase l were perfectly suited for this because of the letter's symmetry within the x-height.

In Fournier's time also matrices were used that were not justified for fixed registers. These matrices were accompanied by 'set patterns', which were collections of pre-cast type. The caster could use these by putting the type into a matrix for setting the mould's registers.

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[476] Vervliet, *Sixteenth-Century Printing Types of the Low Countries*, pp.7,8.

[477] Carter, *Fournier on Typefounding*, p.89.

[478] Ibid., p.106.

In *Type Spaces* Burnhill describes the 'refined system of dimensional' control, which he found in the publications by Manutius. Burnhill mentions a possible limitation of character widths: 'My guess is that in-house typographic norms had been around since Gutenberg sorted mechanized script into sub-sets by reference to common character widths – say. No more than five or six groupings in all – then constructed a set of fixed-width moulds to suit.'[479] Textura type is very well suited for limiting the number of character widths. Because of the morphologic relationship with textura, a small number of character widths can also be used for roman type –not for the horizontal proportions Fournier and his contemporaries used, but definitely for the archetypal models. The reduced number of widths must have made the justification for fixed registers relatively simple.

A10.3 Spacing and rhythm

The spacing of written letters will be the result of an organic rhythm, i.e., a flowing movement. The goal is a general effect of evenness.[480] This rhythm results in an interval of vertical strokes, of which the ones of the perpendicular letters, like h, i, j, l, m, n, and u, in particular result in a fencing rhythm. The more identical the space between the perpendicular letters and the space inside the letters (the counters) are, the more regular the rhythm will be.

In case of textura the fencing can become very strong and can even affect the recognisability of the letters. The repetition of black and white in the textura easily forces the calligrapher into the fencing rhythm. In case of the Humanistic minuscule the rhythm asks for more control of the pen.

Noordzij puts in *The Stroke* the emphasis on intervals of counters and spaces, which he calls 'white shapes': 'The white shapes are constituted only in the combination of letters; there is no simple measure of their size and they follow almost incidentally from the black strokes which solicit so much attention.' According to Noordzij maintaining the equilibrium in the white is especially important.[481] Noordzij implies that the fencing is the result of spacing instead of the opposite.

The traditional approach in type design and typography is to ensure that the space between the counters is an optical repetition of the space within the counters. The problem, however, is that for the Latin script this concept works well for letters with enclosed counters, like n and o, but not for letters that are (partly) open within

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479 Burnhill, *Type Spaces*, p.10.

480 Johnston, *Writing and Illuminating & Lettering*, p.43.

481 Ibid., p.42.

the x-height, like a, c, and e, or for letters that contain diagonals, like k, s, and v–z. And, of course, in order to combine lowercase with capitals compromises have to be made.

The even distribution of (white) space is something that a calligrapher tries to achieve as much as possible and, because of the flexibility of writing, ad hoc character variants can be applied. The division of space in equal parts to provide a mechanism for creating rhythmic uniformity within type inevitably leads to problems because the written letters were not developed (did not evolve) with the idea in mind of placing them on rectangles at a later stage. For instance, the lowercase a and e have partly open counters, which at some point transform into the letter space. The question of where exactly the borderline between the counter and the letter space can be placed is only relevant to the typographer, because the calligrapher does not need to answer this.

The equilibrium idea cannot be applied on very light or very bold or extensively condensed type designs. At some point these variants will deviate too much from the scheme of the archetypes. In the case of extra bold letters, at some point the space between the letters will become inevitably larger than the space in the counters, for instance because serifs cannot be made shorter.

A10.4 Stem interval

The rhythm in the roman type by Jenson shows a clear rhythm of the stems: the stem interval. Figure A10.1 shows the roman Jenson also used for his *Epistolæ ad Brutum* edition. Jenson clearly applied 'fence-posting' (based on the proportional model) here: the stem interval within the n was used as the basis for spacing. This stem interval seems to have been dominant for the proportions of Jenson's capitals as well.

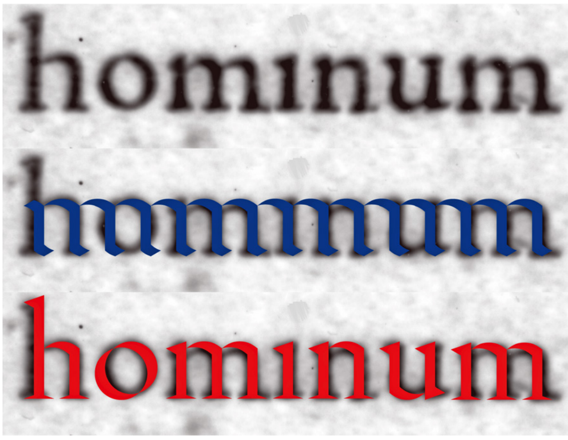


Figure A10.1 Detail from *Cicero, Epistolæ ad Brutum* (Jenson, 1470).

The small differences in Figure A10.1 between the applied fences and the roman by Jenson are partly the result of expectable irregularities in the type itself, because the relatively small point size (approximately 16 'current' points) made both casting and printing impossible on a more detailed level. On the other hand it is well possible that Jenson was aware of the fact that not all (sorts of) stems require equal distances to the side bearings. Kapr refers in *The Art of Lettering* to this fact:

> When several m's are placed together then all strokes must have the same optical distance and other letters inserted between two m's would have to be in harmony with this rhythm. The inter character interval before the first downstroke and the distance after the third downstroke of the m must together correspond to the counter of the m.[482]

The spacing Jenson applied on his roman type also shows the equilibrium idea and hence the result is an optimal combination of balanced white space and a regular stem interval. Griffo's type for the *Hypnerotomachia Poliphili* shows the same balance (Figure A10.2).

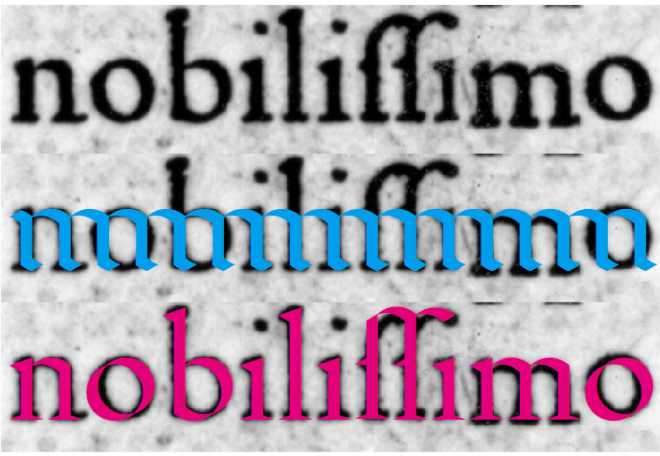


Figure A10.2 Detail from *Hypnerotomachia Poliphili*, published by Manutius in 1499, with applied 'fence-posting'.

The distance between the stems is dictated by the spaces in the letters, which are all related to each other, because of the fact that the letters share the same proportional system. The length of the serifs helps to preserve the space between the letters. Conversely, the serifs work as wedges and help to force the letters in the rhythmic system. Jan Tschichold briefly mentions the stem interval in *Treasury of Alphabets and Lettering*: 'The old lettering masters followed the rule that all the basic strokes of a

[482] Kapr, *The Art of Lettering*, p.308.

word should be spaced at approximately equal distance. This rule is disregarded today; lower case letters are pushed together.'[483]

This optimal rhythmic system only works for text sizes, i.e., roughly 16 points (Jenson) and smaller. Because of the lack of serifs, it is impossible to apply such spacing on sans serif typefaces, with the exception perhaps of condensed versions, where there is not much space in the first place. The stem interval in sans serifs with proportions related to the archetypes is due to the lack of serifs by definition disturbed.

Figure A10.3 The serif version of DTL Haarlemmer combines a regular stem interval with equilibrium of space.

Figure A10.3 shows the serif version of DTL Haarlemmer. The space between the perpendicular letters is optically equal to the space inside the letters. The serifs make it impossible to tighten the spacing more, because they would collide then.

Figure A10.4 The sans-serif version of DTL Haarlemmer has a slightly disturbed stem interval.

Figure A10.4 shows the sans-serif version of DTL Haarlemmer. Although the equilibration of the spacing is obvious, the stem interval of the serif version could not be maintained, as is shown in Figure A10.5.

[483] Jan Tschichold, *Treasury of Alphabets and Lettering* (Ware, Hertfordshire: Omega Books, 1985), p.34.

Figure A10.5 Stem intervals in the serif and sans-serif version of DTL Haarlemmer compared.

A10.5 n- and m-widths

Figure A10.6 shows the m's on n-fences of Adobe Jenson, Monotype Bembo, Monotype Poliphilus, and Adobe Garamond Premier respectively. The last two typefaces have m's, which have smaller counters than the n's. Over time the relatively condensed m seems to have become common practice for type designers. In *Letters of Credit* Tracy mentions the 'untypical' width of the m (in relation to fitting):

> '[...] for the fitting of the lowercase, the standards being the n and o. (Fournier specified the m; but since that is often untypical, being designed after the n, with narrower interior spaces than those in n, h and u, the n seems a better choice for the standard.)'[484]

If the m is untypical, why would a type designer make an m like that, and why did Fournier, who was a very experienced punchcutter, advise the use of the m as standard for the fitting?

Figure A10.6 The m of Adobe Jenson (1), Monotype Bembo (2), Monotype Poliphilus (3), Adobe Garamond Premier (4) on n-fences.

The four typefaces shown here are interpretations of Italian and French Renaissance type. The original type by Griffo applied in the *Hypnerotomachia Poliphili* (Figure A10.2) does not seem to have such a convincingly condensed m, and neither do the smaller point sizes cut by Garamont. Griffo did not cut 'display' type, but Garamont did: in Figure A10.7 his Gros Canon Romain seems to have a slightly narrower m (top) in comparison with the n (bottom). The Petit Canon Romain and the Parangon

[484] Tracy, *Letters of Credit*, p.74.

Romain have m's of which the counters are equal to those of the n's. The Garamond Premier is not based only on Garamont's designs for smaller point sizes; its revivalist Slimbach also took Garamont's larger type into account. So, this can explain the differences of the counters of the m and the n shown in Figure A10.7.

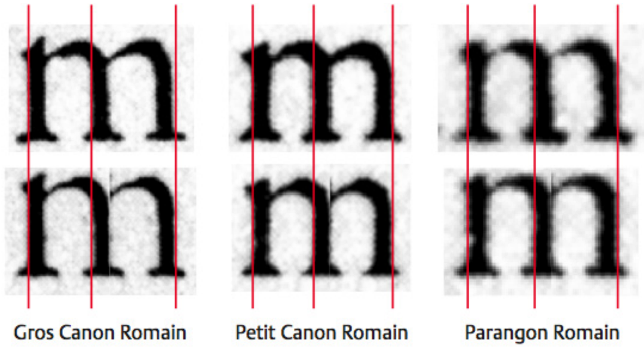


Figure A10.7 The widths of a few of Garamont's m's compared.

One can only guess why the m of Monotype Poliphilus seems to be more condensed than the original type. Perhaps the condensing was forced by the mapping of the Monotype matrix case –or was it influenced by an expected difference of the size of the m and n counters?

In *The Alphabet* Goudy illustrates his interpretations of historical typefaces, including Jenson's 'Eusebius' type, and he praises 'the perfect harmony and symmetry of the letters.'[485] On the same plates he shows his own Kennerley typeface. Goudy interpreted the 'Eusebius' type with equal counters in the m and the n, but the counter of the n of his own typeface is considerably wider than the counters of the m. So, although Goudy praised Jenson's harmony, he did not copy the n-m correlation in his own type.

In *Roman Letter Forms* Thompson wrote about the m: 'The small m is not formed by merely adding another stroke to the n, but the whole character is somewhat condensed to distinguish it from the n.'[486] One can imagine that this is applicable to textura type, but for roman type the 'distinguishing' argument does not seem to be very valid.

[485] Goudy, *The Alphabet*, p.96.

[486] Tommy Thompson, *How to Render Roman Letter Forms (*New York: Holme Press, 1946), p.31.

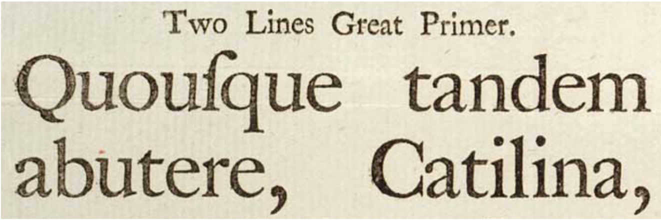


Figure A10.9 William Caslon's *Two Lines Great Primer*.

Especially in his larger point sizes William Caslon made the m more condensed (Figure A10.9), and so did Rosart (Figure A10.10). These larger point sizes also show a tighter spacing, which seems to be based on the counters of the m. This is in line with Kapr's note that:

> According to the experience of the punchcutters, the average distance from letter to letter is about equal to the counter of the m. Therefore the rhythm of the strokes and the stroke distance of the vertical in the m must be particularly carefully balanced. When several m's are placed together then all strokes must have the same optical distance and other letters inserted between two m's would have to be in harmony with this rhythm.[487]

Kapr's statement is in contradiction with Tracey's ideas, but seems to underline Fournier's approach.

Figure A10.10 Jacques-Francois Rosart's Grand Canon Romain.

The question is why the aforenamed punchcutters made the counters of the m's narrower than the counters of the n's. Could it be that the early punchcutters were aware of the fact that larger point sizes need a (slightly) tighter spacing than smaller point sizes, and that they subsequently cut the m more condensed as an indication for the fitting? Fournier's specification of the m would make perfect sense then. At some point in history (probably the seventeenth century) the condensed m must have become a sort of standard for all point sizes, including the ones for text.

[487] Kapr, *The Art of Lettering*, p.308.

AII.1 Introduction

This appendix is supplemental to Section 6 of Chapter 9. It provides additional information on the Kernagic and LS Cadencer tools and presents results of the auto-spacing process based on cadence units.

AII.2 Brief recapitulation of the cadence-units concept

In this dissertation the relation between steminterval and (roundness of) curves, and the translation of the rhythmic pattern into cadence-units is described in great detail.

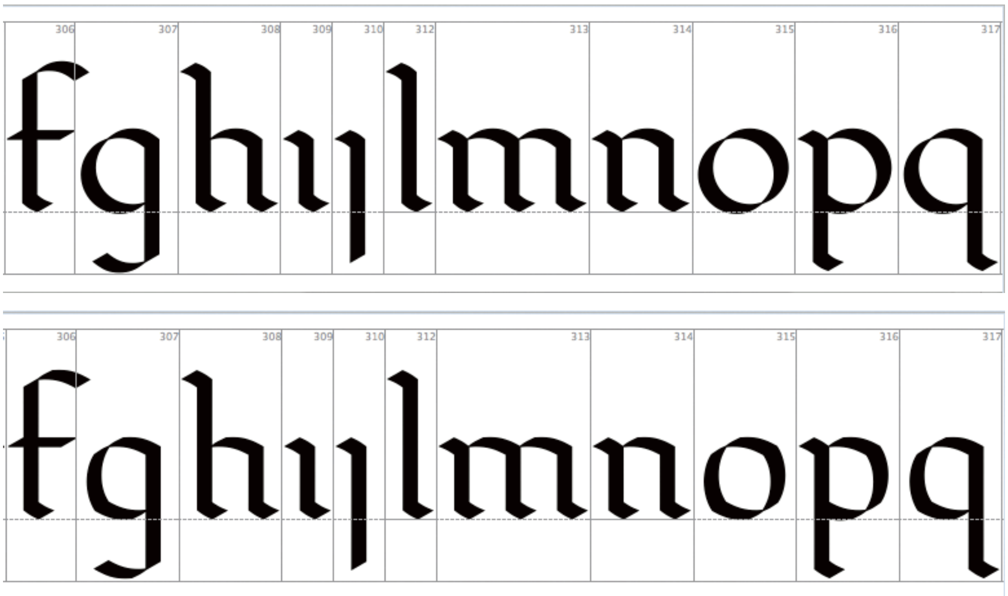


Figure AII.1 Flattening of curves in LeMo leaves the character widths unattached.

Measurements of Renaissance foundry type and matrices –as part of this research– clearly prove that standardised character widths were used. With the LeMo application the relation between stem interval and the overshoot of curves can simply be demonstrated; the flattening of curves leaves the stem interval and hence the character widths unaffected (Figure AII.1).

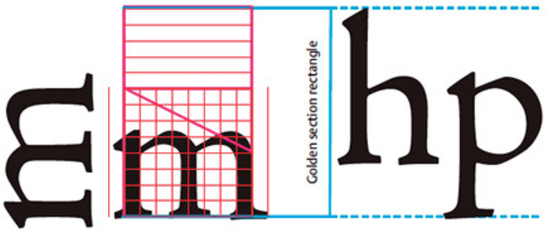


Figure AII.2 Simple grid distilled from Jenon's archetypal roman type.

It is plausible that Nicolas Jenson's archetypal roman type was defined on a grid. It is possible that Jenson defined the x-height of his roman as five times the vertical stroke-width, i.e., stem thickness, instead of using the pen-width as a calligrapher will do (Figure AII.2). This unit-arrangement system is rather coarse and it only works well for letters that share the archetypal proportions. As soon as one changes these proportions, things become more complex.

Figure AII.3 Van den Keere's (Gros) Canon Romain.

For example Van den Keere's Canon Romain, which shares the proportions of Van den Keere's rotunda type Canon d'Espaigne, clearly deviates from Jenson's archetypal model for roman type (Figure AII.3).

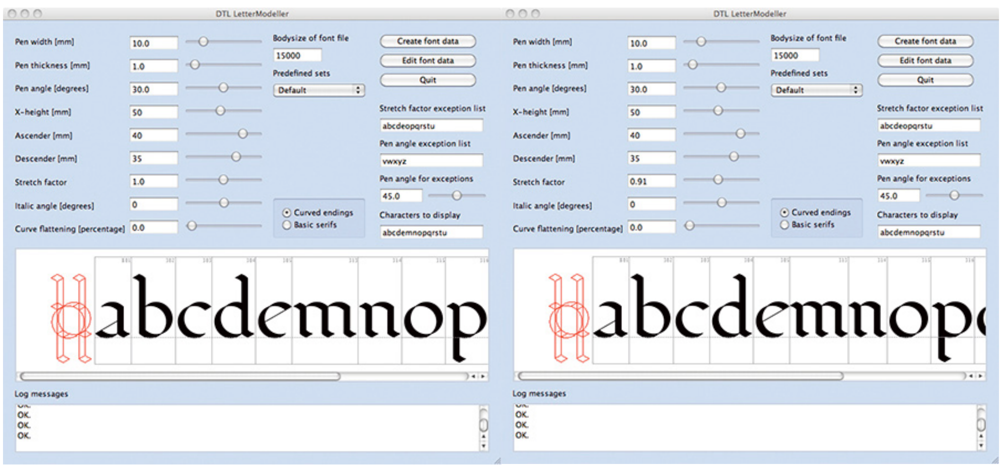


Figure AII.4 In LeMo some letters can be stretched and other ones can be left unattached.

This effect can be reproduced with LeMo by 'stretching' some letters and by leaving other ones unaffected (Figure AII.4). The rhythmical pattern is obstructed and the original mechanism does not provide a correct fitting. Such a deviation requires an adapted patterning. I distilled a system from especially French Renaissance type in which the stem interval (marked with 'a' in Figure AII.5) is divided into what I baptised 'cadence units' (Figure AII.5). As a consequence the units are not by definition related anymore to the vertical stroke width, and subsequently the system is more versatile. However, these units are organical: they are distilled from the intrinsic patterning of the design itself. This forms the basis for the parameterised cadence-units fitting.

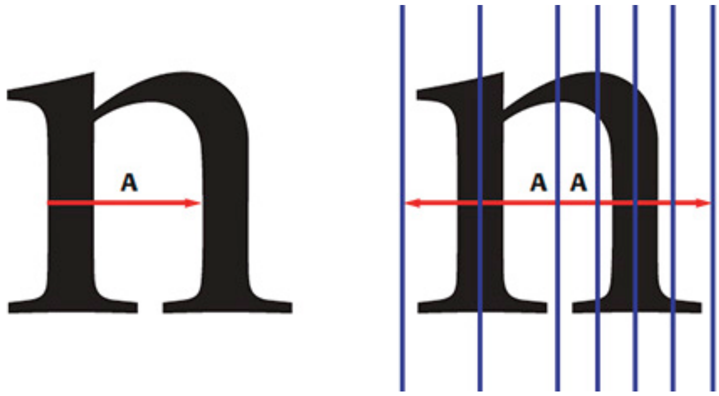


Figure AII.5 Cadence units are the result of a division of the stem interval.

Cadence units are always font-specific. This in contrast with the units that are used in digital font tools, which are always universal. The density of the units can be defined by the user and can be as refined as is preferred. However, this resolution does not have to be extremely high to generate a detailed spacing. That is one of the strengths of the system: a smaller design-related unit-arrangement system makes fitting easier to oversee and more controllable.

If types are morphologically related, a comparable fitting system can be exchanged between the types. The simplest way is to translate side-bearings into cadence units and to store these in a table. Because the size of cadence units is always font-specific, the units will become smaller or wider if the stem interval decreases or increases respectively. One can compare the effect with playing an accordion. The distances to the side bearings can be measured from stems or from extremes (curves or serifs). Distilled values can be listed and used for morphologically related typefaces, irrespective of whether these are more condensed or wider than the archetypal model.

The table system is a simplification and a translation of a patterning that was at the basis of textura and roman type. Initially a relatively simple pattern was required to control all aspects of the Renaissance type production and also to make the justification of lines simpler. Later in history the system shifted to an optical interpretation of the early systematisation and standardisation. In the eighteenth century so-called set patterns (bundles of precast type for setting the registers of the mould) were delivered together with matrices that do not show the initial standardised widths. And in that case the stem interval is not the dominant factor anymore, but the focus comes on equilibrium of white space. And looking primarily – if not only– at the white space in counters and between characters is what is taught in type design (and typography) nowadays.

This equilibrium-approach results by definition in an interruption of the stem interval if one does not take the latter into account. It is highly plausible that Jenson's asymmetric serifs, like the ones of the lowercase n, were meant to position the characters measurably centred in their widths. By shortening the serifs of the lowercase n at the left and enlarging them at the right, the weight was balanced at both sides and the side-bearings placed at equal distances from the stems. Nowadays type designers will for instance put somewhat more space at the left side of the i in comparison with the left side of the l.

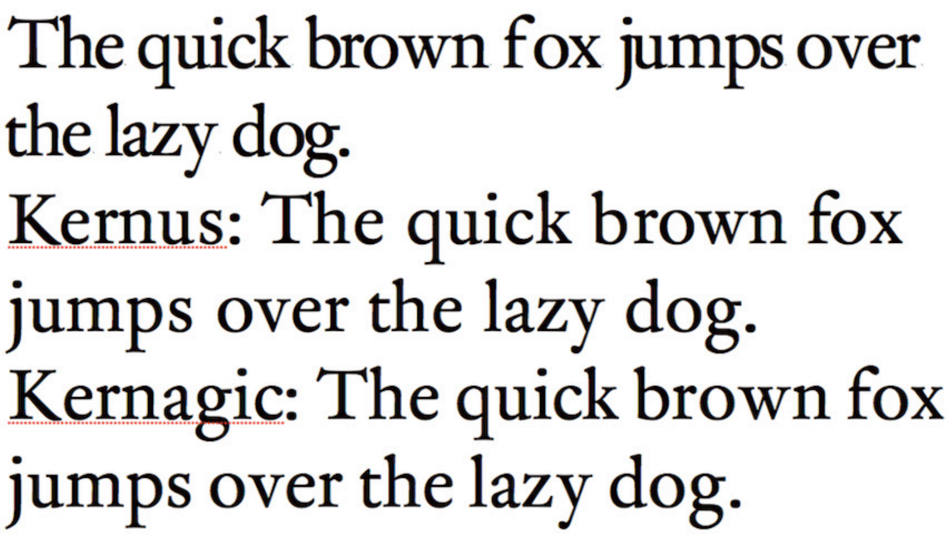


Figure AII.6 DTL Fell with zero side-bearings, Kernus 3.0 fitting, and Kernagic fitting.

The IKARUS-based[488] program Kernus 3.0, developed by the German software and type company URW(++) calculates the space between characters based on a couple of key characaters, like the lowercase n and o. It rasterizes the areas between characters and takes a couple of (exception) rules into account, like to prevent collisions between parts of different letters. Depending on the design, for instance the lengths of serifs can differ in basically identical situations and consequently the stem interval, will be to some extent interrupted. As mentioned, for cadence-based fitting the stem interval forms the basis. Figure A11.6 shows respectively DTL Fell with zero side-bearings, Kernus 3.0 fitting, and Kernagic fitting.

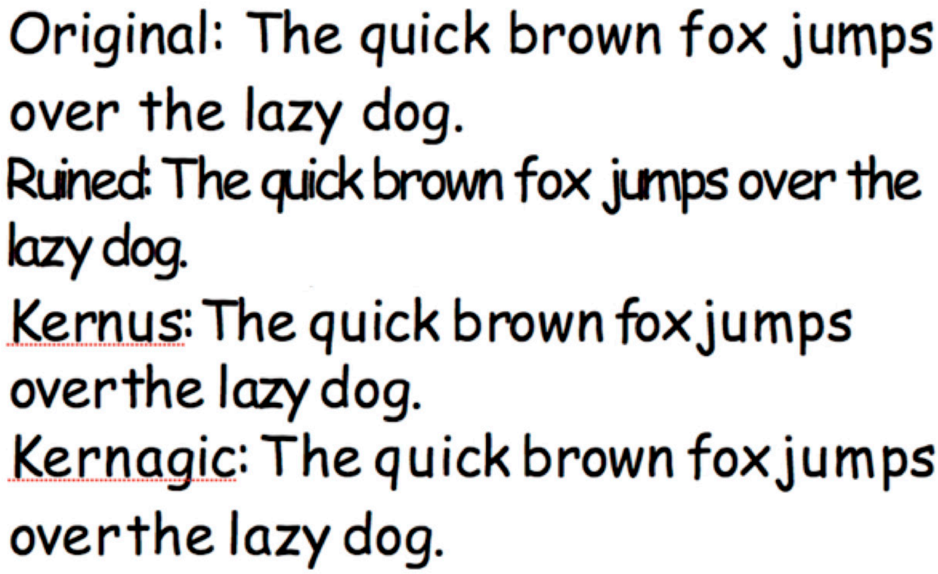


Figure A11.7 Comic Sans with zero side-bearings, Kernus 3.0 fitting, and Kernagic fitting.

If a design clearly deviates from the archetypal models, like Comic Sans, then it looks obvious that trying to achieve equilibrium of white space by seems to make more sense than trying to distil (and subsequently apply) a candence-based fitting. However, the related test (Figure A11.7) shows a mixed result. Partly the Kernus 3.0 approach provides better spacing and partly the Kernagic outcomes are preferable. The required relation to the archetypal font used for generating the list of values, implies that a font with for instance very flat curves requires more units from the extremes of these curves to the side bearings. The idea is that at the end the application that applies such tables is capable of recognizing the degree of flatness and also whether the typeface is serifed or a sans serif. The first range of the following tests were made with Kernagic, which lacks such intelligence. However, during these

488 <https://en.wikipedia.org/wiki/Ikarus_(typography_software)>

test the implementation of the cadence-units system into another tool named LS Cadencer, which supports the basis for such intelligence, was initiated.

AII.3 Kernagic tests

For these tests so-called ‘Cadence Units Spacing Table’ (CUST) files have been used. The values in these tables are based on the ones distilled from archetypal fonts. The tables use 32 units from left of left stem to left of right stem of lowercase n, which is the stem interval (Figure AII.8).

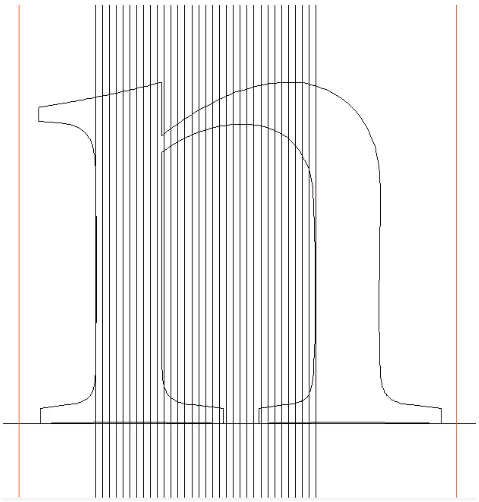


Figure AII.8 For the Kernagic tests the stem interval was divided into 32 cadence units.

For defining the tables a range of typefaces that can be considered archetypal was analysed. In case of the Renaissance Roman [Regular] CUST file, Adobe Jenson, Adobe Garamond, and DTL Haarlemmer formed the basis. Subsequently the table was empirically adjusted and fixed while applying it on a range of test fonts. For the Humanist Sans Roman [Regular] CUST file DTL Haarlemmer Sans was selected as archetypal font, and for the Grotesk Roman [Regular] CUST file DTL Nobel. The applied CUST versions are preliminary and no doubt the system will be improved over time.

It should be mentioned here that for calculating the distances to the side bearings the grid is actually moved. The higher the resolution of the grid, the less this movement is necessary. The more one dilutes the table the more the grid becomes universal: it will be applicable to every morphologically related font without the necessity to shift the units before applying them. In case of a 64-units grid for the stem interval, stems and curves will fit within the grid. It should also mentioned that the grids that seem to have been applied by Renaissance punchcutters is less refined than the ones used for these tests. A grid with a relatively low resolution basically requires the adaptation of the design to the grid.

The big advantage of the system is that the units applied are organic, i.e., distilled from the type itself, as mentioned. This in contrast with the digital grid for the em in which a present-day type designer normally designs and which is also used to define the fitting and kerning. Usually this 1000 units or a multiple of this value, and this is unnecessarily refined for positioning the side bearings. At the end the cadence units are translated into the actual em-units. This inevitably results in some rounding when the stem interval has to be divided into a certain number of units. However, the tests seem to prove that the tolerance is quite acceptable. An alternative method would be to adjust the stem interval to the grid.

If a typeface is not deliberately designed on a cadence-unit grid, the system can be used for spacing still, as is proven by the fitting tests. By diluting the grid, the boundaries of the glyphs of such a typeface will fit in the grid eventually. Hence, a 64-unit grid will theoretically be even more universal, but preliminary tests show not much difference in the outcomes in comparison with a 32-unit grid.

Even if one does apply the fitting optically, the auto-spacing (preferably) in combination with the display of the underlying pattern can help to improve matters. It provides a second opinion and one can compare one's optical spacing with an approach that formed the basis for the conditioning of the type designer's eye. One can even adjust proportions to the distilled patterns.

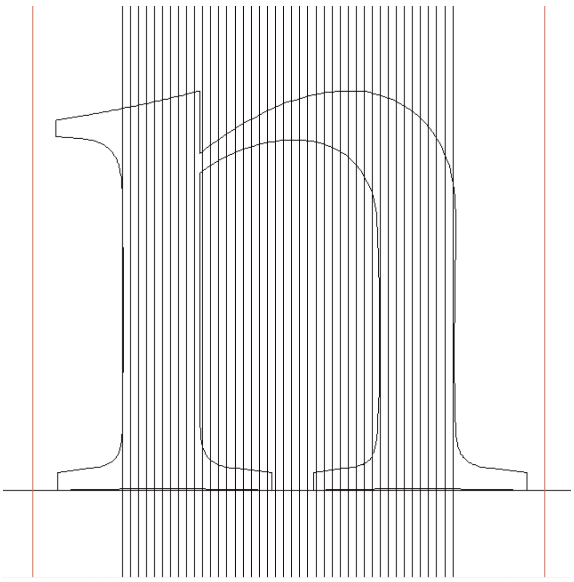


Figure A11.9 A bug in Kernagic results in a different definition of the stem interval.

The CUST files' table headers show some deviations from the default 32 units. The reason for this is that the applied version of Kernagic calculates the n-basis from left of left stem to right of right stem of lowercase n (Figure AII.9), instead of from left of left stem to left of right stem. This is actually a bug. Because the latter distance is the stem interval and the stem-thickness is not always the same, this makes the interpretation of the tables slightly inaccurate. The bug can be circumvented by dividing the stem interval into 32 units and to subsequently divide the distance of left of left stem to right of right stem of lowercase n by the value of the distilled cadence-unit. However, the deviation is in general small; for instance in case of Times New Roman the rounded outcome was 42 units and in case of Baskerville 40. However, in case of the latter the conversion to the nearest integer resulted in an identical grid as with 41 units, as is shown below.

The invention of printing from movable types was one of
the chief events affecting the history of European civiliza-
tion. The task of duplicating texts without variance was im-
possible before Gutenberg equipped the scholar with the
accuracy of type.

Figure AII.10 Times New Roman's original fitting.

The invention of printing from movable types was one of the
chief events affecting the history of European civilization.
The task of duplicating texts without variance was impossible
before Gutenberg equipped the scholar with the accuracy of
type.

Figure AII.11 Times New Roman spaced with Kernagic (CUST: Renaissance Roman, n_basis: 41 [default]).

The invention of printing from movable types was one of the
chief events affecting the history of European civilization.
The task of duplicating texts without variance was impossible
before Gutenberg equipped the scholar with the accuracy of
type.

Figure AII.12 Times New Roman spaced with Kernagic (CUST: Renaissance Roman, n_basis: 42).

It is not peculiar that there is not much tolerance when it comes to the n_basis value, because the horizontal proportions of most typefaces for text purposes are closely related to the archetypal models from the Renaissance. So, the default number of units specified in the CUST files are commonly shared values. In case there was a deviation, i.e., a font-specific value applied, this is mentioned in the tests. The outcomes are preceded by a text typeset in the original version of the font. Because this test focused on the fitting and kerning was not implemented, kerning has been turned off for all texts.

The CUST system works in such a way that the distilled units are font-specific. For applying a CUST file, the proportions do not have to be exactly identical to the archetypal ones used for defining the table; as long as the morphology is related, the system will work. The applied tables use a certain number of units for creating side bearings (see text above). The number of units defined in the 'n-basis' entry can be manipulated however: a larger value will make the spacing more condensed (the units become smaller) and a smaller value makes the spacing wider (the units become larger). All values can be altered on the fly in a text editor when a font is opened in Kernagic.

AII.4 Bold variants

Bold weights are deviations from the original pattern of roman type, which was initially only meant for the 'regular' weight. One can approach the bold weights in two ways: with a specifically adapted table representing the narrower counters and hence the small distances to the side bearings in comparison with the regular weight (Figure AII.13), or by adapting the same table as is used for the regular weight, taking into account that the bold weight is a variant of the regular one. In the latter case the same unit-values can be used as for the regular weight if the size of the units is decreased.

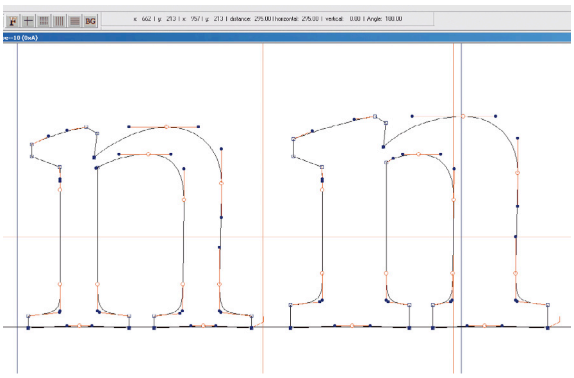


Figure AII.13 Bold weights have narrower counters than regular weights and require a tighter spacing.

In the tests following this recapitulation, the same tables have been used for the regular, (the intermediate) medium, and bold weights. In general the counters (horizontally measured) of the bold weights are roughly 25 percent smaller as those of the regular ones. Hence, the medium weights are around 12.5 percent smaller. As default the number of units have been relatively adjusted in the tables for the medium and bold weights.

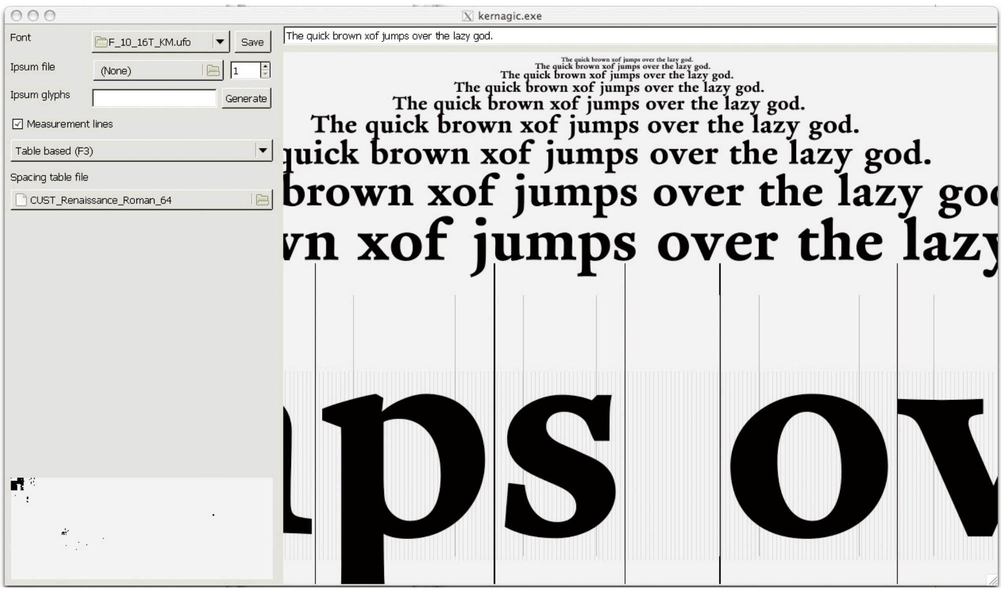


Figure AII.14 Cadence-units spacing of the bold variant of DTL Fell in Kernagic.

AII.5 Italic variants

Italic (or cursive) variants can be handled the same way as the roman type ones, i.e., using a specific table based on archetypal models. However, this requires a more precise point of measurement of the stems. Another matter that should be taken into account is the angle of the italics, which can differ quite a bit. When it comes to shape, roughly two archetypal models for italics can be traced: the Italian Renaissance italic (think of Arrighi) with its basically interrupted construction and the French Renaissance cursive (think of Granjon and Guyot) with its basically uninterrupted construction and rounder shapes

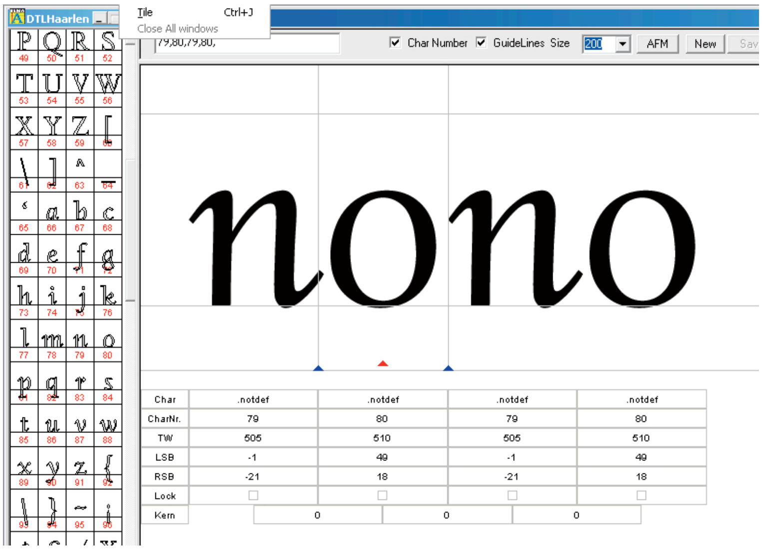


Figure AII.15 An upwards-slanted version of the cursive of DTL Haarlemmer was made for testing.

Preliminary tests were also made with an upwards-slanted variant cursive of DTL Haarlemmer to investigate whether this could be handled like roman type using roman-type CUST file (Figure AII.16). The outcomes have not been very satisfactory so far.

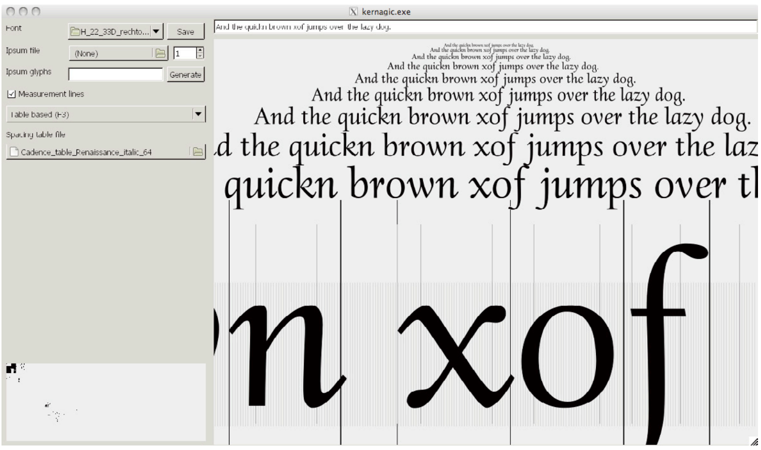


Figure AII.16 Spacing test in Kernagic with an upwards-slanted version of the cursive of DTL Haarlemmer.

AII.6 Environmental setting Kernagic tests

The workflow on a Mac OS X.5 system (this system is relatively old, but used for parts of DTL's font-production workflow still) was as follows: first an OpenType CFF font (.otf) was converted to the UFO format in the font editor FontForge under X11 (Figure AII.17).

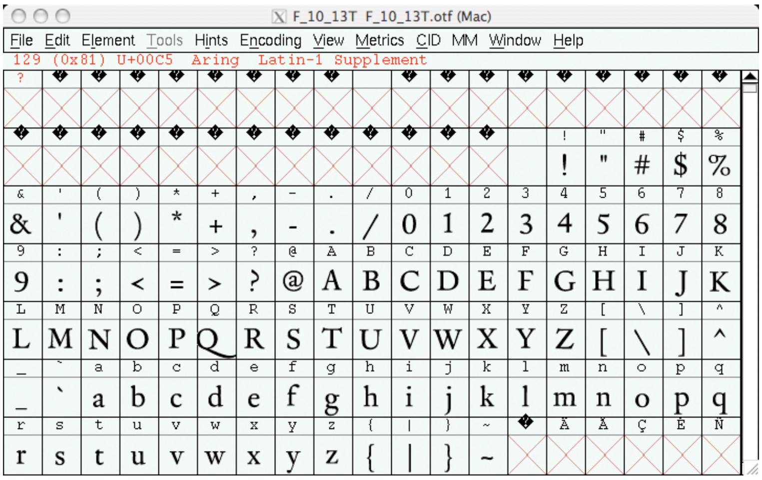


Figure AII.17 An OpenType CFF font was converted to the UFO format.

Second, the UFO file was opened in Kernagic (running in a Wineskin environment) and a CUST file was applied (Figure AII.18). The new fitting was calculated in a split second. Third, FontForge was used to generate an OpenType CFF font from the UFO file.

Figure AII.18 The UFO file was auto-spaced in Kernagic.

Fourth, the .otf was converted to .be format using DTL BezierMaster. The last step was necessary because the applied version of Kernagic contains bugs for the calculating the left side bearing of the lowercase g and the right side bearing of the lowercase f. These values were manually corrected by placing the distilled grid behind the characters in question and subsequently changing the side bearings according to the values in the table (Figure AII.19).

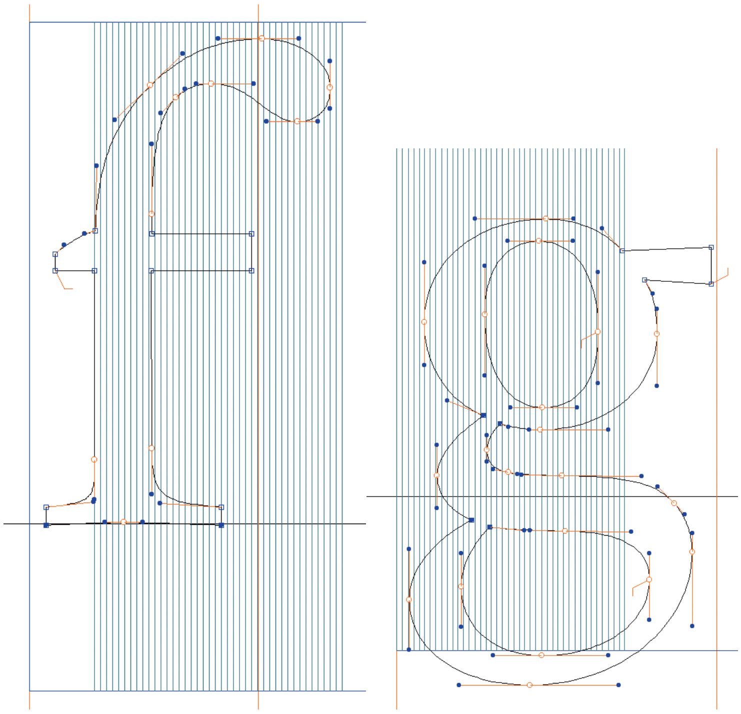


Figure AII.19 The distilled grid was reproduced in BezierMaster for the application of manual corrections .

There was inevitably some rounding involved, because the grid can only be defined in integers. This manual grid-fitting could also have been done directly in FontForge, but it felt more convenient for me in BezierMaster (which was for a large part developed to my needs). Next CFF-based OpenType font was generated for typesetting in QuarkXpress 7 (the use of the latter application was quite arbitrary; it was just available on the testing system).

Although theoretically Kernagic should have been able to read-in the width of the wordspace in units too, this was unfortunately not always done properly during this test (to be investigated). Subsequently, in all fonts to which Kernagic has been applied, the word space has been defined as 1/5 of the em, i.e., 200 units. In most cases this made the line lengths by definition a bit different in comparison with the original spacing, irrespective of the deviations in the fitting of the characters (most fonts have a default word space which is too large anyway). However, all DTL fonts (with exception of condensed variants) have a word space of 200 units.

All tests are preceded by the applied CUST's:

– CUST_Renaissance_Roman_32

– CUST_Humanist_Sans_32

– CUST_Humanist_Sans_semi_flat_32

– CUST_Grotesk_32

AII.7 LS Cadencer tests

Just like Kernagic, the LS Cadencer is a tool for the batch fitting ('auto-spacing') of fonts. The LS Cadencer uses cadence units (distilled from the stem interval) to position the side bearings from either extremes on the x-axis or stems (Figure AII.20).

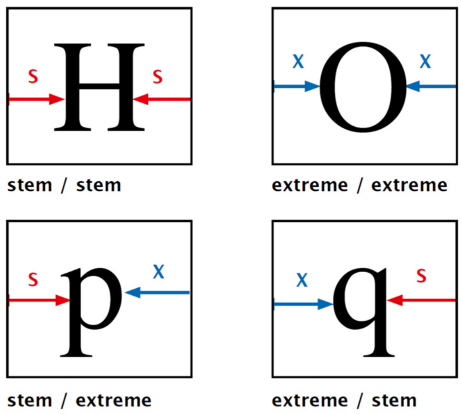
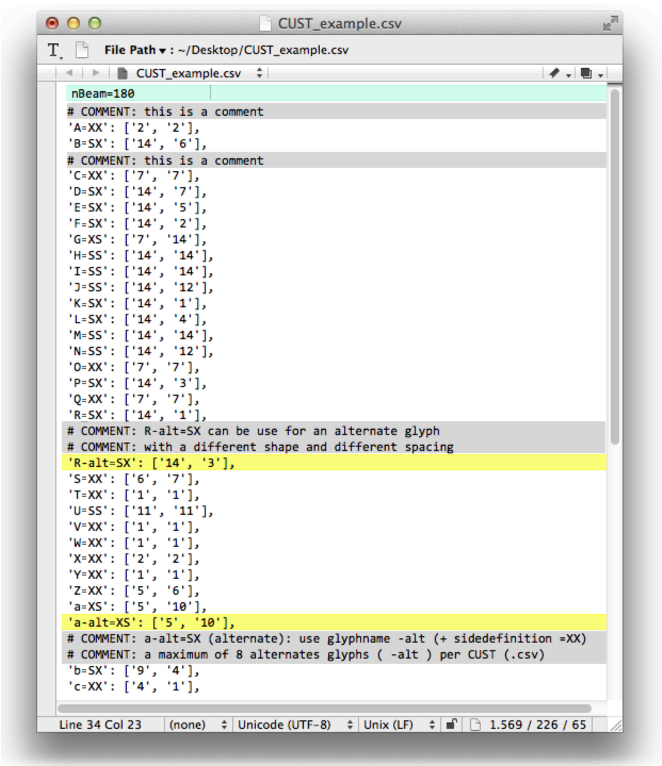


Figure AII.20 Positioning of the side bearings (using units) is done from either stem (s) or extreme (x).

To apply units for the positioning of the side bearings, pre-defined CUST files that I developed are used (Figure AII.21). These tables are fully comparable with the one shown in Figure 5.23.



CUST_example.csv
File Path ▾ : ~/Desktop/CUST_example.csv
CUST_example.csv

```
nBeam=180
# COMMENT: this is a comment
'A=XX': ['2', '2'],
'B=SX': ['14', '6'],
# COMMENT: this is a comment
'C=XX': ['7', '7'],
'D=SX': ['14', '7'],
'E=SX': ['14', '5'],
'F=SX': ['14', '2'],
'G=XS': ['7', '14'],
'H=SS': ['14', '14'],
'I=SS': ['14', '14'],
'J=SS': ['14', '12'],
'K=SX': ['14', '1'],
'L=SX': ['14', '4'],
'M=SS': ['14', '14'],
'N=SS': ['14', '12'],
'O=XX': ['7', '7'],
'P=SX': ['14', '3'],
'Q=XX': ['7', '7'],
'R=SX': ['14', '1'],
# COMMENT: R-alt=SX can be use for an alternate glyph
# COMMENT: with a different shape and different spacing
'R-alt=SX': ['14', '3'],
'S=XX': ['6', '7'],
'T=XX': ['1', '1'],
'U=SS': ['11', '11'],
'V=XX': ['1', '1'],
'W=XX': ['1', '1'],
'X=XX': ['2', '2'],
'Y=XX': ['1', '1'],
'Z=XX': ['5', '6'],
'a=XS': ['5', '10'],
'a-alt=XS': ['5', '10'],
# COMMENT: a-alt=SX (alternate): use glyphname -alt (+ sidedefinition =XX)
# COMMENT: a maximum of 8 alternates glyphs ( -alt ) per CUST (.csv)
'b=SX': ['9', '4'],
'c=XX': ['4', '1'],
```

Line 34 Col 23 | (none) | Unicode (UTF-8) | Unix (LF) | 1.569 / 226 / 65

Figure AII.21 An example of a CUST table.

The LS Cadencer uses a slightly more refined method than Kernagic for positioning the points of measurement: the adjustable ‘n-beam’ (Figure A11.22) plus a few optional exceptions for the lowercase f (‘f-beam’) and g (‘g-beam’). These beams define the horizontal position from where the units to the side bearing must be calculated. For example, if the terminal of the f is used as starting point for the positioning of the right side bearing, the outcome will clearly differ than if the crossbar of the f is used as starting point.

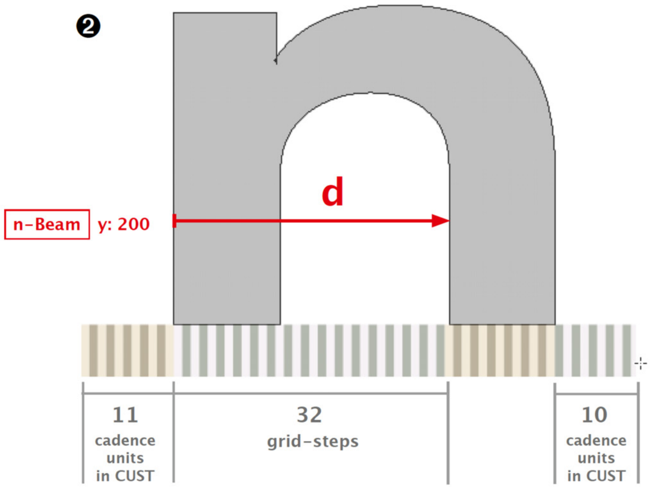


Figure A11.22 Beams, such as the ‘n-beam’ are used for determining from which position units are applied.

The LS Cadencer displays grids and beams by default in the glyph-editing windows of the Glyphs and RoboFont font editors (Figure A11.23), in this way also providing the option to manually supersede the positioning of the side bearings using the calculated cadence units in the background. The display of the grid in the background of the characters also makes it possible to adjust the characters to the grid itself. This will make the patterning a conscious part of the design process. Such grid fitting is in line with the patterning I distilled from Jenson’s archetypal model, as discussed in Section 2 of Chapter 5. The application of cadence units is not restricted to roman type: they also work –using adapted tables– for italics. Hence, there is an option to slant the side bearings to the angle of the glyphs before the units are applied.

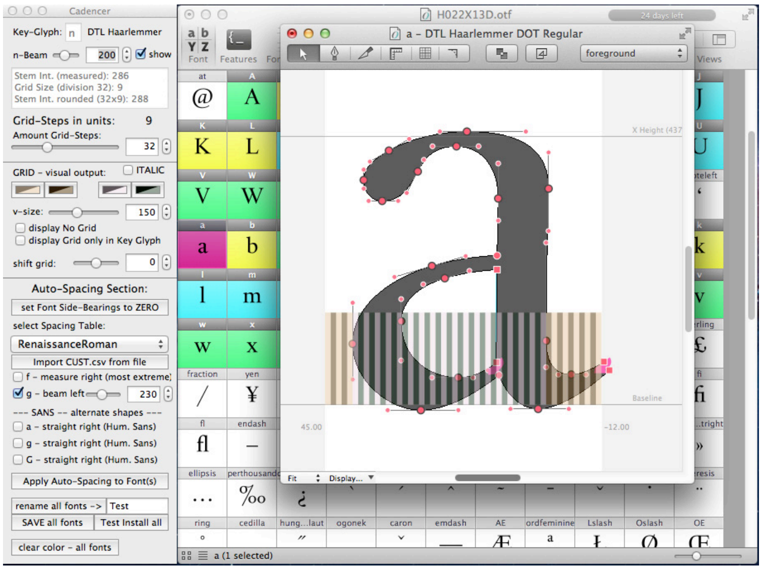


Figure AII.23 Grids and beams are displayed by LS Cadencer in the glyph-editing window

For fine-tuning the spacing, the division of the stem interval into cadence units can be altered by either increasing or decreasing the number of units. Because the position of the side bearings is defined in units and the number is fixed in the CUST files, an increased amount of units results in a tighter fitting, and a decreased amount in a wider one.

AII.8 Environmental setting LS Cadencer tests

The pages with auto-spaced type that follow the outcomes of the Kernagic tests, are the result of the application of the LS Cadencer extension in Robofont under system Mac OS X.7 on a MacBook Pro. The fonts were fitted in presence of their creators, i.e., TypeMedia students, at the KABK on the morning of Wednesday 11 February 2015.[489] The PDF's containing the type specimens and the table comparisons were generated on Thursday 12 February 2015.

AII.9 LS Cadenculator tests

The LS Cadenculator translates the fitting of characters into distances from either extremes on the x-axis or stems to the side bearings, which are then defined in cadence units. For this it uses the centre of the x-height for measurements by default, but a beam can be used here as well for altering the vertical point of measurement. The outcomes of the measurements are stored in cust files; these files can be imported into the LS Cadencer tool and subsequently used for the spacing of fonts.

489 With exception of Jasper Terra's Roman Regular type, which was cadenced a couple of days earlier.

LS Cadenculator can generate CUST files based on the spacing measured in single fonts or in multiple fonts, in which case it will calculate the most commonly used spacing among the fonts measured. The generated CUST files can be adapted in a text editor or directly in the LS Cadencer tool. Reports of the measurements can be stored in text files and as graphs in PDF format, as shown at the end of this appendix.

```
Cadence Units Spacing Table
Renaissance Roman [Regular-Bold]
Version 0.1

n_basis: 41

A extreme 2 extreme 2
B stem 14 extreme 6
C extreme 7 extreme 7
D stem 14 extreme 7
E stem 14 extreme 5
F stem 14 extreme 2
G extreme 7 stem 14
H stem 14 stem 14
I stem 14 stem 14
J stem 14 stem 12
K stem 14 extreme 1
L stem 14 extreme 4
M stem 14 stem 14
N stem 14 stem 12
O extreme 7 extreme 7
P stem 14 extreme 3
Q extreme 7 extreme 7
R stem 14 extreme 1
S extreme 6 extreme 7
T extreme 1 extreme 1
U stem 11 stem 11
V extreme 1 extreme 1
W extreme 1 extreme 1
X extreme 2 extreme 2
Y extreme 1 extreme 1
Z extreme 5 extreme 6

a extreme 5 stem 10
b stem 9 extreme 4
c extreme 4 extreme 1
d extreme 4 stem 10
e extreme 4 extreme 3
f stem 11 extreme 1
g extreme 5 extreme 1
h stem 10 stem 10
i stem 11 stem 10
j stem 10 stem 9
k stem 10 extreme 0
l stem 10 stem 10
m stem 11 stem 10
n stem 11 stem 10
o extreme 4 extreme 4
p stem 10 extreme 4
q extreme 4 stem 9
r stem 11 extreme 0
s extreme 4 extreme 4
t stem 9 extreme 1
u stem 10 stem 11
v extreme 0 extreme 0
w extreme 0 extreme 0
x extreme 0 extreme 0
y extreme 0 extreme 0
z extreme 4 extreme 4

. extreme 7 extreme 7
: extreme 7 extreme 7
; extreme 7 extreme 7
, extreme 6 extreme 7
```

```
DTL Fell [Regular]
-with zero side bearings:
```

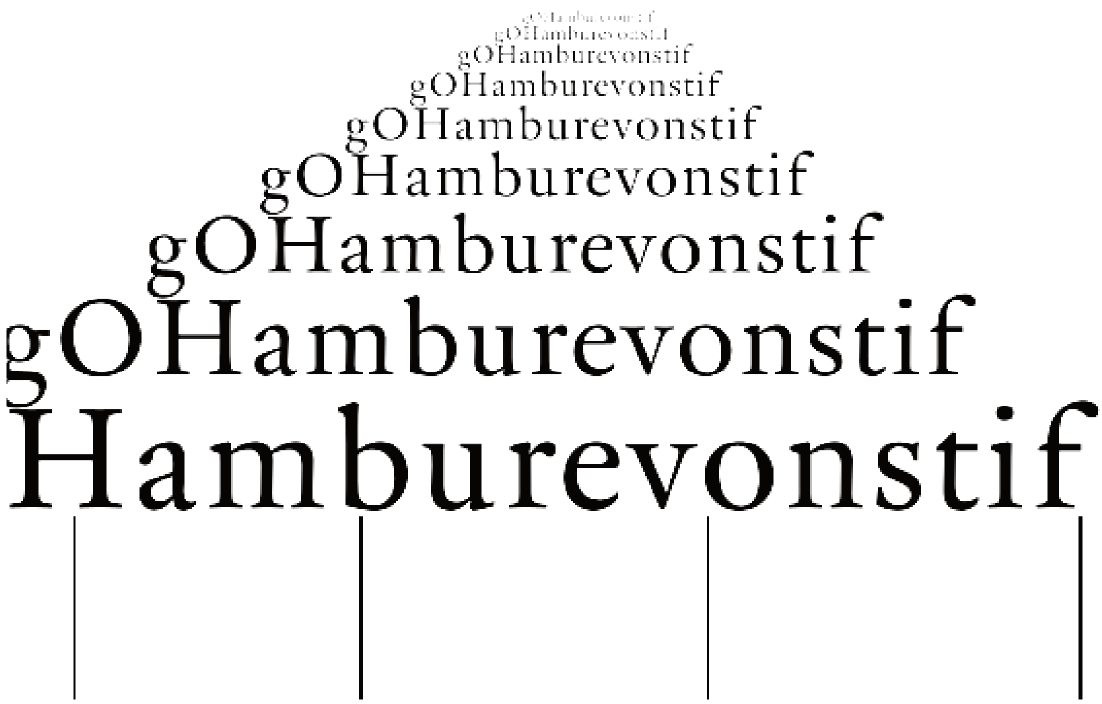
The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

```
DTL Fell [Regular] Kernagic
-table: Renaissance Roman [Regular] version 0.1
n_basis: 41 (default)
```

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

```
DTL Fell [Regular] Kernagic
-table: Renaissance Roman [Regular] version 0.1
n_basis 32 (the number of units is decreased; as a result the units are larger)
note: because some characters like r (right side) and v have zero-unit side bearings in
the table, larger units disturb the even distribution of the wider spacing. For this
reason instead of zero a single unit would be better. If that is considered too wide for
the default setting, the resolution can for instance be doubled, i.e., 128 units for the
n_basis.
```

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.



```
DTL Fell [Regular] Kernagic
-table: Renaissance Roman [Regular] version 0.1
n_basis: 32 with zero-unit side bearings replaced by one-unit side bearings
```

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

```
DTL Fell [Regular] Kernagic
-table: Renaissance Roman [Regular] version 0.1
n_basis: 50 (the number of units is increased; as a result the units are smaller)
note: also here the problem the zero-unit side bearings occur.
```

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

```
DTL Fell [Medium]
-with zero side bearings:
```

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

```
DTL Fell [Medium] Kernagic
-table: Renaissance Roman [Regular-Bold] version 0.1
n_basis: 47
```

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

```
DTL Fell [Bold]
-with zero side bearings:
```

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

```
DTL Fell [Bold] Kernagic
-table: Renaissance Roman [Regular-Bold] version 0.1
n_basis: 51
```

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

```
Adobe Jenson Pro [Regular]
-default, i.e., original fitting
```

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

```
Adobe Jenson Pro [Regular] Kernagic
-table: Renaissance Roman [Regular] version 0.1
n_basis: 41 (default)
```

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

```
(Monotype) Bembo Book [Regular]
-default, i.e., original fitting
```

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

```
(Monotype) Bembo Book [Regular] Kernagic
-table: Renaissance Roman [Regular] version 0.1
n_basis: 41 (default)
note: TrueType format (encountered problems during generation of .otf [to be investi-
gated]).
```

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

```
Adobe Garamond Pro [Regular]
-default, i.e., original fitting
```

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

```
Adobe Garamond Pro [Regular] Kernagic
-table: Renaissance Roman [Regular] version 0.1
n_basis: 41 (default)
```

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

```
Adobe Garamond Pro [Bold]
-default, i.e., original fitting
```

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

```
Adobe Garamond Pro [Regular-Bold] Kernagic
-table: Renaissance Roman [Regular] version 0.1
n_basis: 51
```

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

```
DTL VandenKeere [Regular]
-default, i.e., original fitting
```

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

```
DTL VandenKeere [Regular] Kernagic
-table: Renaissance Roman [Regular] version 0.1
n_basis: 41 (default)
```

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

```
Adobe Minion Pro [Regular]
-default, i.e., original fitting
```

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

```
Adobe Minion Pro [Regular] Kernagic
-table: Renaissance Roman [Regular] version 0.1
n_basis: 41 (default)
```

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

```
Arno Pro [Regular]
–default, i.e., original fitting
```

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

```
Arno Pro [Regular] Kernagic
–table: Renaissance Roman [Regular] version 0.1
n_basis: 41 (default)
note: TrueType format (encountered problems during generation of .otf [to be investi-
gated]).
```

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

```
Times New Roman [Regular]
-default, i.e., original fitting
note: the fitting of the digital TNR is somewhat irregular due to the underlying
18 units-arrangement system of the hot-metal composing machine.
```

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

```
Times New Roman [Regular] Kernagic
-table: Renaissance Roman [Regular] version 0.1
n_basis: 41 (default)
```

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

```
Adobe Caslon Pro [Regular]
-default, i.e., original fitting
```

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

```
Adobe Caslon Pro [Regular] Kernagic
-table: Renaissance Roman [Regular] version 0.1
n_basis: 41 (default)
```

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

```
DTL Fleischmann (text) [Regular]
-default, i.e., original fitting
```

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

```
DTL Fleischmann (text) [Regular] Kernagic
-table: Renaissance Roman [Regular] version 0.1
n_basis: 41 (default)
```

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before G utenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

```
(Monotype) Baskerville [Regular]
-default, i.e., original fitting
note: TrueType (.dfont)
```

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

```
(Monotype) Baskerville [Regular] Kernagic
-table: Renaissance Roman [Regular] version 0.1
n_basis: 41 (default)
note: converted to .otf
```

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

```
DTL Haarlemmer [Regular]
-default, i.e., original fitting
```

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

```
DTL Haarlemmer [Regular] Kernagic
-table: Renaissance Roman [Regular] version 0.1
n_basis: 41 (default)
```

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

```
DTL Haarlemmer [Medium]
-default, i.e., original fitting
```

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

```
DTL Haarlemmer [Medium] Kernagic
-table: Renaissance Roman [Regular-Bold] version 0.1
n_basis: 47 (default)
```

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

DTL Haarlemmer [Bold]
-default, i.e., original fitting

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

DTL Haarlemmer [Regular] Kernagic
-table: Renaissance Roman [Regular-Bold] version 0.1
n_basis: 51

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

```
DTL Documenta [Regular]
-default, i.e., original fitting
```

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

```
DTL Documenta [Regular] Kernagic
-table: Renaissance Roman [Regular] version 0.1
n_basis: 41 (default)
```

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

```
Cadence Units Spacing Table
Humanist Sans
Version 0.1

n_basis 40

A extreme 4 extreme 4
B stem 10  extreme 6
C extreme 6 extreme 5
D stem 10  extreme 6
E stem 10  extreme 3
F stem 10  extreme 2
G extreme 6 stem 9
H stem 10  stem 10
I stem 10  stem 10
J stem 10 stem 10
K stem 10  extreme 1
L stem 10  extreme 3
M stem 10  stem 10
N stem 10  stem 10
O extreme 6 extreme 6
P stem 10  extreme 2
Q extreme 6 extreme 6
R stem 10  extreme 1
S extreme 6 extreme 7
T extreme 1 extreme 1
U stem 9 stem 9
V extreme 1 extreme 1
W extreme 1 extreme 1
X extreme 2 extreme 2
Y extreme 1 extreme 1
Z extreme 4 extreme 4

a extreme 4 stem 10
       # for a with straight stem:
       # a extreme 4 stem 8
b stem 9 extreme 4
c extreme 4 extreme 1
d extreme 4 stem 9
e extreme 4 extreme 4
f stem 10 extreme 1
g extreme 6 extreme 1
h stem 9 stem 8
i stem 9 stem 9
j stem 9 stem 9
k stem 9 extreme 1
l stem 9 stem 9
m stem 9 stem 8
n stem 9 stem 8
o extreme 4 extreme 4
p stem 9 extreme 4
q extreme 4 stem 9
r stem 9 extreme 0
s extreme 4 extreme 4
t stem 10 extreme 2
u stem 8 stem 9
v extreme 1 extreme 1
w extreme 1 extreme 1
x extreme 2 extreme 2
y extreme 1 extreme 1
z extreme 3 extreme 3

. extreme 5 extreme 5
: extreme 6 extreme 6
; extreme 6 extreme 6
, extreme 4 extreme 4
```

```
DTL Haarlemmer Sans [Regular]
-default, i.e., original fitting
```

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

```
DTL Haarlemmer Sans [Regular] Kernagic
-table: Humanist Sans [Regular] version 0.1
n_basis: 40 (default)
note: because the font formed the main basis (so far) for this table, the outcome is
almost identical to the original fitting.
```

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

```
DTL Caspari [Regular]
-default, i.e., original fitting
```

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

```
DTL Caspari [Regular] Kernagic
-table: Humanist Sans [Regular] version 0.1
n_basis: 40 (default)
note: the original fitting is a bit tight.
```

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

```
(Monotype) Gill Sans [Regular]
-default, i.e., original fitting
```

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

```
(Monotype) Gill Sans [Regular] Kernagic
-table: Humanist Sans [Regular] version 0.1
n_basis: 40 (default)
```

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

```
DTL Prokyon [Regular]
-default, i.e., original fitting
```

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

```
DTL Prokyon [Regular] Kernagic
-table: Humanist Sans [Regular] version 0.1
n_basis: 40 (default)
note: left side bearing of g identical to that of d.
```

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

Cadence Units Spacing Table
For **Humanist-related Sans with semi-flat curves** like Lucida Grande.
Version 0.1

```
n_basis 40

A extreme 4 extreme 4
B stem 10  extreme 6
C extreme 8 extreme 5
D stem 10  extreme 7
E stem 10  extreme 3
F stem 10  extreme 2
G extreme 7 stem 9
H stem 10  stem 10
I stem 10  stem 10
J stem 10 stem 10
K stem 10  extreme 1
L stem 10  extreme 3
M stem 10  stem 10
N stem 10  stem 10
O extreme 7 extreme 7
P stem 10  extreme 2
Q extreme 7 extreme 7
R stem 10  extreme 1
S extreme 6 extreme 7
T extreme 1 extreme 1
U stem 9 stem 9
V extreme 1 extreme 1
W extreme 1 extreme 1
X extreme 2 extreme 2
Y extreme 1 extreme 1
Z extreme 4 extreme 4

a extreme 4 stem 10
       # for a with straight stem:
       # a extreme 4 stem 8
b stem 9 extreme 6
c extreme 6 extreme 2
d extreme 6 stem 9
e extreme 6 extreme 6
f stem 10 extreme 1
# For 'binocular-shaped' g:
# g extreme 6 extreme 1
# For 'single story' g:
g extreme 6 stem 9
h stem 9 stem 8
i stem 9 stem 9
j stem 9 stem 9
k stem 9 extreme 1
l stem 9 stem 9
m stem 9 stem 8
n stem 9 stem 8
o extreme 6 extreme 6
p stem 9 extreme 6
q extreme 6 stem 9
r stem 9 extreme 1
s extreme 4 extreme 4
t stem 10 extreme 2
u stem 8 stem 9
v extreme 1 extreme 1
w extreme 1 extreme 1
x extreme 2 extreme 2
y extreme 1 extreme 1
z extreme 3 extreme 3

. extreme 5 extreme 5
: extreme 6 extreme 6
; extreme 6 extreme 6
, extreme 4 extreme 4
```

Lucida Grande [Regular]
-default, i.e., original fitting

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

Lucida Grande [Regular] Kernagic
-table: Humanist-related Sans [Regular] *semi-flat* version 0.1
n_basis: 40 (default)

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

Lucida Grande [Regular] Kernagic
-table: Humanist-related Sans [Regular] *semi-flat* version 0.1
n_basis: 38

The invention of printing from movable types was one of the chief events affecting the history of Euro-pean civilization. The task of duplicating texts with-out variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prej-udiced connoisseurs in the fifteenth century de-plored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

Lucida Grande [Regular] Kernagic
-table: Humanist-related Sans [Regular] *semi-flat* version 0.1
n_basis: 38 | with corretions: /c RSB+1, /f RSB+1, /t RSB+1, /t RSB+1, /v LSB+1 RSB+1,
/w LSB+1 RSB+1, /y LSB+1 RSB+1

The invention of printing from movable types was one of the chief events affecting the history of Euro-pean civilization. The task of duplicating texts with-out variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prej-udiced connoisseurs in the fifteenth century de-plored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

```
DTL Argo [Regular]
-default, i.e., original fitting
note: the original fitting is a bit tight
```

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

DTL Argo [Regular] Kernagic
-table: Humanist-related Sans [Regular] *semi-flat* version 0.1
n_basis: 40 (default)

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

```
Cadence Units Spacing Table
Grotesks
Version 0.1

n_basis 42

A extreme 1 extreme 1
B stem 10  extreme 6
C extreme 4 extreme 3
D stem 10  extreme 4
E stem 10  extreme 5
F stem 10  extreme 2
       # For G with rounded right side:
       G extreme 4 stem 4
       # For G with stem at the right:
       # G extreme 4 stem 10
H stem 10  stem 10
I stem 10  stem 10
J stem 1 stem 10
K stem 10  extreme 1
L stem 10  extreme 2
M stem 10  stem 10
N stem 10  stem 10
O extreme 4 extreme 4
P stem 10  extreme 1
Q extreme 4 extreme 1
R stem 10  extreme 1
S extreme 3 extreme 5
T extreme 1 extreme 1
U stem 8 stem 8
V extreme 1 extreme 1
W extreme 1 extreme 1
X extreme 1 extreme 1
Y extreme 1 extreme 1
Z extreme 1 extreme 1

a extreme 4 stem 8
b stem 9 extreme 3
c extreme 3 extreme 2
d extreme 3 stem 9
e extreme 3 extreme 3
f stem 9 extreme 1
       # For 'binocular-shaped' g:
       g extreme 3 extreme 9
       # For 'single story' g:
       # g extreme 4 stem 8
h stem 9 stem 8
i stem 9 stem 9
j stem 9 stem 9
k stem 9 extreme 1
l stem 9 stem 9
m stem 9 stem 8
n stem 9 stem 8
o extreme 3 extreme 3
p stem 9 extreme 3
q extreme 3 stem 9
r stem 9 extreme 0
s extreme 3 extreme 4
t stem 8 extreme 1
u stem 8 stem 9
v extreme 1 extreme 1
w extreme 1 extreme 1
x extreme 1 extreme 1
y extreme 1 extreme 1
z extreme 1 extreme 1

. extreme 7 extreme 7
: extreme 8 extreme 8
; extreme 7 extreme 7
, extreme 8 extreme 8
```

DTL Nobel [Regular]
-default, i.e., original fitting

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

DTL Nobel [Regular] Kernagic
-table: Grotesk [Regular] version 0.1
n_basis: 42 (default)
note: because the font formed the main basis (so far) for this table, the outcome is almost identical to the original fitting.

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

```
Futura [Medium]
-default, i.e., original fitting
```

The invention of printing from movable types was one of the chief events affecting the history of Euro-pean civilization. The task of duplicating texts with-out variance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prej-udiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of dis-seminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

```
Futura [Medium] Kernagic
-table: Grotesk [Regular] version 0.1
n_basis: 42 (default)
```

The invention of printing from movable types was one of the chief events affecting the history of European civilization. The task of duplicating texts without vari-ance was impossible before Gutenberg equipped the scholar with the accuracy of type. Prejudiced connois-seurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the printing press as a method of disseminating knowl-edge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day.

Font: Font Etienne Regular
Designer: Marko
Spacing: original (optical)
Note: based on archetypal model from Garamont

ABCDEFGHIJKLMNOPQRSTUVW
XYZabcdefghijklmnopqrstuvwxyz:,,.;

Lorem ipsum dolor sit amet, consectetuer adipiscing elit, sed diam nonummy nibh euismod tincidunt ut laoreet dolore magna aliquam erat volutpat. Ut wisi enim ad minim veniam, quis nostrud exerci tation ullamcorper suscipit lobortis nisl ut aliquip ex ea commodo consequat. Duis autem vel eum iriure dolor in hendrerit in vulputate velit esse molestie consequat, vel illum dolore eu feugiat nulla facilisis at vero eros et accumsan et iusto odio dignissim qui blandit praesent luptatum zzril delenit augue duis dolore te feugait nulla facilisi. Nam liber tempor cum soluta nobis eleifend option congue nihil imperdiet doming id quod mazim placerat facer possim assum. Typi non habent claritatem insitam; est usus legentis in iis qui facit eo-rum claritatem. Investigationes demonstraverunt lectores legere me lius quod ii legunt saepius. Claritas est etiam processus dynamicus, qui sequitur mutationem consuetudium lectorum. Mirum est notare quam lit-tera gothica, quam nunc putamus parum claram, anteposuerit litterarum formas humanitatis per seacula quarta decima et quinta decima. Eodem modo typi, qui nunc nobis videntur parum clari, fiant

OHamburgefontsiv

Font: Etienne Cadenced Regular
Designer: Marko
Stem Int. measured: 273 | rounded (32x9): 288
Grid Size (division 32): 9

ABCDEFGHIJKLMNOPQRSTUVW
XYZabcdefghijklmnopqrstuvwxyz:,.;

Lorem ipsum dolor sit amet, consectetuer adipiscing elit, sed diam nonummy nibh euismod tincidunt ut laoreet dolore magna aliquam erat volutpat. Ut wisi enim ad minim veniam, quis nostrud exerci tation ullamcorper suscipit lobortis nisl ut aliquip ex ea commodo consequat. Duis autem vel eum iriure dolor in hendrerit in vulputate velit esse molestie consequat, vel illum dolore eu feugiat nulla facilisis at vero eros et accumsan et iusto odio dignissim qui blandit praesent luptatum zzril delenit augue duis dolore te feugait nulla facilisi. Nam liber tempor cum soluta nobis eleifend option congue nihil imperdiet doming id quod mazim placerat facer possim assum. Typi non habent claritatem insitam; est usus legentis in iis qui facit eo-rum claritatem. Investigationes demonstraverunt lectores legere me lius quod ii legunt saepius. Claritas est etiam processus dynamicus, qui sequitur mutationem consuetudium lectorum. Mirum est notare quam lit-tera gothica, quam nunc putamus parum claram, anteposuerit litterarum formas humanitatis per seacula quarta decima et quinta decima. Eodem modo typi, qui nunc nobis videntur parum clari, fiant

OHamburgefontsiv

selected CUST: RenaissanceRoman

A_XX 2 2
B_SX 14 6
C_XX 7 7
D_SX 14 7
E_SX 14 5
F_SX 14 2
G_XS 7 14
H_SS 14 14
I_SS 14 14
J_SS 14 12
K_SX 14 1
L_SX 14 4
M_SS 14 14
N_SS 14 12
O_XX 7 7
P_SX 14 3
Q_XX 7 7
R_SX 14 1
S_XX 6 7
T_XX 1 1
U_SS 11 11
V_XX 1 1
W_XX 1 1
X_XX 2 2
Y_XX 1 1
Z_XX 5 6
a_XS 5 10
b_SX 9 4
c_XX 4 1
colon_XX 7 7
comma_XX 6 7
d_XS 4 10
e_XX 4 3
f_SX 11 1
g_XX 5 1
h_SS 10 10
i_SS 11 10
j_SS 10 9
k_SX 10 0
l_SS 10 10
m_SS 11 10
n_SS 11 10
o_XX 4 4
p_SX 10 4
period_XX 7 7
q_XS 4 9
r_SX 11 0
s_XX 4 4
semicolon_XX 7 7
t_SX 9 1
u_SS 10 11
v_XX 0 0
w_XX 0 0
x_XX 0 0
y_XX 0 0
z_XX 4 4

```
Font: Fournier Ordinaire
Designer: Loris
Spacing: original (optical)
Note: based on model from Fournier
```

ABCDEFGHIJKLMNOPQRST
UVWXYZabcdefghijklmnopqrst
uvwxyz:,.;

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OHamburgefontsiv

Font: Fournier Ordinaire Cadenced Regular
Designer: Loris
Stem Int. measured: 321 | rounded (32x10): 320
Grid Size (division 32): 10

ABCDEFGHIJKLMNOPQRST
UVWXYZabcdefghijklmnopqrst
uvwxyz:,.;

Lorem ipsum dolor sit amet, consectetuer adipiscing elit, sed diam nonummy nibh euismod tincidunt ut laoreet dolore magna aliquam erat volutpat. Ut wisi enim ad minim veniam, quis nostrud exerci tation ullamcorper suscipit lobortis nisl ut aliquip ex ea commodo consequat. Duis autem vel eum iriure dolor in hendrerit in vulputate velit esse molestie consequat, vel illum dolore eu feugiat nulla facilisis at vero eros et accumsan et iusto odio dignissim qui blandit praesent luptatum zzril delenit augue duis dolore te feugait nulla facilisi. Nam liber tempor cum soluta nobis eleifend option congue nihil imperdiet doming id quod mazim placerat facer possim assum. Typi non habent claritatem insitam; est usus legentis in iis qui facit eorum claritatem. Investigationes demonstraverunt lectores legere me lius quod ii legunt saepius. Claritas est etiam processus dynamicus, qui sequitur mutationem consuetudium lectorum. Mirum est notare quam littera gothica, quam nunc putamus parum claram, anteposuerit litter-

---

OHamburgefontsiv

---

selected CUST: Fournier.csv

```
A_XX 2 2
B_SX 14 6
C_XX 7 7
D_SX 14 7
E_SX 14 5
F_SX 14 2
G_XS 7 14
H_SS 14 14
I_SS 14 14
J_SS 14 12
K_SX 14 1
L_SX 14 4
M_SS 14 14
N_SS 14 12
O_XX 7 7
P_SX 14 3
Q_XX 7 7
R_SX 14 1
S_XX 6 7
T_XX 1 1
U_SS 11 11
V_XX 1 1
W_XX 1 1
X_XX 2 2
Y_XX 1 1
Z_XX 5 6
a_XS 5 10
b_SX 9 4
c_XX 4 1
colon_XX 7 7
comma_XX 6 7
d_XS 4 10
e_XX 4 3
f_SX 11 1
g_XX 4 1
h_SS 10 10
i_SS 11 10
j_SS 10 9
k_SX 10 0
l_SS 10 10
m_SS 11 10
n_SS 11 10
o_XX 4 4
p_SX 10 4
period_XX 7 7
q_XS 4 9
r_SX 11 0
s_XX 4 4
semicolon_XX 7 7
t_SX 9 1
u_SS 10 11
v_XX 0 0
w_XX 0 0
x_XX 0 0
y_XX 0 0
z_XX 4 4
```

```
Font: High Contrast
Designer: Bahman
Spacing: original (optical)
Note: none
```

ABCDEFGHIJKLMNOPQRSTUV WXYZabcdefghijklmnopqrstuv wxyz:,.;

Lorem ipsum dolor sit amet, consectetuer adipiscing elit, sed diam nonummy nibh euismod tincidunt ut laoreet dolore magna aliquam erat volutpat. Ut wisi enim ad minim veniam, quis nostrud exerci tation ullamcorper suscipit lobortis nisl ut aliquip ex ea con modo consequat. Duis autem vel eum iriure dolor in hendrerit in vulputate velit esse mo lestie consequat, vel illum dolore eu feugiat nulla facilisis at vero eros et accumsan et ius to odio dignissim qui blandit praesent luptatum zzril delenit augue duis dolore te feugai nulla facilisi. Nam liber tempor cum soluta nobis eleifend option congue nihil imperdiet doming id quod mazim placerat facer possim assum. Typi non habent claritatem insitam est usus legentis in iis qui facit eorum claritatem. Investigationes demonstraverunt lectores legere me lius quod ii legunt saepius. Claritas est etiam processus dynamicus, qui sequitur mutationem consuetudium lectorum. Mirum est notare quam littera gothica,

---

OHamburgefontsiv

```
Font: High Contrast
Designer: Bahman
Stem Int. measured: 331 | rounded (32x10): 320
Grid Size (division [to be checked]): …
```

ABCDEFGHIJKLMNOPQRSTU VWXYZabcdefghijklmnopqrstu vwxyz:,.;

Lorem ipsum dolor sit amet, consectetuer adipiscing elit, sed diam nonummy nibh euismod tincidunt ut laoreet dolore magna aliquam erat volutpat. Ut wisi enim ad minim veniam, quis nostrud exerci tation ullamcorper suscipit lobortis nisl ut aliquip ex ea commodo consequat. Duis autem vel eum iriure dolor in hendrerit in vulputate velit esse molestie consequat, vel illum dolore eu feugiat nulla facilisis at vero eros et accumsan et iusto odio dignissim qui blandit praesent luptatum zzril delenit augue duis dolore te feugait nulla facilisi. Nam liber tempor cum soluta nobis eleifend option congue nihil imperdiet doming id quod mazim placerat facer possim assum. Typi non habent claritatem insitam; est usus legentis in iis qui facit eorum claritatem. Investigationes demonstraverunt lectores legere me lius quod ii legunt saepius. Claritas est etiam processus dynamicus, qui sequitur mutationem consuetudium lectorum. Mirum est notare quam

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OHamburgefontsiv

```
selected CUST: RenaissanceRoman

A_XX 2 2
B_SX 14 6
C_XX 7 7
D_SX 14 7
E_SX 14 5
F_SX 14 2
G_XS 7 14
H_SS 14 14
I_SS 14 14
J_SS 14 12
K_SX 14 1
L_SX 14 4
M_SS 14 14
N_SS 14 12
O_XX 7 7
P_SX 14 3
Q_XX 7 7
R_SX 14 1
S_XX 6 7
T_XX 1 1
U_SS 11 11
V_XX 1 1
W_XX 1 1
X_XX 2 2
Y_XX 1 1
Z_XX 5 6
a_XS 5 10
b_SX 9 4
c_XX 4 1
colon_XX 7 7
comma_XX 6 7
d_XS 4 10
e_XX 4 3
f_SX 11 1
g_XX 5 1
h_SS 10 10
i_SS 11 10
j_SS 10 9
k_SX 10 0
l_SS 10 10
m_SS 11 10
n_SS 11 10
o_XX 4 4
p_SX 10 4
period_XX 7 7
q_XS 4 9
r_SX 11 0
s_XX 4 4
semicolon_XX 7 7
t_SX 9 1
u_SS 10 11
v_XX 0 0
w_XX 0 0
x_XX 0 0
y_XX 0 0
z_XX 4 4
```

```
Font: Jasper Roman Regular
Designer: Jasper
Spacing: original (optical)
Note: none
```

A|B|C|D|E|F|G|H|I|J|K|L|M|N|O|P|Q|R|S|T|U|V|
W|X|Y|Z|a|b|c|d|e|f|g|h|i|j|k|l|m|n|o|p|q|r|s|t|u|v|w|
x|y|z|:|,|.|;|

The invention of printing from movable types was one of the chief events affecting the hist
y of European civilization. The task of duplicating texts without variance was impossible be
re Gutenberg equiped the scholar with the accuracy of type. Prejudiced connoisseurs in the
fteenth century deplored the new mass-production of books, but men of letters eagerly hail
the printing press as a method of disseminating knowledge in permanent form; and the ea
iest printed books soon rivalled in beauty, as they superseded in economy, the fine manusc
pts of their day. Lorem ipsum dolor sit amet, consectetuer adipiscing elit, sed diam nonum
y nibh euismod tincidunt ut laoreet dolore magna aliquam erat volutpat. Ut wisi enim ad m
im veniam, quis nostrud exerci tation ullamcorper suscipit lobortis nisl ut aliquip ex ea cor
modo consequat. Duis autem vel eum iriure dolor in hendrerit in vulputate velit esse moles
e consequat, vel illum dolore eu feugiat nulla facilisis at vero eros et accumsan et iusto odio
gnissim qui blandit praesent luptatum zzril delenit augue duis dolore te feugait nulla facilis

---

OHamburgefontsiv

Font: Jasper Roman Cadenced Regular
Designer: Jasper
Stem Int. measured: 310 | rounded (32x10): 320
Grid Size (division 32): 10

ABCDEFGHIJKLMNOPQRSTUV
WXYZabcdefghijklmnopqrstuvwx
yz:,.;

The invention of printing from movable types was one of the chief events affecting the history o f European civilization. The task of duplicating texts without variance was impossible before G utenberg equiped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century deplored the new mass-production of books, but men of letters eagerly hailed the print ing press as a method of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day . Lorem ipsum dolor sit amet, consectetuer adipiscing elit, sed diam nonummy nibh euismod ti ncidunt ut laoreet dolore magna aliquam erat volutpat. Ut wisi enim ad minim veniam, quis no strud exerci tation ullamcorper suscipit lobortis nisl ut aliquip ex ea commodo consequat. Duis autem vel eum iriure dolor in hendrerit in vulputate velit esse molestie consequat, vel illum dol ore eu feugiat nulla facilisis at vero eros et accumsan et iusto odio dignissim qui blandit praese nt luptatum zzril delenit augue duis dolore te feugait nulla facilisi. Nam liber tempor cum solut

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OHamburgefontsiv

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selected CUST: Renaissance_Jasper.csv

```
A_XX 2 2
B_SX 14 6
C_XX 7 7
D_SX 14 7
E_SX 14 5
F_SX 14 2
G_XS 7 14
H_SS 14 14
I_SS 14 14
J_SS 14 12
K_SX 14 1
L_SX 14 4
M_SS 14 14
N_SS 14 12
O_XX 7 7
P_SX 14 3
Q_XX 7 7
R_SX 14 1
S_XX 6 7
T_XX 1 1
U_SS 11 11
V_XX 1 1
W_XX 1 1
X_XX 2 2
Y_XX 1 1
Z_XX 5 6
a_XS 5 10
b_SX 9 4
c_XX 4 1
colon_XX 7 7
comma_XX 6 7
d_XS 4 10
e_XX 4 3
f_SX 11 2
g_XX 4 2
h_SS 10 10
i_SS 11 10
j_SS 10 9
k_SX 10 0
l_SS 10 10
m_SS 11 10
n_SS 11 10
o_XX 4 4
p_SX 10 4
period_XX 7 7
q_XS 4 9
r_SX 11 0
s_XX 4 4
semicolon_XX 7 7
t_SX 9 1
u_SS 10 11
v_XX 0 0
w_XX 0 0
x_XX 0 0
y_XX 0 0
z_XX 4 4
```

```
Font: Jasper Roman Bold
Designer: Jasper
Spacing: original (optical)
Note: none
```

ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz:,.;

Lorem ipsum dolor sit amet, consectetuer adipiscing elit, sed diam nonummy nibh euismod tincidunt ut laoreet dolore magna aliquam erat volutpat. Ut wisi enim ad mini veniam, quis nostrud exerci tation ullamcorper suscipit lobortis nisl ut aliquip ex ea commodo consequat. Duis autem vel eum iriure dolor in hendrerit in vulputate velit ess molestie consequat, vel illum dolore eu feugiat nulla facilisis at vero eros et accumsan et iusto odio dignissim qui blandit praesent luptatum zzril delenit augue duis dolore te feugait nulla facilisi. Nam liber tempor cum soluta nobis eleifend option congue nihil in perdiet doming id quod mazim placerat facer possim assum. Typi non habent claritaten insitam; est usus legentis in iis qui facit eorum claritatem. Investigationes demonstraverunt lectores legere me lius quod ii legunt saepius. Claritas est etiam processus dynamicus, qui sequitur mutationem consuetudium lectorum. Mirum est notare quam littera gothica, quam nunc putamus parum claram, anteposuerit litterarum formas

OHamburgefontsiv

```
Font: Jasper Roman Cadenced Bold
Designer: Jasper
Stem Int. measured): 330 | rounded (40x8): 320
Grid Size (division 40): 8
```

ABCDEFGHIJKLMNOPQRST UVWXYZabcdefghijklmnopqr stuvwxyz:,.;

Lorem ipsum dolor sit amet, consectetuer adipiscing elit, sed diam nonummy nibh euismod tincidunt ut laoreet dolore magna aliquam erat volutpat. Ut wisi enim ad minim veniam, quis nostrud exerci tation ullamcorper suscipit lobortis nisl ut aliquip ex ea commodo consequat. Duis autem vel eum iriure dolor in hendrerit in vulputate velit esse molestie consequat, vel illum dolore eu feugiat nulla facilisis at vero eros et accumsan et iusto odio dignissim qui blandit praesent luptatum zzril delenit augue duis dolore te feugait nulla facilisi. Nam liber tempor cum soluta nobis eleifend option congue nihil imperdiet doming id quod mazim placerat facer possim assum. Typi non habent claritatem insitam; est usus legentis in iis qui facit eorum claritatem. Investigationes demonstraverunt lectores legere me lius quod ii legunt saepius. Claritas est etiam processus dynamicus, qui sequitur mutationem consuetudium lectorum. Mirum est notare quam littera gothica, quam nunc putamus parum claram, anteposuerit litterarum

---

OHamburgefontsiv

```
selected CUST: CUST (selfmade)

A_XX 2 2
B_SX 14 6
C_XX 7 7
D_SX 14 7
E_SX 14 5
F_SX 14 2
G_XS 7 14
H_SS 14 14
I_SS 14 14
J_SS 14 12
K_SX 14 1
L_SX 14 4
M_SS 14 14
N_SS 14 12
O_XX 7 7
P_SX 14 3
Q_XX 7 7
R_SX 14 1
S_XX 6 7
T_XX 1 1
U_SS 11 11
V_XX 1 1
W_XX 1 1
X_XX 2 2
Y_XX 1 1
Z_XX 5 6
a_XS 5 10
b_SX 9 4
c_XX 4 1
colon_XX 7 7
comma_XX 6 7
d_XS 4 10
e_XX 4 3
f_SX 11 2
g_XX 3 1
h_SS 10 10
i_SS 11 10
j_SS 10 9
k_SX 10 0
l_SS 10 10
m_SS 11 10
n_SS 11 10
o_XX 4 4
p_SX 10 4
period_XX 7 7
q_XS 4 9
r_SX 11 0
s_XX 4 4
semicolon_XX 7 7
t_SX 9 1
u_SS 10 11
v_XX 0 0
w_XX 0 0
x_XX 0 0
y_XX 0 0
z_XX 4 4
```

Font: Jasper Roman Sans Regular
Designer: Jasper
Spacing: original (optical)
Note: serif-like endings on d and u (in line with a)

A B C D E F G H I J K L M N O P Q R S T U V W
X Y Z a b c d e f g h i j k l m n o p q r s t u v w x y z : ,
. ;

The invention of printing from movable types was one of the chief events affecting the history
European civilization. The task of duplicating texts without variance was impossible before G
enberg equiped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth
entury deplored the new mass-production of books, but men of letters eagerly hailed the print
ng press as a method of disseminating knowledge in permanent form; and the earliest printed
ooks soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day
Lorem ipsum dolor sit amet, consectetuer adipiscing elit, sed diam nonummy nibh euismod ti
idunt ut laoreet dolore magna aliquam erat volutpat. Ut wisi enim ad minim veniam, quis nost
ud exerci tation ullamcorper suscipit lobortis nisl ut aliquip ex ea commodo consequat. Duis a
tem vel eum iriure dolor in hendrerit in vulputate velit esse molestie consequat, vel illum dol
e eu feugiat nulla facilisis at vero eros et accumsan et iusto odio dignissim qui blandit praeser
luptatum zzril delenit augue duis dolore te feugait nulla facilisi. Nam liber tempor cum soluta

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OHamburgefontsiv

Font: Jasper Roman Sans Cadenced Regular
Designer: Jasper
Stem Int. measured: 308 | rounded (32x10): 320
Grid Size (division 32): 10

ABCDEFGHIJKLMNOPQRSTUVWX
YZabcdefghijklmnopqrstuvwxyz:,.;

The invention of printing from movable types was one of the chief events affecting the history of Eu ropean civilization. The task of duplicating texts without variance was impossible before Gutenberg equiped the scholar with the accuracy of type. Prejudiced connoisseurs in the fifteenth century depl ored the new mass-production of books, but men of letters eagerly hailed the printing press as a me thod of disseminating knowledge in permanent form; and the earliest printed books soon rivalled in beauty, as they superseded in economy, the fine manuscripts of their day. Lorem ipsum dolor sit a met, consectetuer adipiscing elit, sed diam nonummy nibh euismod tincidunt ut laoreet dolore mag na aliquam erat volutpat. Ut wisi enim ad minim veniam, quis nostrud exerci tation ullamcorper sus cipit lobortis nisl ut aliquip ex ea commodo consequat. Duis autem vel eum iriure dolor in hendrerit in vulputate velit esse molestie consequat, vel illum dolore eu feugiat nulla facilisis at vero eros et a ccumsan et iusto odio dignissim qui blandit praesent luptatum zzril delenit augue duis dolore te feu gait nulla facilisi. Nam liber tempor cum soluta nobis eleifend option congue nihil imperdiet domin

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OHamburgefontsiv

---

selected CUST: HumanistSans_Jasper.csv

```
A_XX 4 4
B_SX 10 6
C_XX 6 5
D_SX 10 6
E_SX 10 3
F_SX 10 2
G_XS 6 9
H_SS 10 10
I_SS 10 10
J_SS 10 10
K_SX 10 1
L_SX 10 3
M_SS 10 10
N_SS 10 10
O_XX 6 6
P_SX 10 2
Q_XX 6 6
R_SX 10 1
S_XX 6 7
T_XX 1 1
U_SS 9 9
V_XX 1 1
W_XX 1 1
X_XX 2 2
Y_XX 1 1
Z_XX 4 4
a_XS 4 10
b_SX 9 4
c_XX 4 1
colon_XX 6 6
comma_XX 4 4
d_XS 4 9
e_XX 4 4
f_SX 10 1
g_XX 4 1
h_SS 9 8
i_SS 9 9
j_SS 9 9
k_SX 9 1
l_SS 9 9
m_SS 9 8
n_SS 9 8
o_XX 4 4
p_SX 9 4
period_XX 5 5
q_XS 4 9
r_SX 9 0
s_XX 4 4
semicolon_XX 6 6
t_SX 10 2
u_SS 8 10
v_XX 1 1
w_XX 1 1
x_XX 2 2
y_XX 1 1
z_XX 3 3
```

```
Font: NoName Regular
Designer: Elliot
Spacing: original (optical)
Note: none
```

ABCDEFGHIJKLMNOPQRSTUV
WXYZabcdefghijklmnopqrstuvw
xyz:,.;

Lorem ipsum dolor sit amet, consectetuer adipiscing elit, sed diam nonummy nibh euismo
tincidunt ut laoreet dolore magna aliquam erat volutpat. Ut wisi enim ad minim veniam, qu
nostrud exerci tation ullamcorper suscipit lobortis nisl ut aliquip ex ea commodo consequa
Duis autem vel eum iriure dolor in hendrerit in vulputate velit esse molestie consequat, vel
illum dolore eu feugiat nulla facilisis at vero eros et accumsan et iusto odio dignissim qui
blandit praesent luptatum zzril delenit augue duis dolore te feugait nulla facilisi. Nam liber
tempor cum soluta nobis eleifend option congue nihil imperdiet doming id quod mazim
plac-erat facer possim assum. Typi non habent claritatem insitam; est usus legentis in iis q
facit eorum claritatem. Investigationes demonstraverunt lectores legere me lius quod ii
legunt saepius. Claritas est etiam processus dynamicus, qui sequitur mutationem
consuetudium lectorum. Mirum est notare quam littera gothica, quam nunc putamus paru

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OHamburgefontsiv

```
Font: NoName Cadenced Regular
Designer: Elliot
Stem Int. measured: 314 | rounded (32x10): 320
Grid Size (division 32): 10
```

ABCDEFGHIJKLMNOPQRSTUV
WXYZabcdefghijklmnopqrstuvw
xyz:,.;

Lorem ipsum dolor sit amet, consectetuer adipiscing elit, sed diam nonummy nibh euismod tincidunt ut laoreet dolore magna aliquam erat volutpat. Ut wisi enim ad minim veniam, quis nostrud exerci tation ullamcorper suscipit lobortis nisl ut aliquip ex ea commodo consequat. Duis autem vel eum iriure dolor in hendrerit in vulputate velit esse molestie consequat, vel illum dolore eu feugiat nulla facilisis at vero eros et accumsan et iusto odio dignissim qui blandit praesent luptatum zzril delenit augue duis dolore te feugait nulla facilisi. Nam liber tempor cum soluta nobis eleifend option congue nihil imperdiet doming id quod mazim plac-erat facer possim assum. Typi non habent claritatem insitam; est usus legentis in iis qui facit eorum claritatem. Investigationes demonstraverunt lectores legere me lius quod ii legunt saepius. Claritas est etiam processus dynamicus, qui sequitur mutationem consuetudium lectorum. Mirum est notare quam littera gothica, quam nunc putamus parum claram, an-teposuerit litterarum formas humanitatis per seacula quarta decima et quinta

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OHamburgefontsiv

```
selected CUST: RenaissanceRoman

A_XX 2 2
B_SX 14 6
C_XX 7 7
D_SX 14 7
E_SX 14 5
F_SX 14 2
G_XS 7 14
H_SS 14 14
I_SS 14 14
J_SS 14 12
K_SX 14 1
L_SX 14 4
M_SS 14 14
N_SS 14 12
O_XX 7 7
P_SX 14 3
Q_XX 7 7
R_SX 14 1
S_XX 6 7
T_XX 1 1
U_SS 11 11
V_XX 1 1
W_XX 1 1
X_XX 2 2
Y_XX 1 1
Z_XX 5 6
a_XS 5 10
b_SX 9 4
c_XX 4 1
colon_XX 7 7
comma_XX 6 7
d_XS 4 10
e_XX 4 3
f_SX 11 1
g_XX 5 1
h_SS 10 10
i_SS 11 10
j_SS 10 9
k_SX 10 0
l_SS 10 10
m_SS 11 10
n_SS 11 10
o_XX 4 4
p_SX 10 4
period_XX 7 7
q_XS 4 9
r_SX 11 0
s_XX 4 4
semicolon_XX 7 7
t_SX 9 1
u_SS 10 11
v_XX 0 0
w_XX 0 0
x_XX 0 0
y_XX 0 0
z_XX 4 4
```

```
Font: Plinivs Regular
Designer: Benedikt
Spacing: original (optical)
Note: pseudo Jenson, relatively dark
```

A|B|C|D|E|F|G|H|I|J|K|L|M|N|O|P|Q|R|S|T|U|V|W|X|Y|Z|a|b|c|d|e|f|g|h|i|j|k|l|m|n|o|p|q|r|s|t|u|v|w|x|y|z|:|,|.|;

Lorem ipsum dolor sit amet, consectetuer adipiscing elit, sed diam nonummy nibh euismod tincidunt ut laoreet dolore magna aliquam erat volutpat. Ut wisi enim ad minim veniam, quis nostrud exerci tation ullamcorper suscipit lobortis nisl ut aliquip ex ea commodo consequat. Duis autem ve eum iriure dolor in hendrerit in vulputate velit esse molestie consequat, vel illum dolore eu feugiat nulla facilisis at vero eros et accumsan et iusto odio dignissim qui blandit praesent luptatum zzril d lenit augue duis dolore te feugait nulla facilisi. Nam liber tempor cum soluta nobis eleifend option congue nihil imperdiet doming id quod mazim placerat facer possim assum. Typi non habent claritatem insitam; est usus legentis in iis qui facit eorum claritatem. Investigationes demonstraverunt lectores legere me lius quod ii legunt saepius. Claritas est etiam processus dynamicus, qui sequitur mutationem consuetudium lectorum. Mirum est notare quam littera gothica, quam nunc putamus parum claram, anteposuerit litterarum formas humanitatis per seacula quarta decima et quinta decima. Eodem modo typi, qui nunc nobis videntur parum clari, fiant sollemnes in futurum.

OHamburgefontsiv

Font: Plinivs Cadenced Regular
Designer: Benedikt
Stem Int. measured: 282 | rounded (32x9): 288
Grid Size (division 32): 9

A|B|C|D|E|F|G|H|I|J|K|L|M|N|O|P|Q|R|S|T|U|V|
W|X|Y|Z|a|b|c|d|e|f|g|h|i|j|k|l|m|n|o|p|q|r|s|t|u|v|w|x|
y|z|:|,|.|;|

Lorem ipsum dolor sit amet, consectetuer adipiscing elit, sed diam nonummy nibh euismod tincidunt ut laoreet dolore magna aliquam erat volutpat. Ut wisi enim ad minim veniam, quis nostrud exerci tation ullamcorper suscipit lobortis nisl ut aliquip ex ea commodo consequat. Duis autem vel eum iriure dolor in hendrerit in vulputate velit esse molestie consequat, vel illum dolore eu feugiat nulla facilisis at vero eros et accumsan et iusto odio dignissim qui blandit praesent luptatum zzril delenit augue duis dolore te feugait nulla facilisi. Nam liber tempor cum soluta nobis eleifend option congue nihil imperdiet doming id quod mazim placerat facer possim assum. Typi non habent claritatem insitam; est usus legentis in iis qui facit eorum claritatem. Investigationes demonstraverunt lectores legere me lius quod ii legunt saepius. Claritas est etiam processus dynamicus, qui sequitur mutationem consuetudium lectorum. Mirum est notare quam littera gothica, quam nunc putamus parum claram, anteposuerit litterarum formas humanitatis per seacula quarta decima et quinta decima. Eodem modo typi, qui nunc nobis videntur parum clari, fiant sollemnes in futurum.

OHamburgefontsiv

---

selected CUST: Plinivs.csv

```
A_XX 2 2
B_SX 14 6
C_XX 7 7
D_SX 14 7
E_SX 14 5
F_SX 14 2
G_XS 7 14
H_SS 14 14
I_SS 14 14
J_SS 14 12
K_SX 14 1
L_SX 14 4
M_SS 14 14
N_SS 14 12
O_XX 7 7
P_SX 14 3
Q_XX 7 7
R_SX 14 1
S_XX 6 7
T_XX 1 1
U_SS 11 11
V_XX 1 1
W_XX 1 1
X_XX 2 2
Y_XX 1 1
Z_XX 5 6
a_XS 5 10
b_SX 9 4
c_XX 4 1
colon_XX 7 7
comma_XX 6 7
d_XS 4 10
e_XX 4 3
f_SX 11 1
g_XX 5 1
h_SS 10 10
i_SS 11 10
j_SS 10 9
k_SX 10 0
l_SS 10 10
m_SS 11 10
n_SS 11 10
o_XX 4 4
p_SX 10 4
period_XX 7 7
q_XS 4 9
r_SX 11 0
s_XX 4 4
semicolon_XX 7 7
t_SX 9 1
u_SS 10 11
v_XX 0 0
w_XX 0 0
x_XX 0 0
y_XX 0 0
z_XX 4 4
```

```
Font: Willhelm Book
Designer: Philipp
Spacing: original (optical)
Note: two cadenced versions with different units-sizes
```

ABCDEFGHIJKLMNOPQRSTUVW
XYZabcdefghijklmnopqrstuvwxyz:,.;

Lorem ipsum dolor sit amet, consectetuer adipiscing elit, sed diam nonummy nibh euismod tincidunt u
laoreet dolore magna aliquam erat volutpat. Ut wisi enim ad minim veniam, quis nostrud exerci tation
ullamcorper suscipit lobortis nisl ut aliquip ex ea commodo consequat. Duis autem vel eum iriure dolor
in hendrerit in vulputate velit esse molestie consequat, vel illum dolore eu feugiat nulla facilisis at vero
eros et accumsan et iusto odio dignissim qui blandit praesent luptatum zzril delenit augue duis dolore t
feugait nulla facilisi. Nam liber tempor cum soluta nobis eleifend option congue nihil imperdiet domin
id quod mazim placerat facer possim assum. Typi non habent claritatem insitam; est usus legentis in iis
qui facit eorum claritatem. Investigationes demonstraverunt lectores legere me lius quod ii legunt
saepius. Claritas est etiam processus dynamicus, qui sequitur mutationem consuetudium lectorum.
Mirum est notare quam littera gothica, quam nunc putamus parum claram, anteposuerit litterarum fo
mas humanitatis per seacula quarta decima et quinta decima. Eodem modo typi, qui nunc nobis vident
parum clari, fiant sollemnes in futurum.

OHamburgefontsiv

Font: Willhelm Cadenced Book
Designer: Phillip
Stem Int. measured: 277 | rounded (32x9): 288
Grid Size (division 32): 9

ABCDEFGHIJKLMNOPQRSTUV
WXYZabcdefghijklmnopqrstuvwxyz
:,.;

Lorem ipsum dolor sit amet, consectetuer adipiscing elit, sed diam nonummy nibh euismod tincidunt ut laoreet dolore magna aliquam erat volutpat. Ut wisi enim ad minim veniam, quis nostrud exerci tation ullamcorper suscipit lobortis nisl ut aliquip ex ea commodo consequat. Duis autem vel eum iriure dolor in hendrerit in vulputate velit esse molestie consequat, vel illum dolore eu feugiat nulla facilisis at vero eros et accumsan et iusto odio dignissim qui blandit praesent luptatum zzril delenit augue duis dolore te feugait nulla facilisi. Nam liber tempor cum soluta nobis eleifend option congue nihil imperdiet doming id quod mazim placerat facer possim assum. Typi non habent claritatem insitam; est usus legentis in iis qui facit eorum claritatem. Investigationes demonstraverunt lectores legere me lius quod ii legunt saepius. Claritas est etiam processus dynamicus, qui sequitur mutationem consuetudium lectorum. Mirum est notare quam littera gothica, quam nunc putamus parum claram, anteposuerit litterarum formas humanitatis per seacula quarta decima et quinta decima. Eodem modo typi, qui nunc nobis videntur parum clari, fiant sollemnes in futurum.

OHamburgefontsiv

---

selected CUST: Wilhelm_CUST.csv

```
A_XX 2 2
B_SX 14 6
C_XX 7 7
D_SX 14 7
E_SX 14 5
F_SX 14 2
G_XS 7 14
H_SS 14 14
I_SS 14 14
J_SS 14 12
K_SX 14 1
L_SX 14 4
M_SS 14 14
N_SS 14 12
O_XX 7 7
P_SX 14 3
Q_XX 7 7
R_SX 14 1
S_XX 6 7
T_XX 1 1
U_SS 11 11
V_XX 1 1
W_XX 1 1
X_XX 2 2
Y_XX 1 1
Z_XX 5 6
a_XS 5 10
b_SX 9 4
c_XX 4 1
colon_XX 7 7
comma_XX 6 7
d_XS 4 10
e_XX 4 3
f_SX 11 0
g_XX 4 1
h_SS 10 10
i_SS 11 10
j_SS 10 9
k_SX 10 0
l_SS 10 10
m_SS 11 10
n_SS 11 10
o_XX 4 4
p_SX 10 4
period_XX 7 7
q_XS 4 9
r_SX 11 0
s_XX 4 4
semicolon_XX 7 7
t_SX 9 1
u_SS 10 11
v_XX 0 0
w_XX 0 0
x_XX 0 0
y_XX 0 0
z_XX 4 4
```

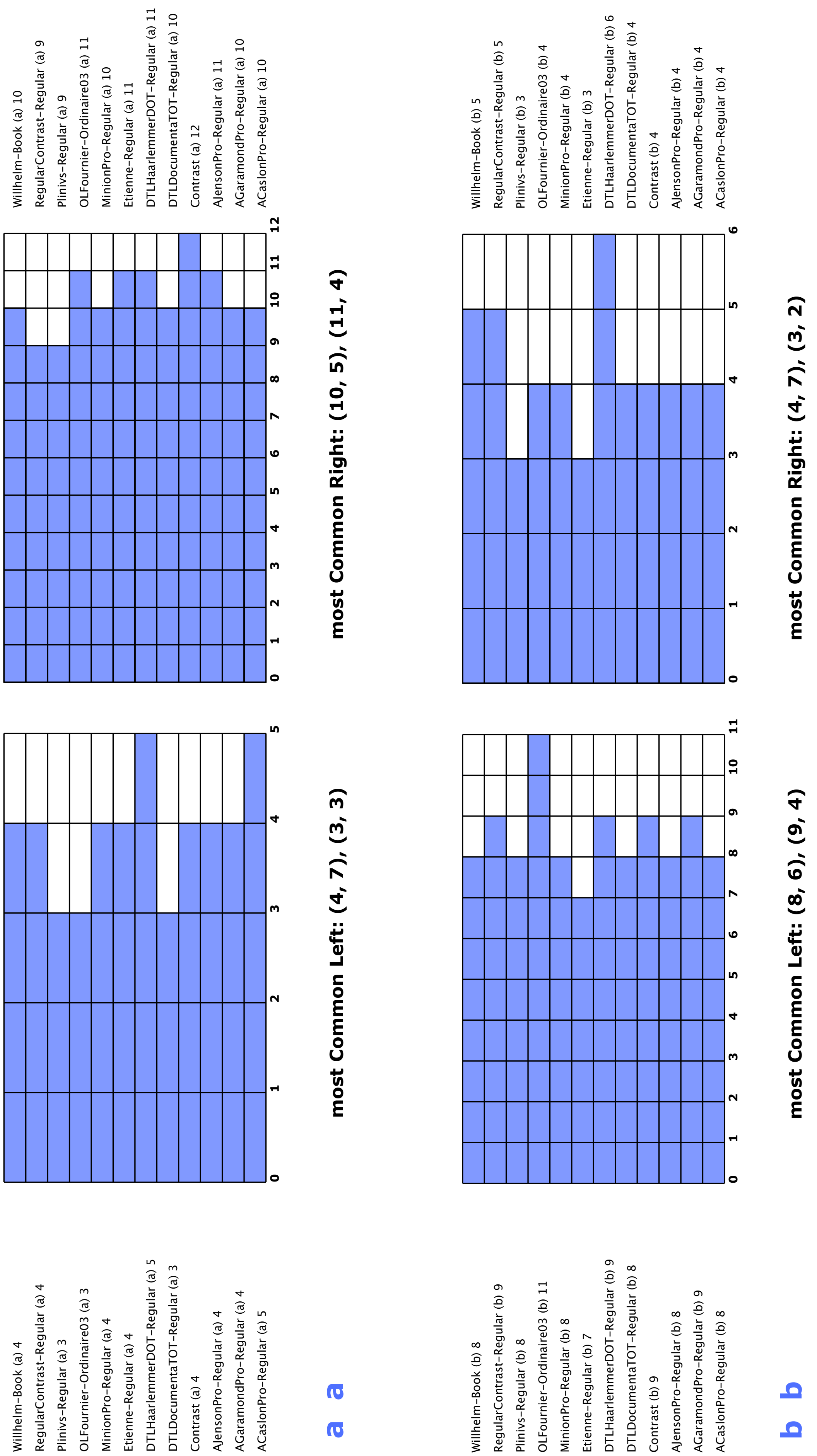
```
Font: <Font Willhelm Cadence Book
Designer: PhillipStem
Stem Int. measured: 277 | Stem Int. rounded (33x8): 264
Grid Size (division 33): 8
```

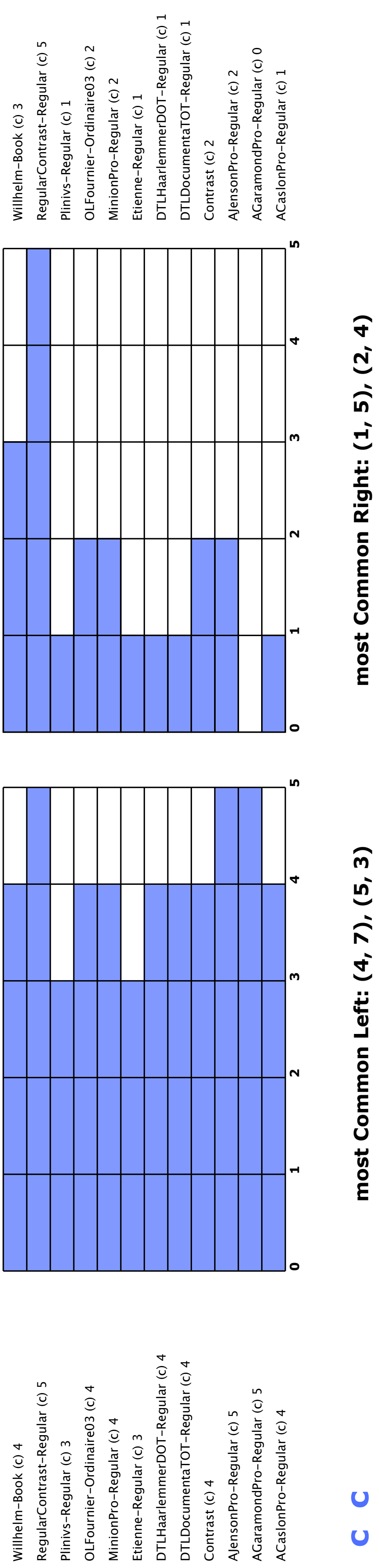
ABCDEFGHIJKLMNOPQRSTUVW
XYZabcdefghijklmnopqrstuvwxyz:,.;

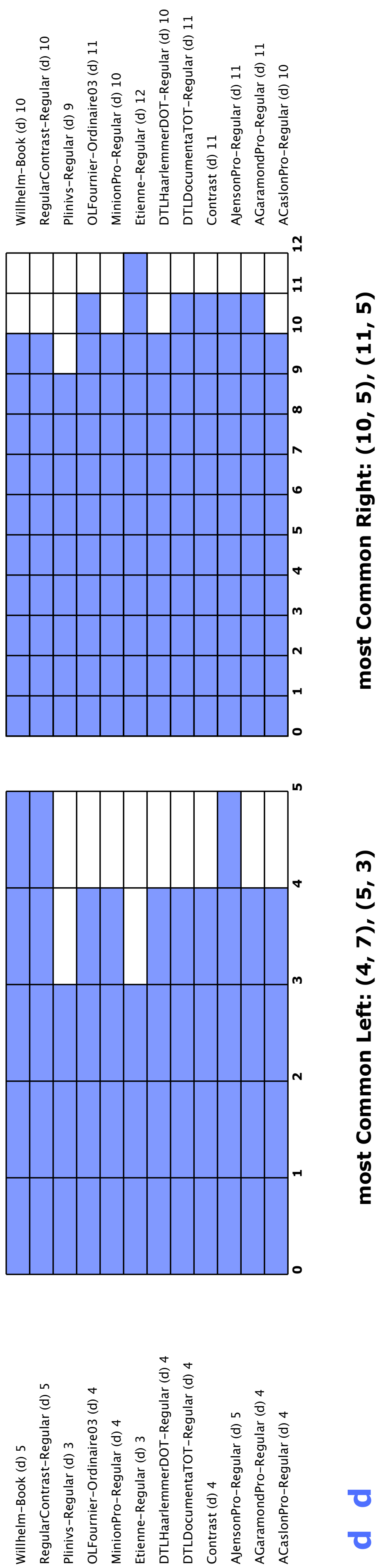
Lorem ipsum dolor sit amet, consectetuer adipiscing elit, sed diam nonummy nibh euismod tincidunt ut laoreet dolore magna aliquam erat volutpat. Ut wisi enim ad minim veniam, quis nostrud exerci tation ullamcorper suscipit lobortis nisl ut aliquip ex ea commodo consequat. Duis autem vel eum iriure dolor in hendrerit in vulputate velit esse molestie consequat, vel illum dolore eu feugiat nulla facilisis at vero eros e accumsan et iusto odio dignissim qui blandit praesent luptatum zzril delenit augue duis dolore te feugait nulla facilisi. Nam liber tempor cum soluta nobis eleifend option congue nihil imperdiet doming id quod mazim placerat facer possim assum. Typi non habent claritatem insitam; est usus legentis in iis qui facit e rum claritatem. Investigationes demonstraverunt lectores legere me lius quod ii legunt saepius. Claritas es etiam processus dynamicus, qui sequitur mutationem consuetudium lectorum. Mirum est notare quam li tera gothica, quam nunc putamus parum claram, anteposuerit litterarum formas humanitatis per seacula quarta decima et quinta decima. Eodem modo typi, qui nunc nobis videntur parum clari, fiant sollemnes futurum.

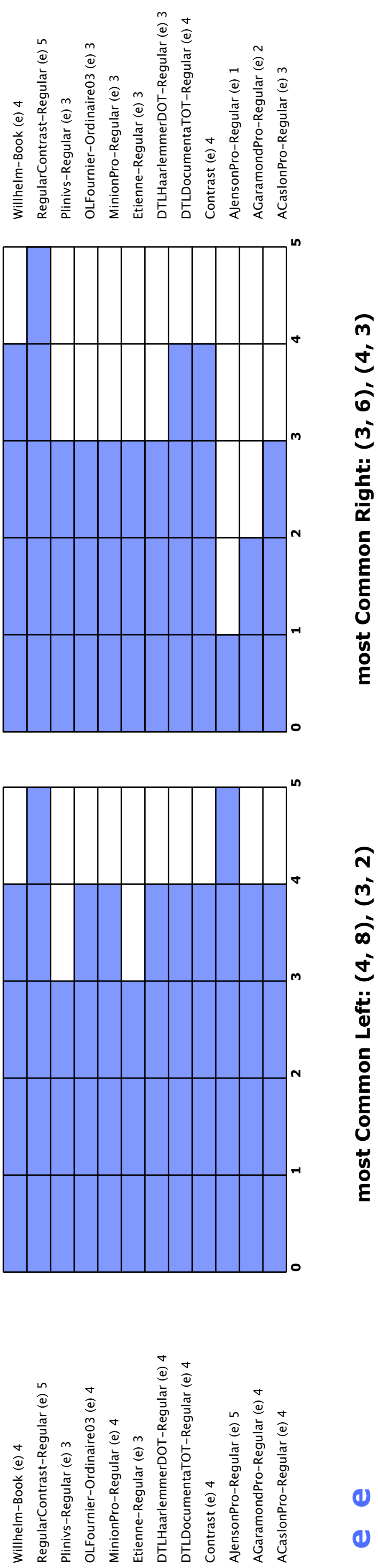
OHamburgefontsiv

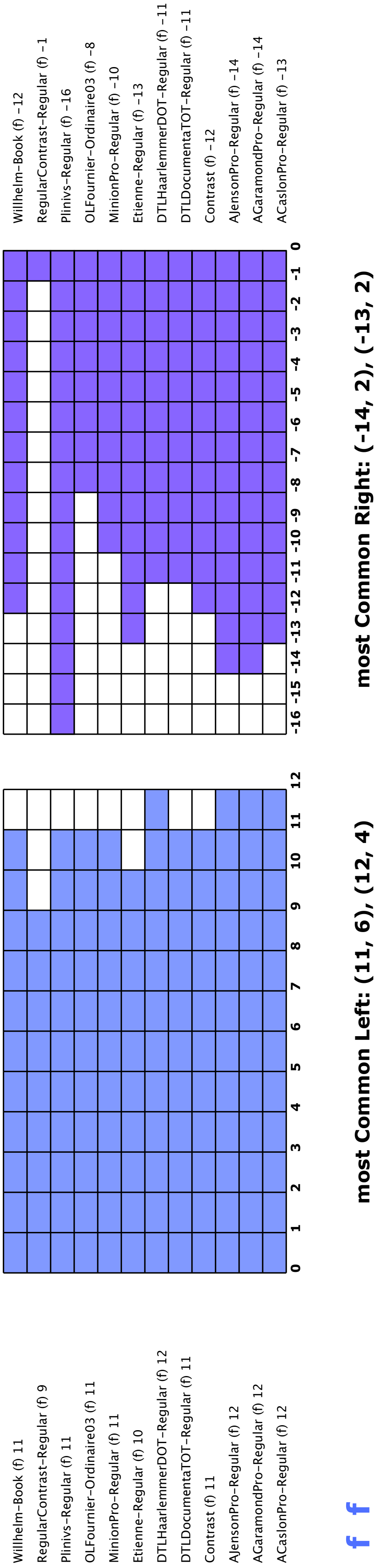
```
selected CUST: Wilhelm_CUST.csv

A_XX 2 2
B_SX 14 6
C_XX 7 7
D_SX 14 7
E_SX 14 5
F_SX 14 2
G_XS 7 14
H_SS 14 14
I_SS 14 14
J_SS 14 12
K_SX 14 1
L_SX 14 4
M_SS 14 14
N_SS 14 12
O_XX 7 7
P_SX 14 3
Q_XX 7 7
R_SX 14 1
S_XX 6 7
T_XX 1 1
U_SS 11 11
V_XX 1 1
W_XX 1 1
X_XX 2 2
Y_XX 1 1
Z_XX 5 6
a_XS 5 10
b_SX 9 4
c_XX 4 1
colon_XX 7 7
comma_XX 6 7
d_XS 4 10
e_XX 4 3
f_SX 11 0
g_XX 4 1
h_SS 10 10
i_SS 11 10
j_SS 10 9
k_SX 10 0
l_SS 10 10
m_SS 11 10
n_SS 11 10
o_XX 4 4
p_SX 10 4
period_XX 7 7
q_XS 4 9
r_SX 11 0
s_XX 4 4
semicolon_XX 7 7
t_SX 9 1
u_SS 10 11
v_XX 0 0
w_XX 0 0
x_XX 0 0
y_XX 0 0
z_XX 4 4
```

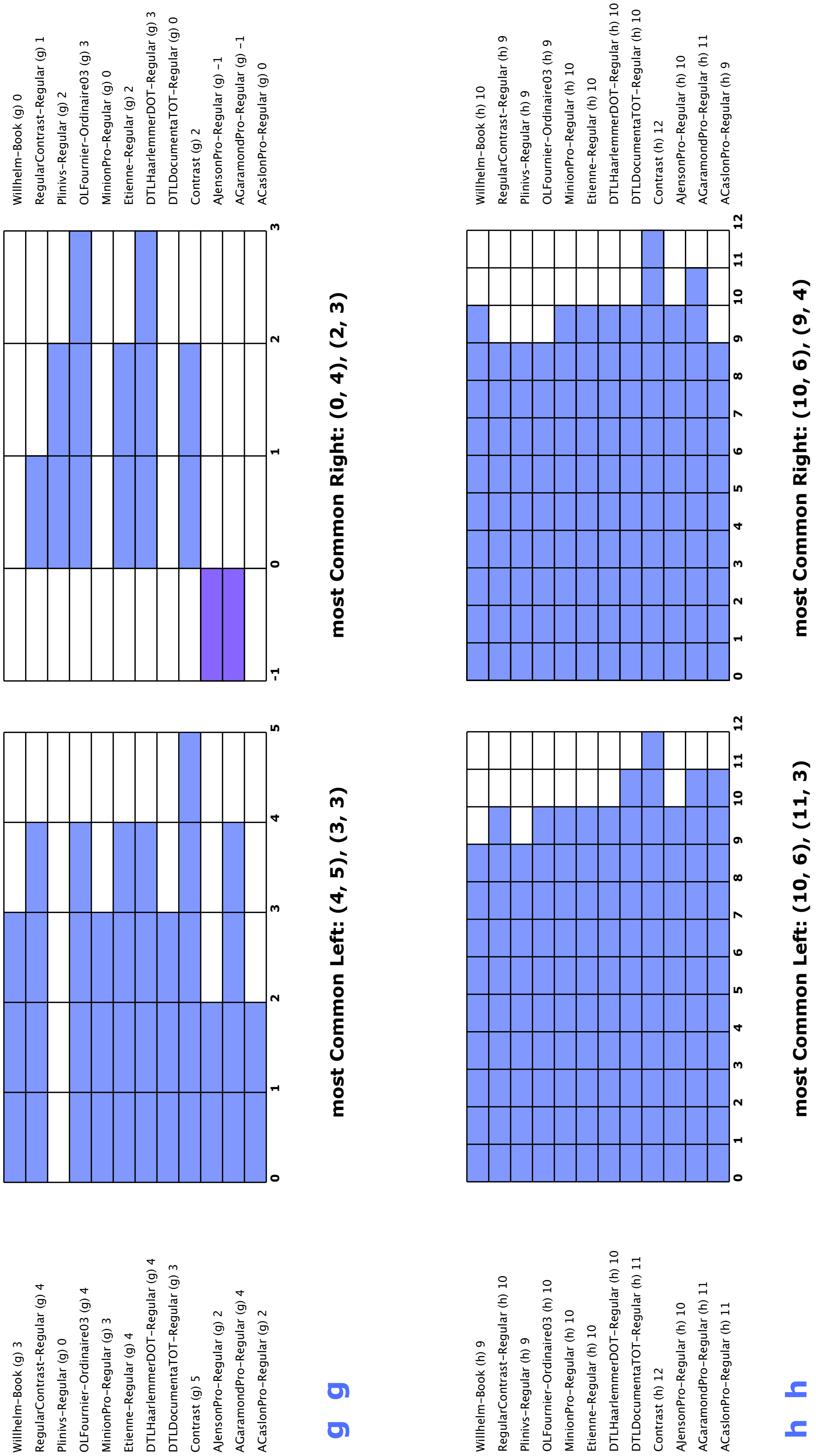

most Common Left: (4, 7), (3, 3)
Willhelm–Book (a) 4
RegularContrast–Regular (a) 4
Plinivs–Regular (a) 3
OLFournier–Ordinaire03 (a) 3
MinionPro–Regular (a) 4
Etienne–Regular (a) 4
DTLHaarlemmerDOT–Regular (a) 5
DTLDocumentaTOT–Regular (a) 3
Contrast (a) 4
AJensonPro–Regular (a) 4
AGaramondPro–Regular (a) 4
ACaslonPro–Regular (a) 5
a a
most Common Right: (10, 5), (11, 4)
Willhelm–Book (a) 10
RegularContrast–Regular (a) 9
Plinivs–Regular (a) 9
OLFournier–Ordinaire03 (a) 11
MinionPro–Regular (a) 10
Etienne–Regular (a) 11
DTLHaarlemmerDOT–Regular (a) 11
DTLDocumentaTOT–Regular (a) 10
Contrast (a) 12
AJensonPro–Regular (a) 11
AGaramondPro–Regular (a) 10
ACaslonPro–Regular (a) 10
most Common Left: (8, 6), (9, 4)
Willhelm–Book (b) 8
RegularContrast–Regular (b) 9
Plinivs–Regular (b) 8
OLFournier–Ordinaire03 (b) 11
MinionPro–Regular (b) 8
Etienne–Regular (b) 7
DTLHaarlemmerDOT–Regular (b) 9
DTLDocumentaTOT–Regular (b) 8
Contrast (b) 9
AJensonPro–Regular (b) 8
AGaramondPro–Regular (b) 9
ACaslonPro–Regular (b) 8
b b
most Common Right: (4, 7), (3, 2)
Willhelm–Book (b) 5
RegularContrast–Regular (b) 5
Plinivs–Regular (b) 3
OLFournier–Ordinaire03 (b) 4
MinionPro–Regular (b) 4
Etienne–Regular (b) 3
DTLHaarlemmerDOT–Regular (b) 6
DTLDocumentaTOT–Regular (b) 4
Contrast (b) 4
AJensonPro–Regular (b) 4
AGaramondPro–Regular (b) 4
ACaslonPro–Regular (b) 4

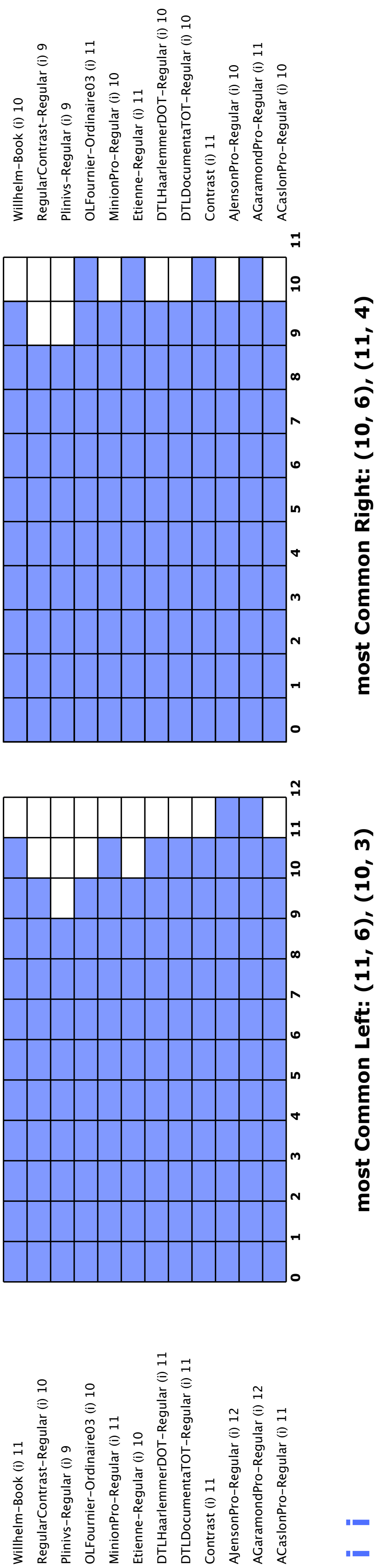

c c
most Common Left: (4, 7), (5, 3)
most Common Right: (1, 5), (2, 4)
Willhelm-Book (c) 4
RegularContrast-Regular (c) 5
Plinivs-Regular (c) 3
OLFournier-Ordinaire03 (c) 4
MinionPro-Regular (c) 4
Etienne-Regular (c) 3
DTLHaarlemmerDOT-Regular (c) 4
DTLDocumentaTOT-Regular (c) 4
Contrast (c) 4
AJensonPro-Regular (c) 5
AGaramondPro-Regular (c) 5
ACaslonPro-Regular (c) 4
Willhelm-Book (c) 3
RegularContrast-Regular (c) 5
Plinivs-Regular (c) 1
OLFournier-Ordinaire03 (c) 2
MinionPro-Regular (c) 2
Etienne-Regular (c) 1
DTLHaarlemmerDOT-Regular (c) 1
DTLDocumentaTOT-Regular (c) 1
Contrast (c) 2
AJensonPro-Regular (c) 2
AGaramondPro-Regular (c) 0
ACaslonPro-Regular (c) 1
0
1
2
3
4
5

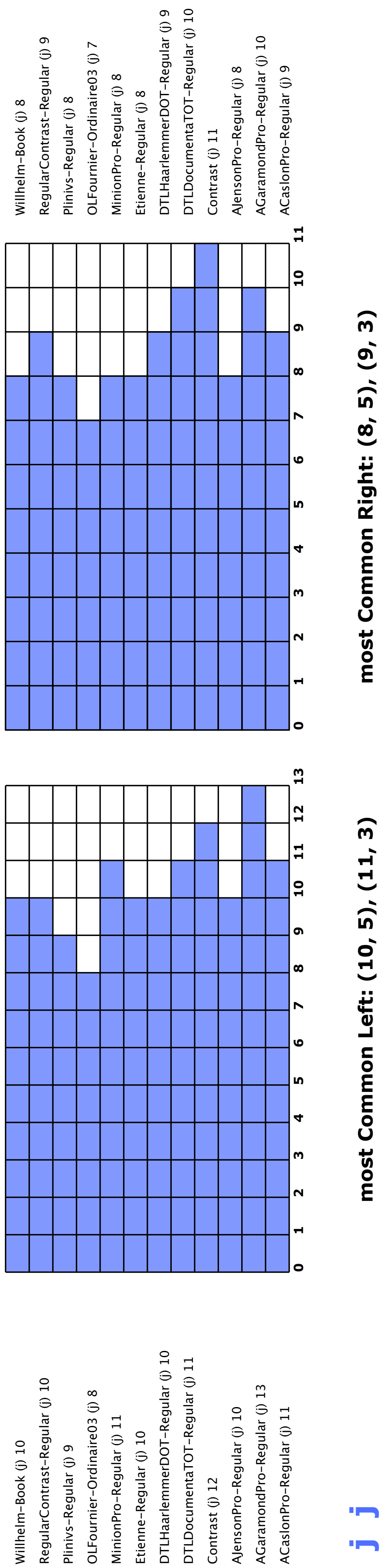

d d
most Common Left: (4, 7), (5, 3)
most Common Right: (10, 5), (11, 5)
Willhelm-Book (d) 5
RegularContrast-Regular (d) 5
Plinivs-Regular (d) 3
OLFournier-Ordinaire03 (d) 4
MinionPro-Regular (d) 4
Etienne-Regular (d) 3
DTLHaarlemmerDOT-Regular (d) 4
DTLDocumentaTOT-Regular (d) 4
Contrast (d) 4
AJensonPro-Regular (d) 5
AGaramondPro-Regular (d) 4
ACaslonPro-Regular (d) 4
Willhelm-Book (d) 10
RegularContrast-Regular (d) 10
Plinivs-Regular (d) 9
OLFournier-Ordinaire03 (d) 11
MinionPro-Regular (d) 10
Etienne-Regular (d) 12
DTLHaarlemmerDOT-Regular (d) 10
DTLDocumentaTOT-Regular (d) 11
Contrast (d) 11
AJensonPro-Regular (d) 11
AGaramondPro-Regular (d) 11
ACaslonPro-Regular (d) 10
0
1
2
3
4
5
6
7
8
9
10
11
12

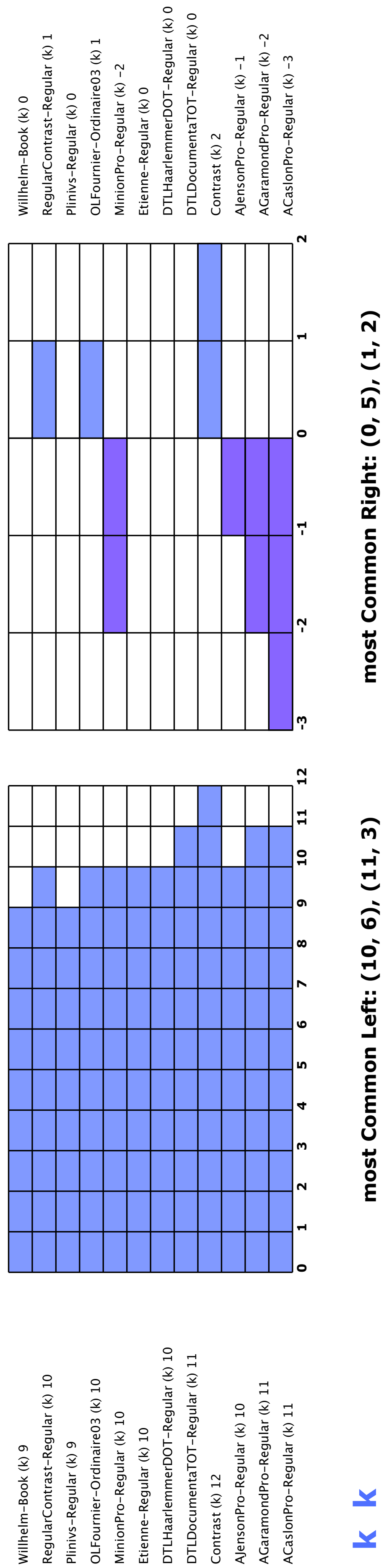

e e
Willhelm-Book (e) 4
RegularContrast-Regular (e) 5
Plinivs-Regular (e) 3
OLFournier-Ordinaire03 (e) 4
MinionPro-Regular (e) 4
Etienne-Regular (e) 3
DTLHaarlemmerDOT-Regular (e) 4
DTLDocumentaTOT-Regular (e) 4
Contrast (e) 4
AJensonPro-Regular (e) 5
AGaramondPro-Regular (e) 4
ACaslonPro-Regular (e) 4
0 1 2 3 4 5
most Common Left: (4, 8), (3, 2)
Willhelm-Book (e) 4
RegularContrast-Regular (e) 5
Plinivs-Regular (e) 3
OLFournier-Ordinaire03 (e) 3
MinionPro-Regular (e) 3
Etienne-Regular (e) 3
DTLHaarlemmerDOT-Regular (e) 3
DTLDocumentaTOT-Regular (e) 4
Contrast (e) 4
AJensonPro-Regular (e) 1
AGaramondPro-Regular (e) 2
ACaslonPro-Regular (e) 3
0 1 2 3 4 5
most Common Right: (3, 6), (4, 3)

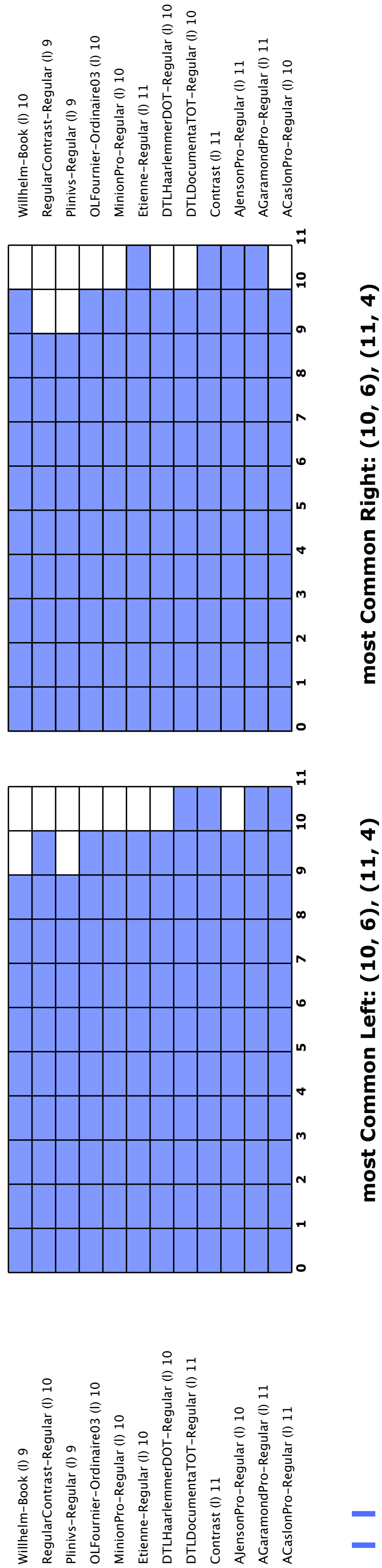

f f
Willhelm-Book (f) 11
RegularContrast-Regular (f) 9
Plinivs-Regular (f) 11
OLFournier-Ordinaire03 (f) 11
MinionPro-Regular (f) 11
Etienne-Regular (f) 10
DTLHaarlemmerDOT-Regular (f) 12
DTLDocumentaTOT-Regular (f) 11
Contrast (f) 11
AJensonPro-Regular (f) 12
AGaramondPro-Regular (f) 12
ACaslonPro-Regular (f) 12
0 1 2 3 4 5 6 7 8 9 10 11 12
most Common Left: (11, 6), (12, 4)
Willhelm-Book (f) -12
RegularContrast-Regular (f) -1
Plinivs-Regular (f) -16
OLFournier-Ordinaire03 (f) -8
MinionPro-Regular (f) -10
Etienne-Regular (f) -13
DTLHaarlemmerDOT-Regular (f) -11
DTLDocumentaTOT-Regular (f) -11
Contrast (f) -12
AJensonPro-Regular (f) -14
AGaramondPro-Regular (f) -14
ACaslonPro-Regular (f) -13
-16 -15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0
most Common Right: (-14, 2), (-13, 2)

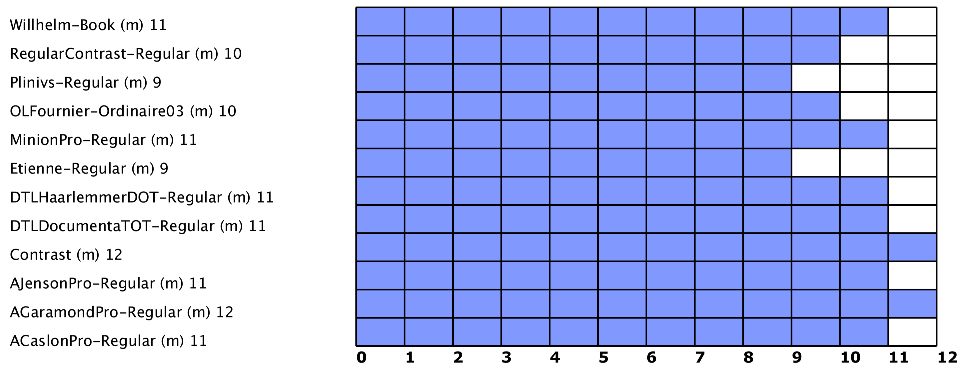

g g
Willhelm–Book (g) 3
RegularContrast–Regular (g) 4
Plinivs–Regular (g) 0
OLFournier–Ordinaire03 (g) 4
MinionPro–Regular (g) 3
Etienne–Regular (g) 4
DTLHaarlemmerDOT–Regular (g) 4
DTLDocumentaTOT–Regular (g) 3
Contrast (g) 5
AJensonPro–Regular (g) 2
AGaramondPro–Regular (g) 4
ACaslonPro–Regular (g) 2
most Common Left: (4, 5), (3, 3)
Willhelm–Book (g) 0
RegularContrast–Regular (g) 1
Plinivs–Regular (g) 2
OLFournier–Ordinaire03 (g) 3
MinionPro–Regular (g) 0
Etienne–Regular (g) 2
DTLHaarlemmerDOT–Regular (g) 3
DTLDocumentaTOT–Regular (g) 0
Contrast (g) 2
AJensonPro–Regular (g) –1
AGaramondPro–Regular (g) –1
ACaslonPro–Regular (g) 0
most Common Right: (0, 4), (2, 3)
h h
Willhelm–Book (h) 9
RegularContrast–Regular (h) 10
Plinivs–Regular (h) 9
OLFournier–Ordinaire03 (h) 10
MinionPro–Regular (h) 10
Etienne–Regular (h) 10
DTLHaarlemmerDOT–Regular (h) 10
DTLDocumentaTOT–Regular (h) 11
Contrast (h) 12
AJensonPro–Regular (h) 10
AGaramondPro–Regular (h) 11
ACaslonPro–Regular (h) 11
most Common Left: (10, 6), (11, 3)
Willhelm–Book (h) 10
RegularContrast–Regular (h) 9
Plinivs–Regular (h) 9
OLFournier–Ordinaire03 (h) 9
MinionPro–Regular (h) 10
Etienne–Regular (h) 10
DTLHaarlemmerDOT–Regular (h) 10
DTLDocumentaTOT–Regular (h) 10
Contrast (h) 12
AJensonPro–Regular (h) 10
AGaramondPro–Regular (h) 11
ACaslonPro–Regular (h) 9
most Common Right: (10, 6), (9, 4)

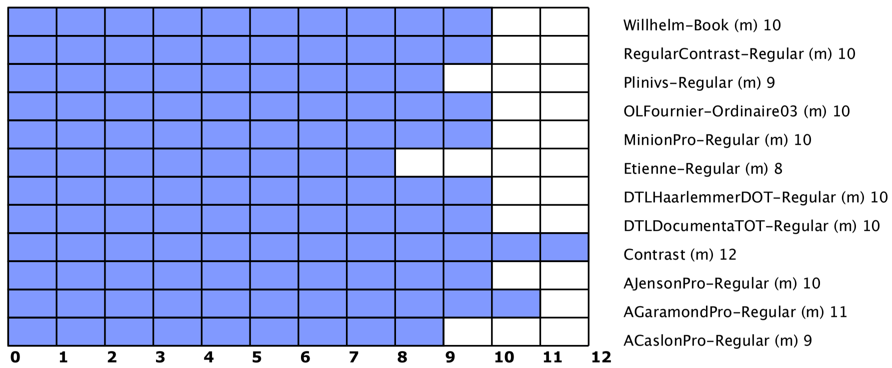

i i
Willhelm-Book (i) 11
RegularContrast-Regular (i) 10
Plinivs-Regular (i) 9
OLFournier-Ordinaire03 (i) 10
MinionPro-Regular (i) 11
Etienne-Regular (i) 10
DTLHaarlemmerDOT-Regular (i) 11
DTLDocumentaTOT-Regular (i) 11
Contrast (i) 11
AJensonPro-Regular (i) 12
AGaramondPro-Regular (i) 12
ACaslonPro-Regular (i) 11
0 1 2 3 4 5 6 7 8 9 10 11 12
most Common Left: (11, 6), (10, 3)
Willhelm-Book (i) 10
RegularContrast-Regular (i) 9
Plinivs-Regular (i) 9
OLFournier-Ordinaire03 (i) 11
MinionPro-Regular (i) 10
Etienne-Regular (i) 11
DTLHaarlemmerDOT-Regular (i) 10
DTLDocumentaTOT-Regular (i) 10
Contrast (i) 11
AJensonPro-Regular (i) 10
AGaramondPro-Regular (i) 11
ACaslonPro-Regular (i) 10
0 1 2 3 4 5 6 7 8 9 10 11
most Common Right: (10, 6), (11, 4)


j j
Willhelm-Book (j) 10
RegularContrast-Regular (j) 10
Plinivs-Regular (j) 9
OLFournier-Ordinaire03 (j) 8
MinionPro-Regular (j) 11
Etienne-Regular (j) 10
DTLHaarlemmerDOT-Regular (j) 10
DTLDocumentaTOT-Regular (j) 11
Contrast (j) 12
AJensonPro-Regular (j) 10
AGaramondPro-Regular (j) 13
ACaslonPro-Regular (j) 11
0 1 2 3 4 5 6 7 8 9 10 11 12 13
most Common Left: (10, 5), (11, 3)
Willhelm-Book (j) 8
RegularContrast-Regular (j) 9
Plinivs-Regular (j) 8
OLFournier-Ordinaire03 (j) 7
MinionPro-Regular (j) 8
Etienne-Regular (j) 8
DTLHaarlemmerDOT-Regular (j) 9
DTLDocumentaTOT-Regular (j) 10
Contrast (j) 11
AJensonPro-Regular (j) 8
AGaramondPro-Regular (j) 10
ACaslonPro-Regular (j) 9
0 1 2 3 4 5 6 7 8 9 10 11
most Common Right: (8, 5), (9, 3)


k k
Willhelm–Book (k) 9
RegularContrast–Regular (k) 10
Plinivs–Regular (k) 9
OLFournier–Ordinaire03 (k) 10
MinionPro–Regular (k) 10
Etienne–Regular (k) 10
DTLHaarlemmerDOT–Regular (k) 10
DTLDocumentaTOT–Regular (k) 11
Contrast (k) 12
AJensonPro–Regular (k) 10
AGaramondPro–Regular (k) 11
ACaslonPro–Regular (k) 11
most Common Left: (10, 6), (11, 3)
Willhelm–Book (k) 0
RegularContrast–Regular (k) 1
Plinivs–Regular (k) 0
OLFournier–Ordinaire03 (k) 1
MinionPro–Regular (k) –2
Etienne–Regular (k) 0
DTLHaarlemmerDOT–Regular (k) 0
DTLDocumentaTOT–Regular (k) 0
Contrast (k) 2
AJensonPro–Regular (k) –1
AGaramondPro–Regular (k) –2
ACaslonPro–Regular (k) –3
most Common Right: (0, 5), (1, 2)


l l
Willhelm–Book (l) 9
RegularContrast–Regular (l) 10
Plinivs–Regular (l) 9
OLFournier–Ordinaire03 (l) 10
MinionPro–Regular (l) 10
Etienne–Regular (l) 10
DTLHaarlemmerDOT–Regular (l) 10
DTLDocumentaTOT–Regular (l) 11
Contrast (l) 11
AJensonPro–Regular (l) 10
AGaramondPro–Regular (l) 11
ACaslonPro–Regular (l) 11
most Common Left: (10, 6), (11, 4)
Willhelm–Book (l) 10
RegularContrast–Regular (l) 9
Plinivs–Regular (l) 9
OLFournier–Ordinaire03 (l) 10
MinionPro–Regular (l) 10
Etienne–Regular (l) 11
DTLHaarlemmerDOT–Regular (l) 10
DTLDocumentaTOT–Regular (l) 10
Contrast (l) 11
AJensonPro–Regular (l) 11
AGaramondPro–Regular (l) 11
ACaslonPro–Regular (l) 10
most Common Right: (10, 6), (11, 4)

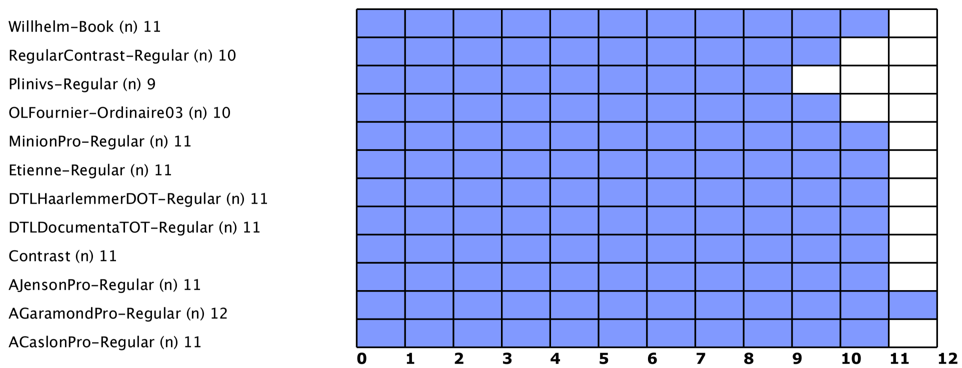


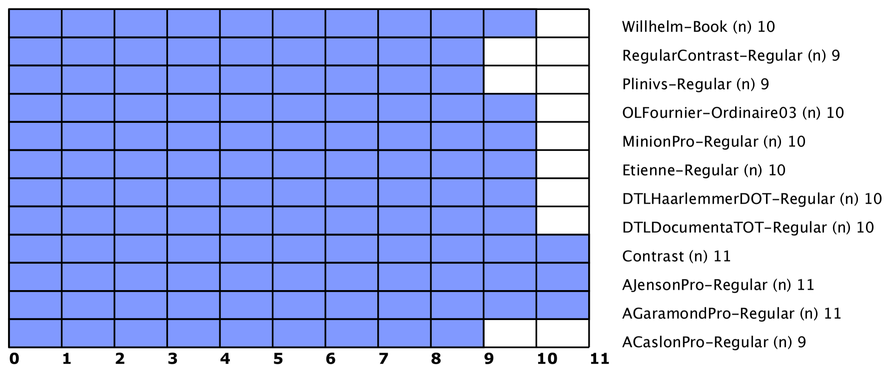


m m

most Common Left: (11, 6), (9, 2)

most Common Right: (10, 7), (9, 2)

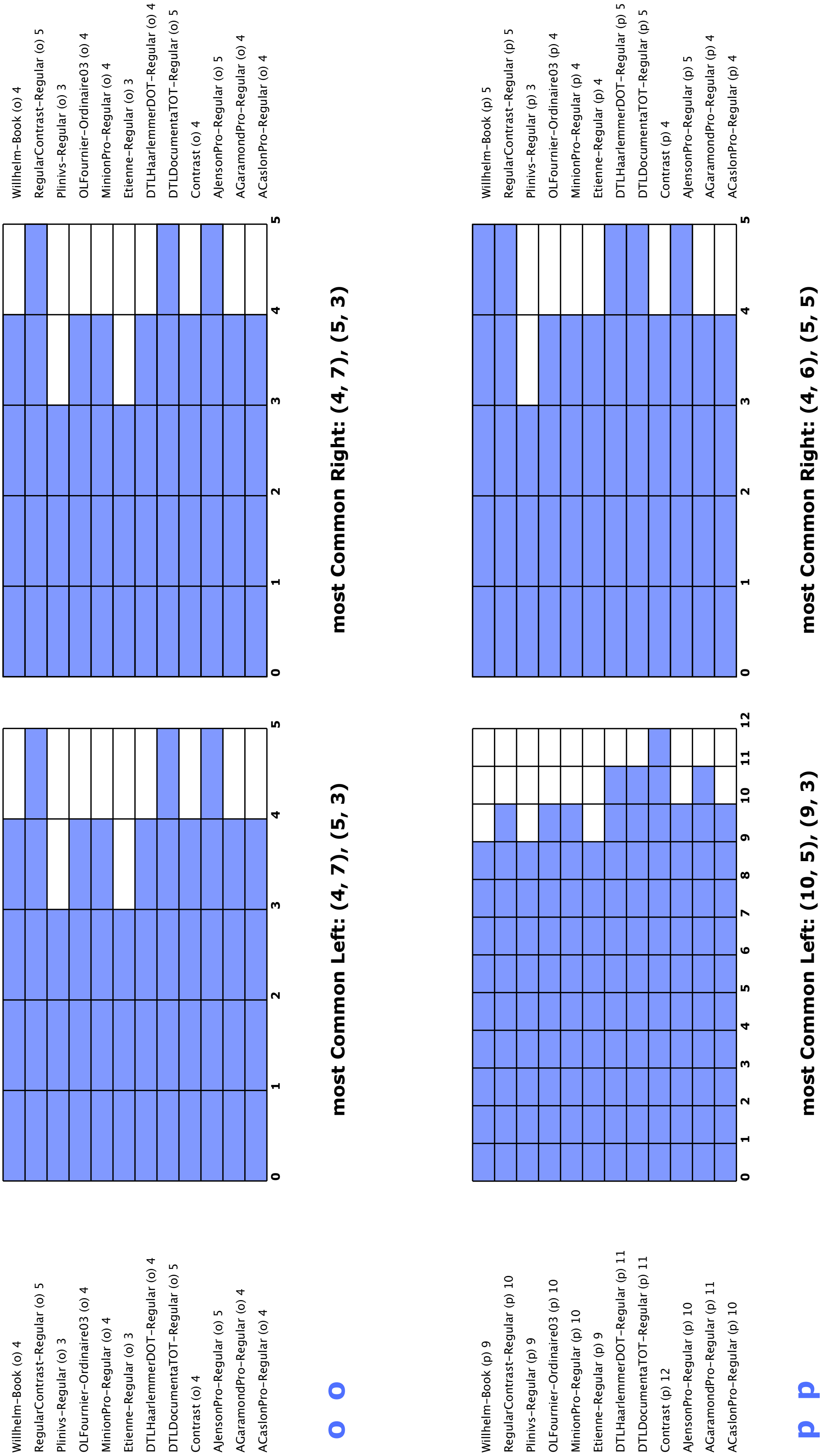


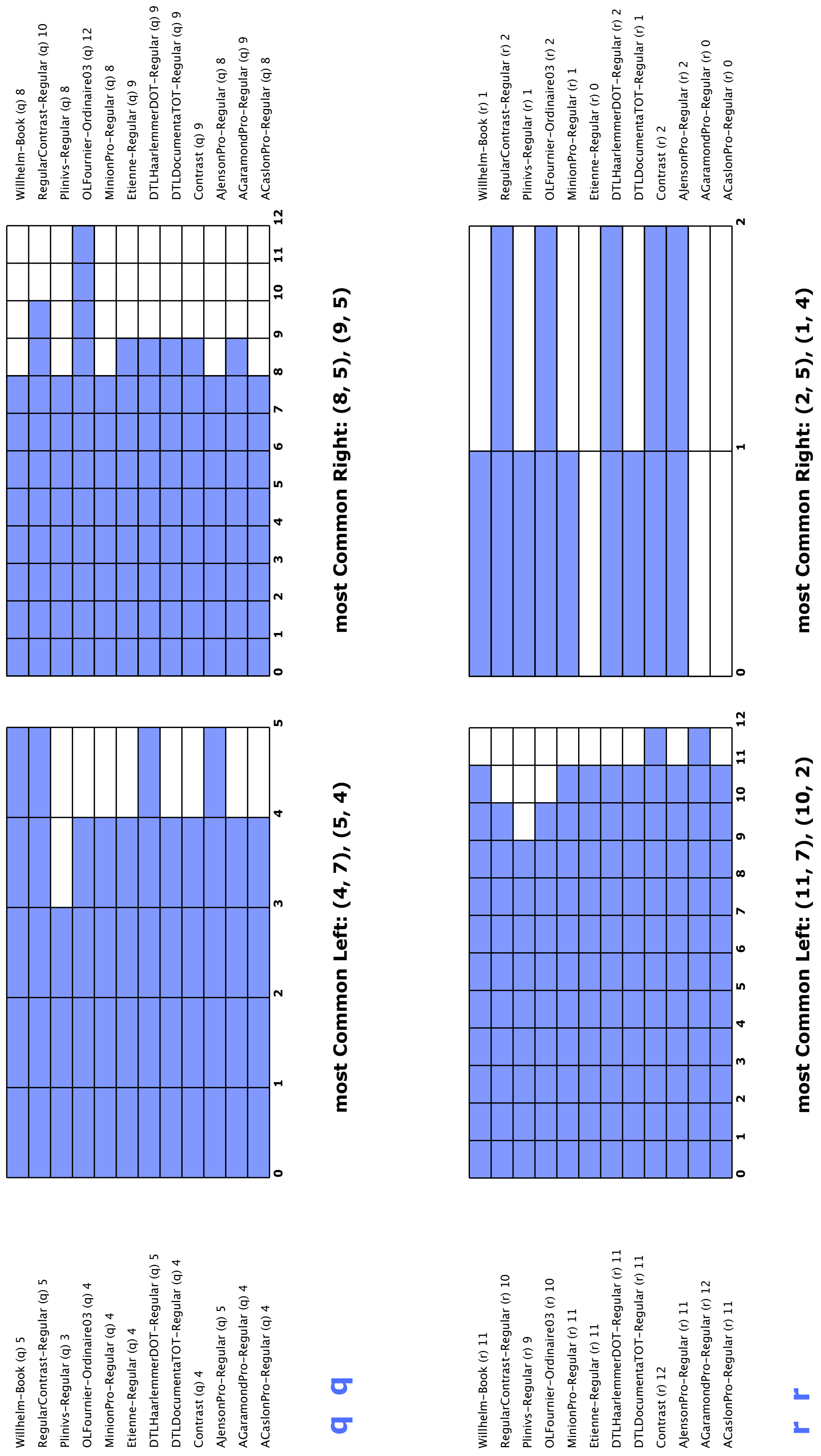


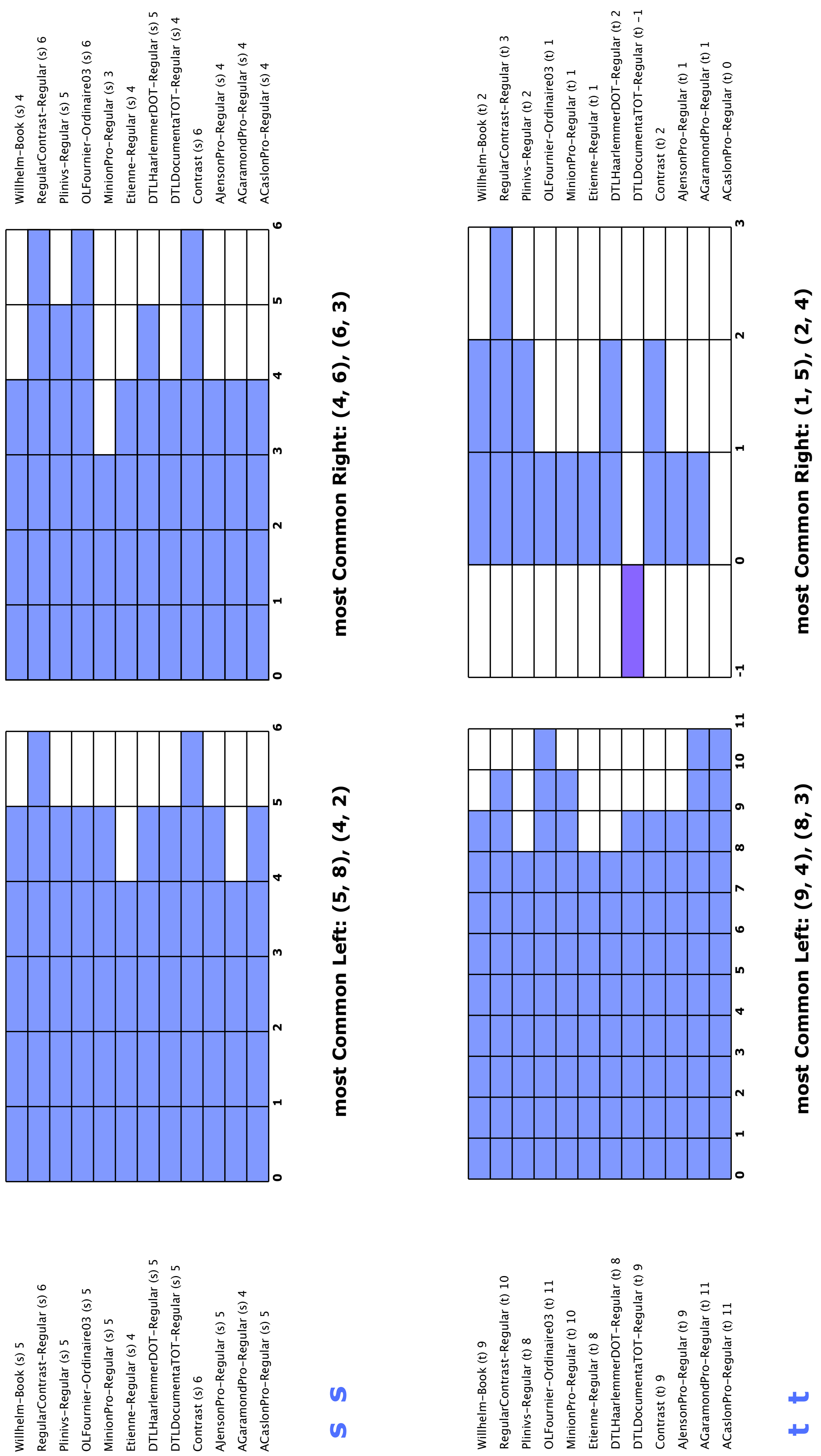
n n

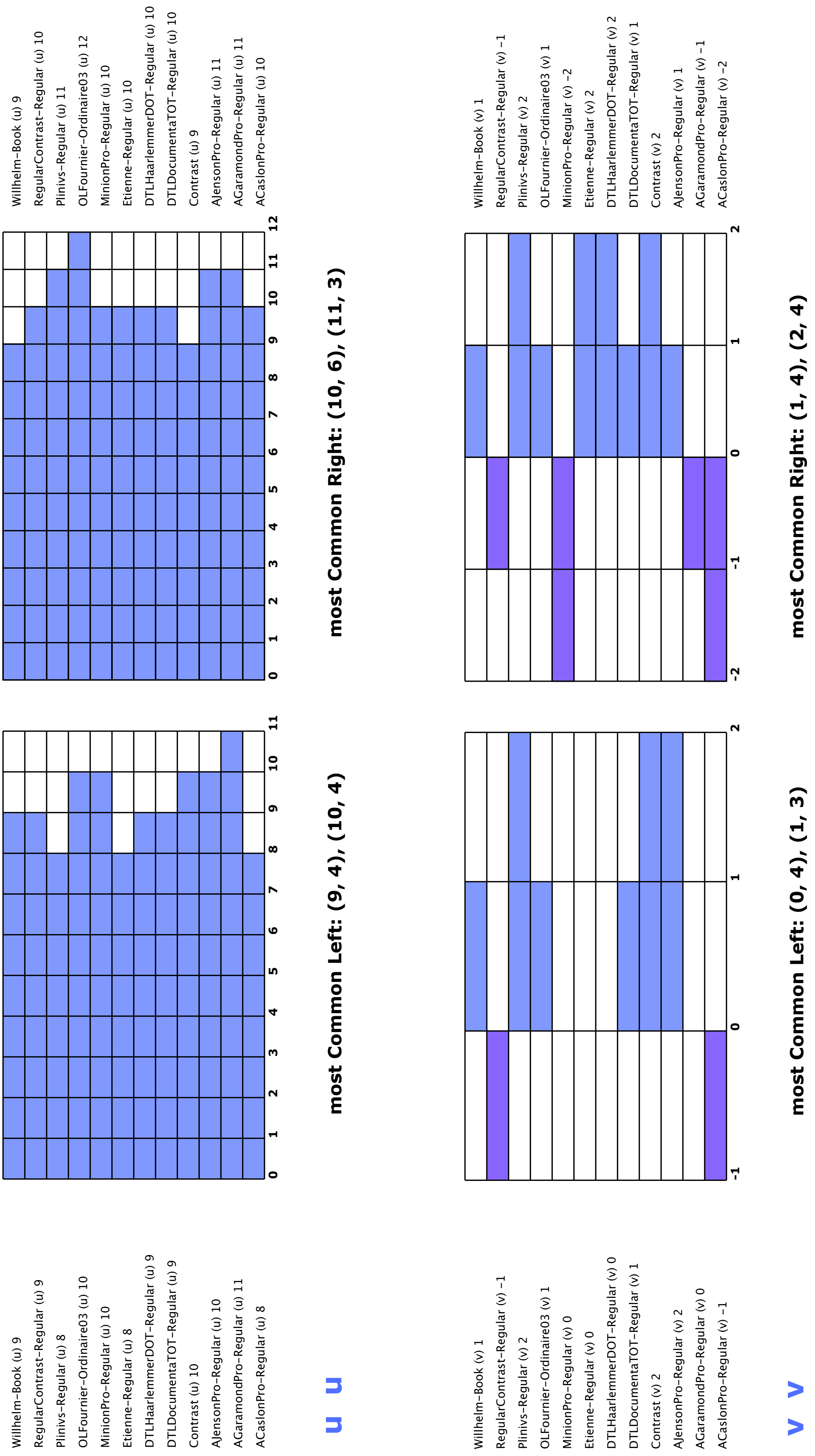
most Common Left: (11, 8), (10, 2)

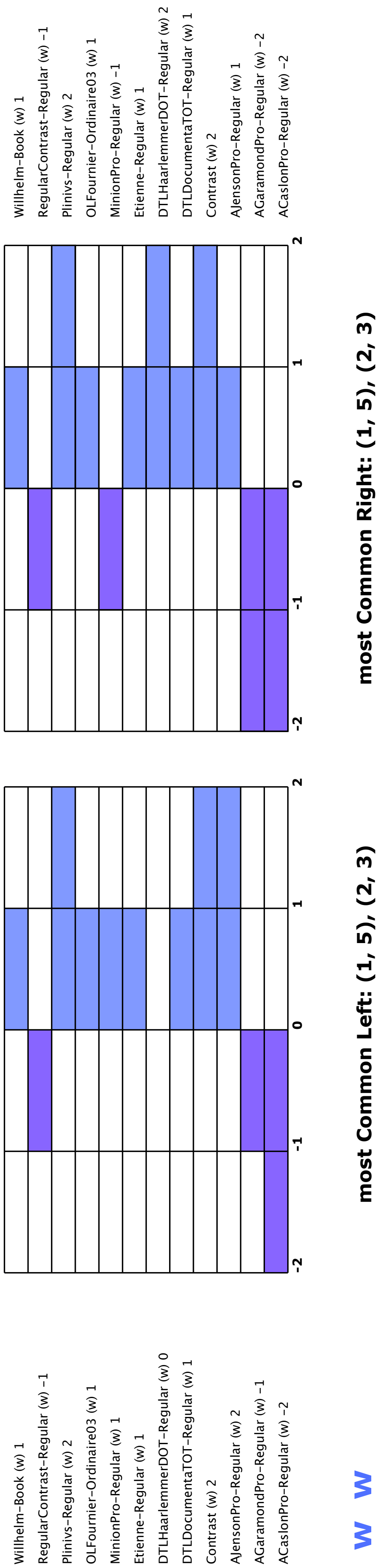
most Common Right: (10, 6), (9, 3)

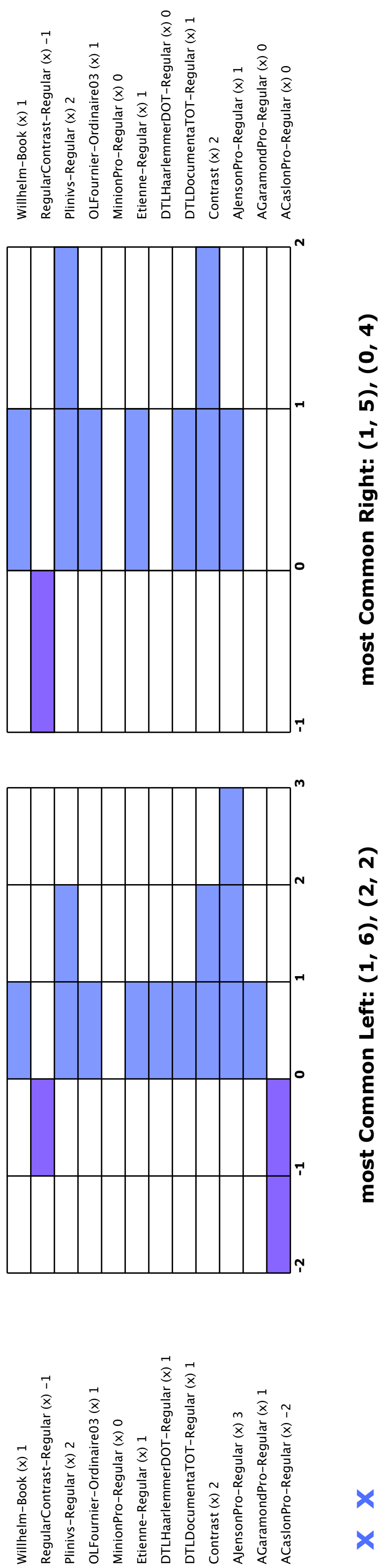

o o
Willhelm-Book (o) 4
RegularContrast-Regular (o) 5
Plinivs-Regular (o) 3
OLFournier-Ordinaire03 (o) 4
MinionPro-Regular (o) 4
Etienne-Regular (o) 3
DTLHaarlemmerDOT-Regular (o) 4
DTLDocumentaTOT-Regular (o) 5
Contrast (o) 4
AJensonPro-Regular (o) 5
AGaramondPro-Regular (o) 4
ACaslonPro-Regular (o) 4
most Common Left: (4, 7), (5, 3)
most Common Right: (4, 7), (5, 3)
p p
Willhelm-Book (p) 9
RegularContrast-Regular (p) 10
Plinivs-Regular (p) 9
OLFournier-Ordinaire03 (p) 10
MinionPro-Regular (p) 10
Etienne-Regular (p) 9
DTLHaarlemmerDOT-Regular (p) 11
DTLDocumentaTOT-Regular (p) 11
Contrast (p) 12
AJensonPro-Regular (p) 10
AGaramondPro-Regular (p) 11
ACaslonPro-Regular (p) 10
most Common Left: (10, 5), (9, 3)
Willhelm-Book (p) 5
RegularContrast-Regular (p) 5
Plinivs-Regular (p) 3
OLFournier-Ordinaire03 (p) 4
MinionPro-Regular (p) 4
Etienne-Regular (p) 4
DTLHaarlemmerDOT-Regular (p) 5
DTLDocumentaTOT-Regular (p) 5
Contrast (p) 4
AJensonPro-Regular (p) 5
AGaramondPro-Regular (p) 4
ACaslonPro-Regular (p) 4
most Common Right: (4, 6), (5, 5)

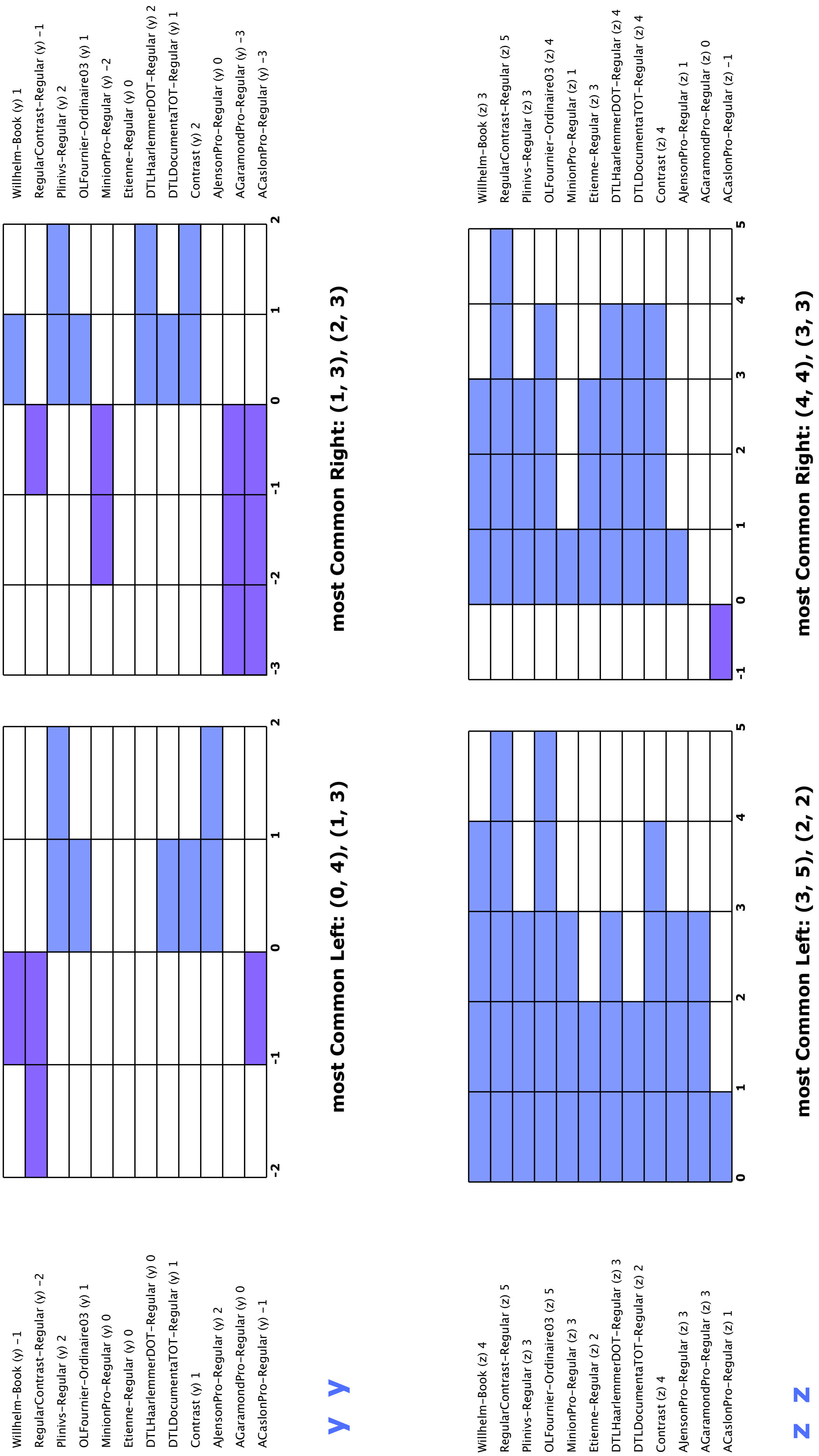

q q
Willhelm–Book (q) 5
RegularContrast–Regular (q) 5
Plinivs–Regular (q) 3
OLFournier–Ordinaire03 (q) 4
MinionPro–Regular (q) 4
Etienne–Regular (q) 4
DTLHaarlemmerDOT–Regular (q) 5
DTLDocumentaTOT–Regular (q) 4
Contrast (q) 4
AJensonPro–Regular (q) 5
AGaramondPro–Regular (q) 4
ACaslonPro–Regular (q) 4
most Common Left: (4, 7), (5, 4)
Willhelm–Book (q) 8
RegularContrast–Regular (q) 10
Plinivs–Regular (q) 8
OLFournier–Ordinaire03 (q) 12
MinionPro–Regular (q) 8
Etienne–Regular (q) 9
DTLHaarlemmerDOT–Regular (q) 9
DTLDocumentaTOT–Regular (q) 9
Contrast (q) 9
AJensonPro–Regular (q) 8
AGaramondPro–Regular (q) 9
ACaslonPro–Regular (q) 8
most Common Right: (8, 5), (9, 5)
r r
Willhelm–Book (r) 11
RegularContrast–Regular (r) 10
Plinivs–Regular (r) 9
OLFournier–Ordinaire03 (r) 10
MinionPro–Regular (r) 11
Etienne–Regular (r) 11
DTLHaarlemmerDOT–Regular (r) 11
DTLDocumentaTOT–Regular (r) 11
Contrast (r) 12
AJensonPro–Regular (r) 11
AGaramondPro–Regular (r) 12
ACaslonPro–Regular (r) 11
most Common Left: (11, 7), (10, 2)
Willhelm–Book (r) 1
RegularContrast–Regular (r) 2
Plinivs–Regular (r) 1
OLFournier–Ordinaire03 (r) 2
MinionPro–Regular (r) 1
Etienne–Regular (r) 0
DTLHaarlemmerDOT–Regular (r) 2
DTLDocumentaTOT–Regular (r) 1
Contrast (r) 2
AJensonPro–Regular (r) 2
AGaramondPro–Regular (r) 0
ACaslonPro–Regular (r) 0
most Common Right: (2, 5), (1, 4)

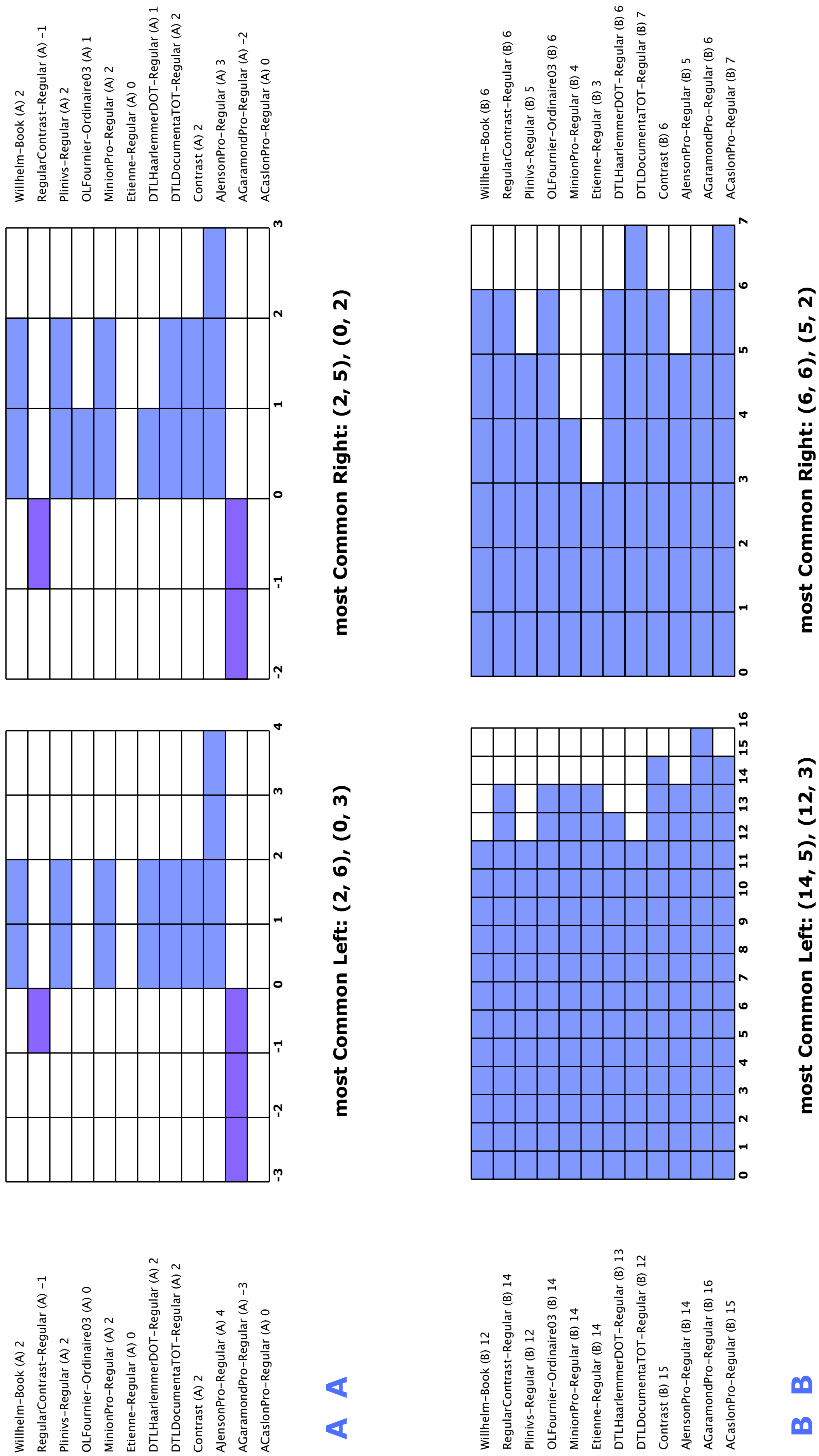

s s
Willhelm–Book (s) 5
RegularContrast–Regular (s) 6
Plinivs–Regular (s) 5
OLFournier–Ordinaire03 (s) 5
MinionPro–Regular (s) 5
Etienne–Regular (s) 4
DTLHaarlemmerDOT–Regular (s) 5
DTLDocumentaTOT–Regular (s) 5
Contrast (s) 6
AJensonPro–Regular (s) 5
AGaramondPro–Regular (s) 4
ACaslonPro–Regular (s) 5
most Common Left: (5, 8), (4, 2)
most Common Right: (4, 6), (6, 3)
Willhelm–Book (s) 4
RegularContrast–Regular (s) 6
Plinivs–Regular (s) 5
OLFournier–Ordinaire03 (s) 6
MinionPro–Regular (s) 3
Etienne–Regular (s) 4
DTLHaarlemmerDOT–Regular (s) 5
DTLDocumentaTOT–Regular (s) 4
Contrast (s) 6
AJensonPro–Regular (s) 4
AGaramondPro–Regular (s) 4
ACaslonPro–Regular (s) 4
t t
Willhelm–Book (t) 9
RegularContrast–Regular (t) 10
Plinivs–Regular (t) 8
OLFournier–Ordinaire03 (t) 11
MinionPro–Regular (t) 10
Etienne–Regular (t) 8
DTLHaarlemmerDOT–Regular (t) 8
DTLDocumentaTOT–Regular (t) 9
Contrast (t) 9
AJensonPro–Regular (t) 9
AGaramondPro–Regular (t) 11
ACaslonPro–Regular (t) 11
most Common Left: (9, 4), (8, 3)
most Common Right: (1, 5), (2, 4)
Willhelm–Book (t) 2
RegularContrast–Regular (t) 3
Plinivs–Regular (t) 2
OLFournier–Ordinaire03 (t) 1
MinionPro–Regular (t) 1
Etienne–Regular (t) 1
DTLHaarlemmerDOT–Regular (t) 2
DTLDocumentaTOT–Regular (t) -1
Contrast (t) 2
AJensonPro–Regular (t) 1
AGaramondPro–Regular (t) 1
ACaslonPro–Regular (t) 0

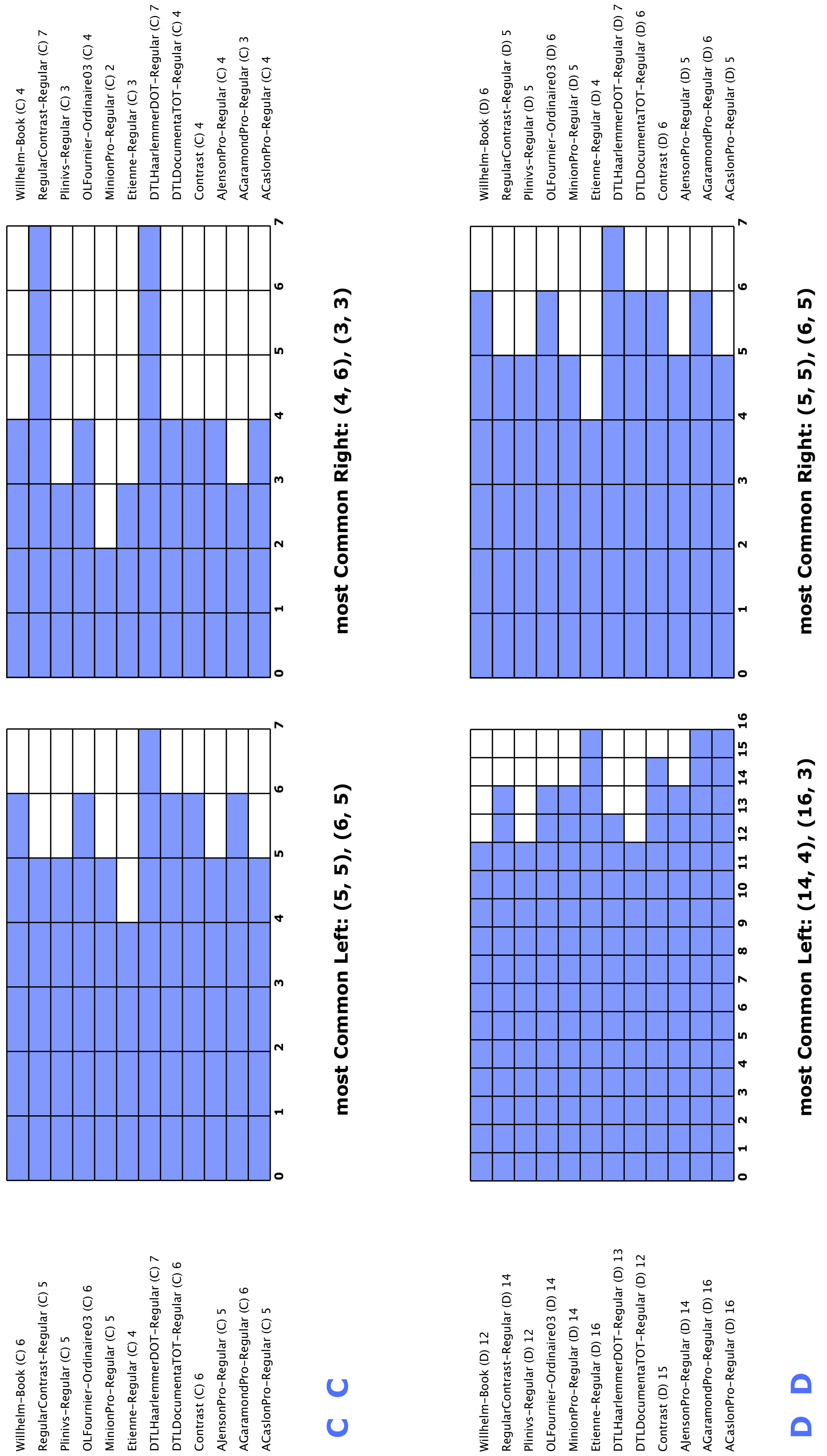

u u
Willhelm-Book (u) 9
RegularContrast-Regular (u) 9
Plinivs-Regular (u) 8
OLFournier-Ordinaire03 (u) 10
MinionPro-Regular (u) 10
Etienne-Regular (u) 8
DTLHaarlemmerDOT-Regular (u) 9
DTLDocumentaTOT-Regular (u) 9
Contrast (u) 10
AJensonPro-Regular (u) 10
AGaramondPro-Regular (u) 11
ACaslonPro-Regular (u) 8
most Common Left: (9, 4), (10, 4)
Willhelm-Book (u) 9
RegularContrast-Regular (u) 10
Plinivs-Regular (u) 11
OLFournier-Ordinaire03 (u) 12
MinionPro-Regular (u) 10
Etienne-Regular (u) 10
DTLHaarlemmerDOT-Regular (u) 10
DTLDocumentaTOT-Regular (u) 10
Contrast (u) 9
AJensonPro-Regular (u) 11
AGaramondPro-Regular (u) 11
ACaslonPro-Regular (u) 10
most Common Right: (10, 6), (11, 3)
v v
Willhelm-Book (v) 1
RegularContrast-Regular (v) -1
Plinivs-Regular (v) 2
OLFournier-Ordinaire03 (v) 1
MinionPro-Regular (v) 0
Etienne-Regular (v) 0
DTLHaarlemmerDOT-Regular (v) 0
DTLDocumentaTOT-Regular (v) 1
Contrast (v) 2
AJensonPro-Regular (v) 2
AGaramondPro-Regular (v) 0
ACaslonPro-Regular (v) -1
most Common Left: (0, 4), (1, 3)
Willhelm-Book (v) 1
RegularContrast-Regular (v) -1
Plinivs-Regular (v) 2
OLFournier-Ordinaire03 (v) 1
MinionPro-Regular (v) -2
Etienne-Regular (v) 2
DTLHaarlemmerDOT-Regular (v) 2
DTLDocumentaTOT-Regular (v) 1
Contrast (v) 2
AJensonPro-Regular (v) 1
AGaramondPro-Regular (v) -1
ACaslonPro-Regular (v) -2
most Common Right: (1, 4), (2, 4)

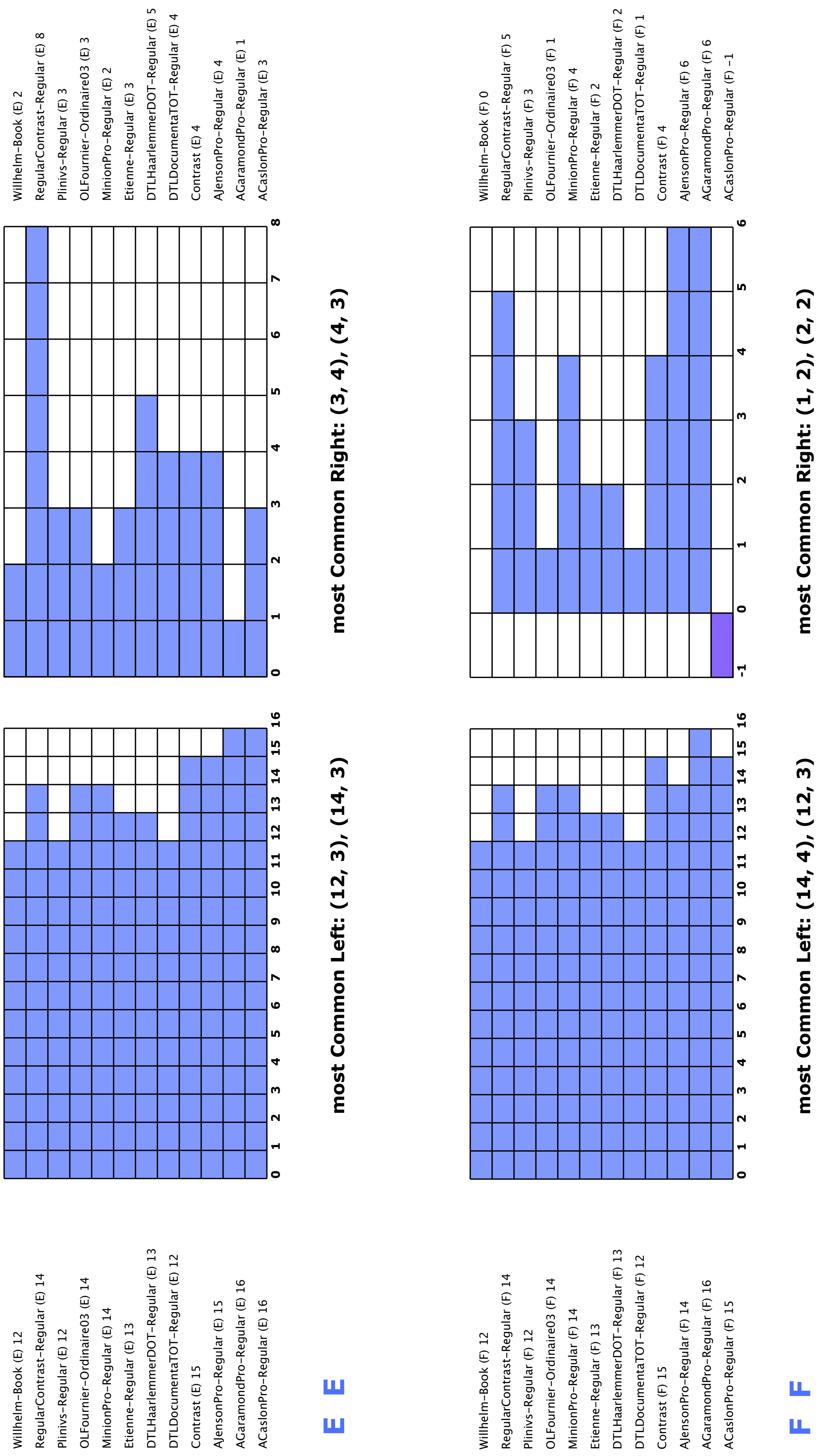

w w
most Common Left: (1, 5), (2, 3)
Willhelm-Book (w) 1
RegularContrast-Regular (w) -1
Plinivs-Regular (w) 2
OLFournier-Ordinaire03 (w) 1
MinionPro-Regular (w) 1
Etienne-Regular (w) 1
DTLHaarlemmerDOT-Regular (w) 0
DTLDocumentaTOT-Regular (w) 1
Contrast (w) 2
AJensonPro-Regular (w) 2
AGaramondPro-Regular (w) -1
ACaslonPro-Regular (w) -2
-2 -1 0 1 2
most Common Right: (1, 5), (2, 3)
Willhelm-Book (w) 1
RegularContrast-Regular (w) -1
Plinivs-Regular (w) 2
OLFournier-Ordinaire03 (w) 1
MinionPro-Regular (w) -1
Etienne-Regular (w) 1
DTLHaarlemmerDOT-Regular (w) 2
DTLDocumentaTOT-Regular (w) 1
Contrast (w) 2
AJensonPro-Regular (w) 1
AGaramondPro-Regular (w) -2
ACaslonPro-Regular (w) -2
-2 -1 0 1 2

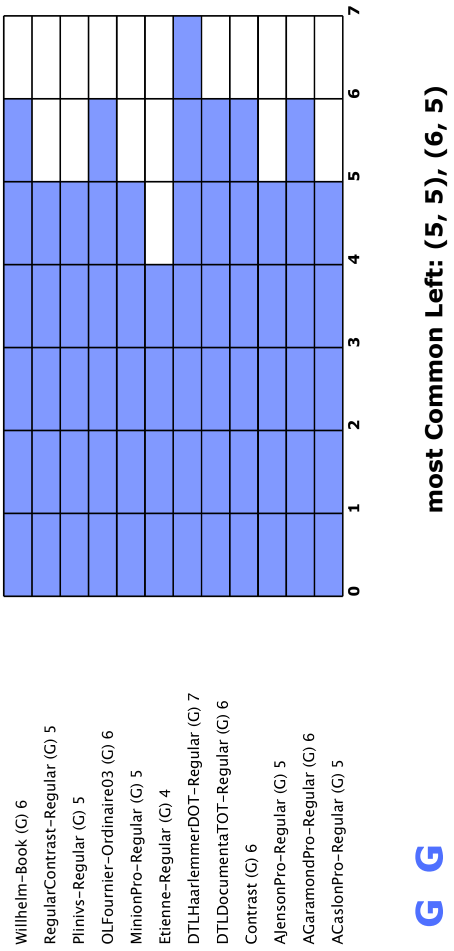

x x
most Common Left: (1, 6), (2, 2)
Willhelm-Book (x) 1
RegularContrast-Regular (x) -1
Plinivs-Regular (x) 2
OLFournier-Ordinaire03 (x) 1
MinionPro-Regular (x) 0
Etienne-Regular (x) 1
DTLHaarlemmerDOT-Regular (x) 1
DTLDocumentaTOT-Regular (x) 1
Contrast (x) 2
AJensonPro-Regular (x) 3
AGaramondPro-Regular (x) 1
ACaslonPro-Regular (x) -2
-2 -1 0 1 2 3
most Common Right: (1, 5), (0, 4)
Willhelm-Book (x) 1
RegularContrast-Regular (x) -1
Plinivs-Regular (x) 2
OLFournier-Ordinaire03 (x) 1
MinionPro-Regular (x) 0
Etienne-Regular (x) 1
DTLHaarlemmerDOT-Regular (x) 0
DTLDocumentaTOT-Regular (x) 1
Contrast (x) 2
AJensonPro-Regular (x) 1
AGaramondPro-Regular (x) 0
ACaslonPro-Regular (x) 0
-1 0 1 2

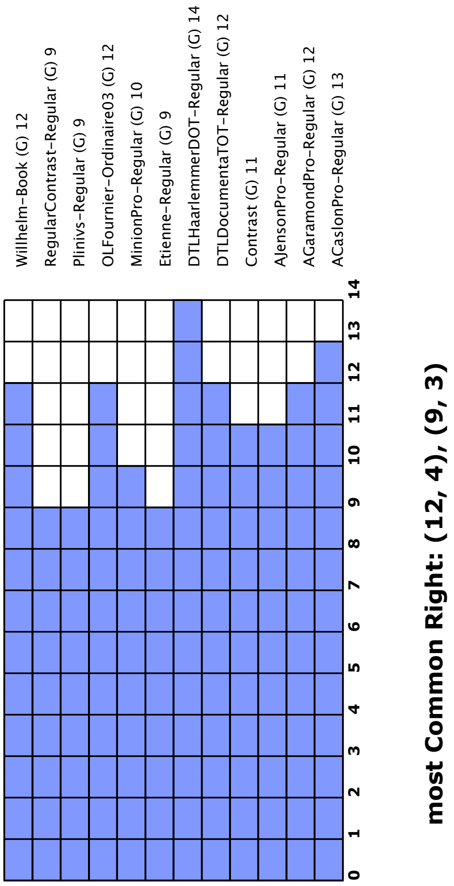

y
Willhelm-Book (y) -1
RegularContrast-Regular (y) -2
Plinivs-Regular (y) 2
OLFournier-Ordinaire03 (y) 1
MinionPro-Regular (y) 0
Etienne-Regular (y) 0
DTLHaarlemmerDOT-Regular (y) 0
DTLDocumentaTOT-Regular (y) 1
Contrast (y) 1
AJensonPro-Regular (y) 2
AGaramondPro-Regular (y) 0
ACaslonPro-Regular (y) -1
most Common Left: (0, 4), (1, 3)
Willhelm-Book (y) 1
RegularContrast-Regular (y) -1
Plinivs-Regular (y) 2
OLFournier-Ordinaire03 (y) 1
MinionPro-Regular (y) -2
Etienne-Regular (y) 0
DTLHaarlemmerDOT-Regular (y) 2
DTLDocumentaTOT-Regular (y) 1
Contrast (y) 2
AJensonPro-Regular (y) 0
AGaramondPro-Regular (y) -3
ACaslonPro-Regular (y) -3
most Common Right: (1, 3), (2, 3)
z
Willhelm-Book (z) 4
RegularContrast-Regular (z) 5
Plinivs-Regular (z) 3
OLFournier-Ordinaire03 (z) 5
MinionPro-Regular (z) 3
Etienne-Regular (z) 2
DTLHaarlemmerDOT-Regular (z) 3
DTLDocumentaTOT-Regular (z) 2
Contrast (z) 4
AJensonPro-Regular (z) 3
AGaramondPro-Regular (z) 3
ACaslonPro-Regular (z) 1
most Common Left: (3, 5), (2, 2)
Willhelm-Book (z) 3
RegularContrast-Regular (z) 5
Plinivs-Regular (z) 3
OLFournier-Ordinaire03 (z) 4
MinionPro-Regular (z) 1
Etienne-Regular (z) 3
DTLHaarlemmerDOT-Regular (z) 4
DTLDocumentaTOT-Regular (z) 4
Contrast (z) 4
AJensonPro-Regular (z) 1
AGaramondPro-Regular (z) 0
ACaslonPro-Regular (z) -1
most Common Right: (4, 4), (3, 3)

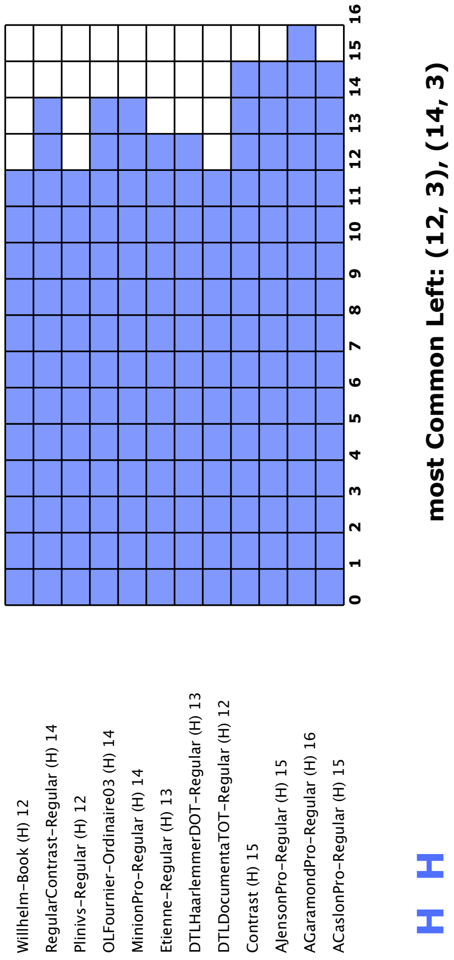

Wilhelm–Book (A) 2
RegularContrast–Regular (A) –1
Plinivs–Regular (A) 2
OLFournier–Ordinaire03 (A) 1
MinionPro–Regular (A) 2
Etienne–Regular (A) 0
DTLHaarlemmerDOT–Regular (A) 1
DTLDocumentaTOT–Regular (A) 2
Contrast (A) 2
AJensonPro–Regular (A) 3
AGaramondPro–Regular (A) –2
ACaslonPro–Regular (A) 0
most Common Right: (2, 5), (0, 2)
Wilhelm–Book (A) 2
RegularContrast–Regular (A) –1
Plinivs–Regular (A) 2
OLFournier–Ordinaire03 (A) 0
MinionPro–Regular (A) 2
Etienne–Regular (A) 0
DTLHaarlemmerDOT–Regular (A) 2
DTLDocumentaTOT–Regular (A) 2
Contrast (A) 2
AJensonPro–Regular (A) 4
AGaramondPro–Regular (A) –3
ACaslonPro–Regular (A) 0
most Common Left: (2, 6), (0, 3)
A A
Wilhelm–Book (B) 6
RegularContrast–Regular (B) 6
Plinivs–Regular (B) 5
OLFournier–Ordinaire03 (B) 6
MinionPro–Regular (B) 4
Etienne–Regular (B) 3
DTLHaarlemmerDOT–Regular (B) 6
DTLDocumentaTOT–Regular (B) 7
Contrast (B) 6
AJensonPro–Regular (B) 5
AGaramondPro–Regular (B) 6
ACaslonPro–Regular (B) 7
most Common Right: (6, 6), (5, 2)
Wilhelm–Book (B) 12
RegularContrast–Regular (B) 14
Plinivs–Regular (B) 12
OLFournier–Ordinaire03 (B) 14
MinionPro–Regular (B) 14
Etienne–Regular (B) 14
DTLHaarlemmerDOT–Regular (B) 13
DTLDocumentaTOT–Regular (B) 12
Contrast (B) 15
AJensonPro–Regular (B) 14
AGaramondPro–Regular (B) 16
ACaslonPro–Regular (B) 15
most Common Left: (14, 5), (12, 3)
B B

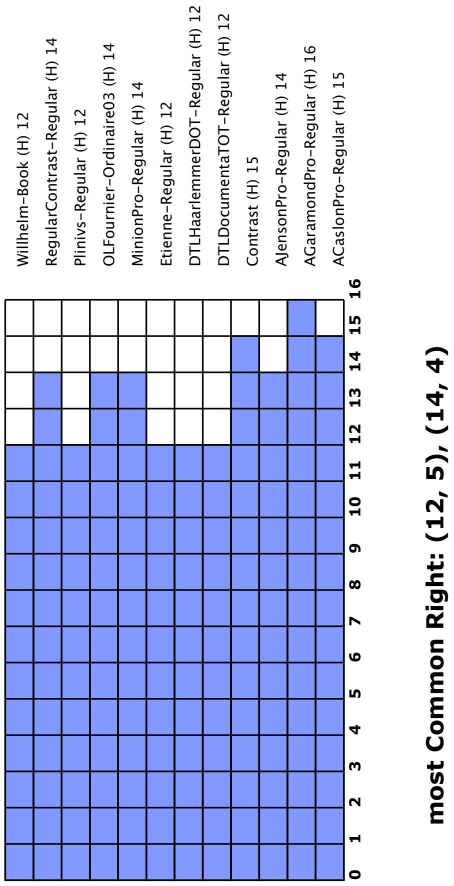

C C
Willhelm–Book (C) 6
RegularContrast–Regular (C) 5
Plinivs–Regular (C) 5
OLFournier–Ordinaire03 (C) 6
MinionPro–Regular (C) 5
Etienne–Regular (C) 4
DTLHaarlemmerDOT–Regular (C) 7
DTLDocumentaTOT–Regular (C) 6
Contrast (C) 6
AJensonPro–Regular (C) 5
AGaramondPro–Regular (C) 6
ACaslonPro–Regular (C) 5
most Common Left: (5, 5), (6, 5)
Willhelm–Book (C) 4
RegularContrast–Regular (C) 7
Plinivs–Regular (C) 3
OLFournier–Ordinaire03 (C) 4
MinionPro–Regular (C) 2
Etienne–Regular (C) 3
DTLHaarlemmerDOT–Regular (C) 7
DTLDocumentaTOT–Regular (C) 4
Contrast (C) 4
AJensonPro–Regular (C) 4
AGaramondPro–Regular (C) 3
ACaslonPro–Regular (C) 4
most Common Right: (4, 6), (3, 3)
D D
Willhelm–Book (D) 12
RegularContrast–Regular (D) 14
Plinivs–Regular (D) 12
OLFournier–Ordinaire03 (D) 14
MinionPro–Regular (D) 14
Etienne–Regular (D) 16
DTLHaarlemmerDOT–Regular (D) 13
DTLDocumentaTOT–Regular (D) 12
Contrast (D) 15
AJensonPro–Regular (D) 14
AGaramondPro–Regular (D) 16
ACaslonPro–Regular (D) 16
most Common Left: (14, 4), (16, 3)
Willhelm–Book (D) 6
RegularContrast–Regular (D) 5
Plinivs–Regular (D) 5
OLFournier–Ordinaire03 (D) 6
MinionPro–Regular (D) 5
Etienne–Regular (D) 4
DTLHaarlemmerDOT–Regular (D) 7
DTLDocumentaTOT–Regular (D) 6
Contrast (D) 6
AJensonPro–Regular (D) 5
AGaramondPro–Regular (D) 6
ACaslonPro–Regular (D) 5
most Common Right: (5, 5), (6, 5)

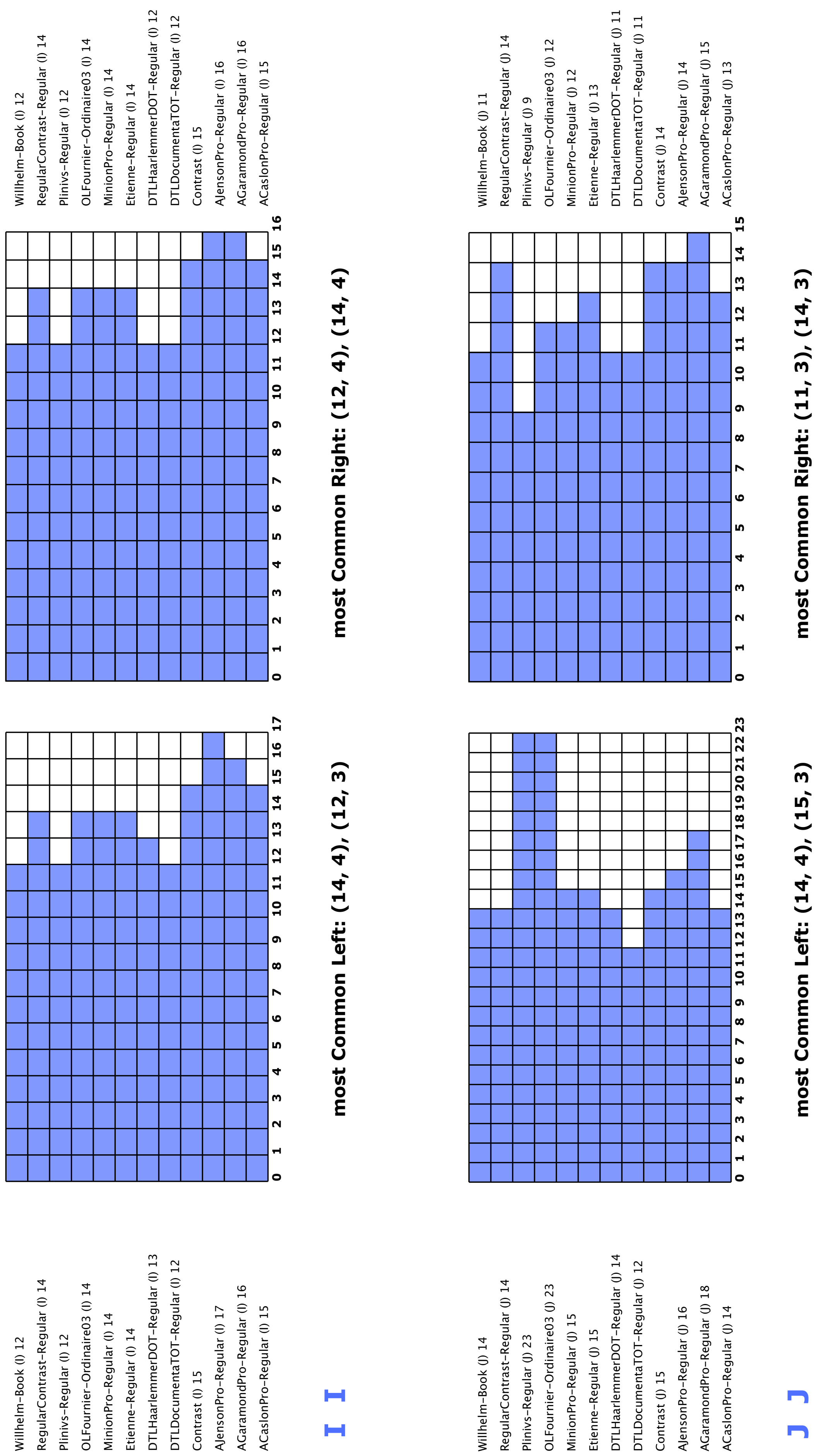

E E
Willhelm-Book (E) 12
RegularContrast-Regular (E) 14
Plinivs-Regular (E) 12
OLFournier-Ordinaire03 (E) 14
MinionPro-Regular (E) 14
Etienne-Regular (E) 13
DTLHaarlemmerDOT-Regular (E) 13
DTLDocumentaTOT-Regular (E) 12
Contrast (E) 15
AJensonPro-Regular (E) 15
AGaramondPro-Regular (E) 16
ACaslonPro-Regular (E) 16
most Common Left: (12, 3), (14, 3)
Willhelm-Book (E) 2
RegularContrast-Regular (E) 8
Plinivs-Regular (E) 3
OLFournier-Ordinaire03 (E) 3
MinionPro-Regular (E) 2
Etienne-Regular (E) 3
DTLHaarlemmerDOT-Regular (E) 5
DTLDocumentaTOT-Regular (E) 4
Contrast (E) 4
AJensonPro-Regular (E) 4
AGaramondPro-Regular (E) 1
ACaslonPro-Regular (E) 3
most Common Right: (3, 4), (4, 3)
F F
Willhelm-Book (F) 12
RegularContrast-Regular (F) 14
Plinivs-Regular (F) 12
OLFournier-Ordinaire03 (F) 14
MinionPro-Regular (F) 14
Etienne-Regular (F) 13
DTLHaarlemmerDOT-Regular (F) 13
DTLDocumentaTOT-Regular (F) 12
Contrast (F) 15
AJensonPro-Regular (F) 14
AGaramondPro-Regular (F) 16
ACaslonPro-Regular (F) 15
most Common Left: (14, 4), (12, 3)
Willhelm-Book (F) 0
RegularContrast-Regular (F) 5
Plinivs-Regular (F) 3
OLFournier-Ordinaire03 (F) 1
MinionPro-Regular (F) 4
Etienne-Regular (F) 2
DTLHaarlemmerDOT-Regular (F) 2
DTLDocumentaTOT-Regular (F) 1
Contrast (F) 4
AJensonPro-Regular (F) 6
AGaramondPro-Regular (F) 6
ACaslonPro-Regular (F) -1
most Common Right: (1, 2), (2, 2)

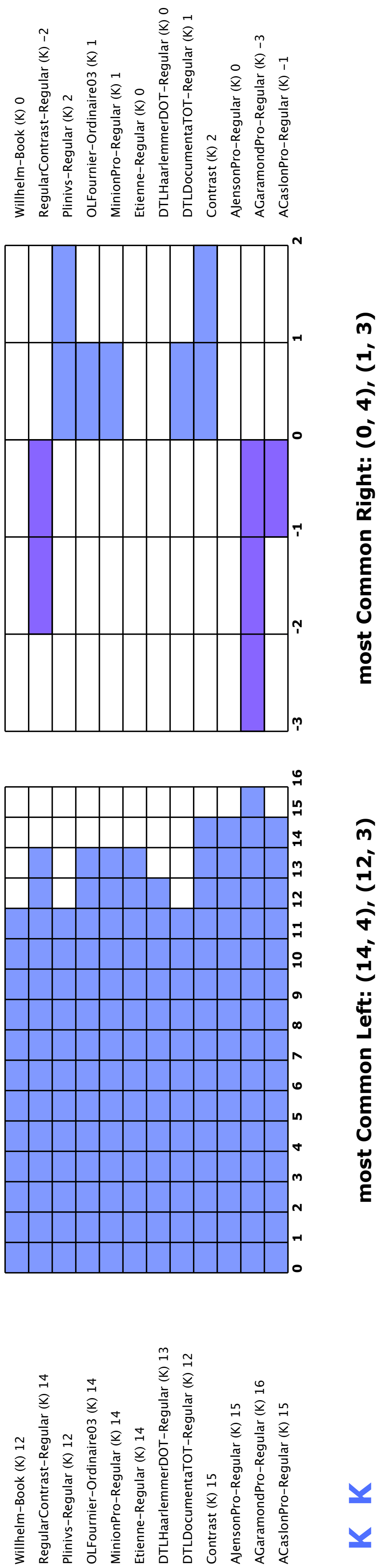

Willhelm-Book (G) 6
RegularContrast-Regular (G) 5
Plinivs-Regular (G) 5
OLFournier-Ordinaire03 (G) 6
MinionPro-Regular (G) 5
Etienne-Regular (G) 4
DTLHaarlemmerDOT-Regular (G) 7
DTLDocumentaTOT-Regular (G) 6
Contrast (G) 6
AJensonPro-Regular (G) 5
AGaramondPro-Regular (G) 6
ACaslonPro-Regular (G) 5
0 1 2 3 4 5 6 7
most Common Left: (5, 5), (6, 5)
G G

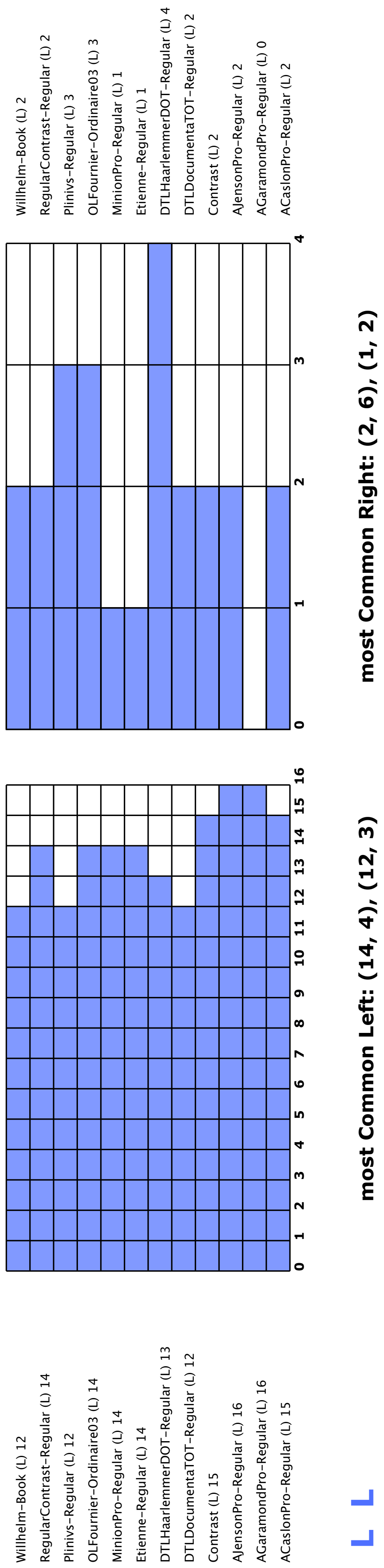

Willhelm-Book (G) 12
RegularContrast-Regular (G) 9
Plinivs-Regular (G) 9
OLFournier-Ordinaire03 (G) 12
MinionPro-Regular (G) 10
Etienne-Regular (G) 9
DTLHaarlemmerDOT-Regular (G) 14
DTLDocumentaTOT-Regular (G) 12
Contrast (G) 11
AJensonPro-Regular (G) 11
AGaramondPro-Regular (G) 12
ACaslonPro-Regular (G) 13
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14
most Common Right: (12, 4), (9, 3)

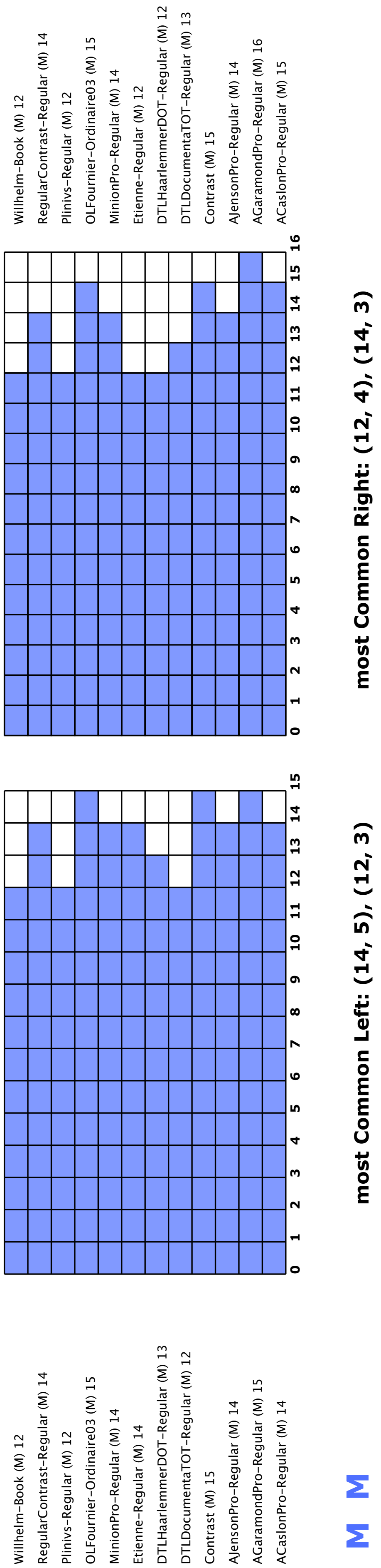

Willhelm-Book (H) 12
RegularContrast-Regular (H) 14
Plinivs-Regular (H) 12
OLFournier-Ordinaire03 (H) 14
MinionPro-Regular (H) 14
Etienne-Regular (H) 13
DTLHaarlemmerDOT-Regular (H) 13
DTLDocumentaTOT-Regular (H) 12
Contrast (H) 15
AJensonPro-Regular (H) 15
AGaramondPro-Regular (H) 16
ACaslonPro-Regular (H) 15
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
most Common Left: (12, 3), (14, 3)
H H

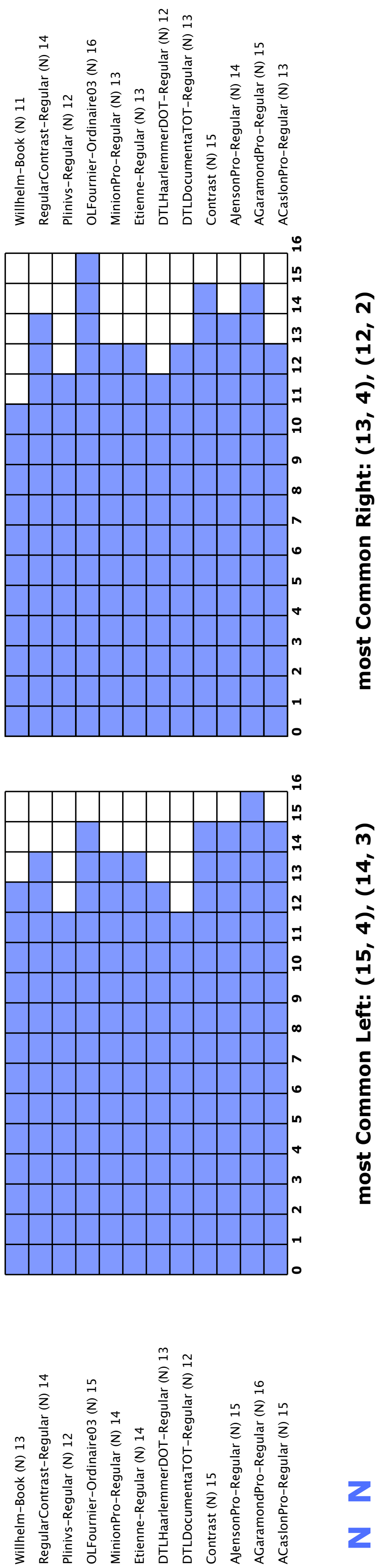

Willhelm-Book (H) 12
RegularContrast-Regular (H) 14
Plinivs-Regular (H) 12
OLFournier-Ordinaire03 (H) 14
MinionPro-Regular (H) 14
Etienne-Regular (H) 12
DTLHaarlemmerDOT-Regular (H) 12
DTLDocumentaTOT-Regular (H) 12
Contrast (H) 15
AJensonPro-Regular (H) 14
AGaramondPro-Regular (H) 16
ACaslonPro-Regular (H) 15
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
most Common Right: (12, 5), (14, 4)

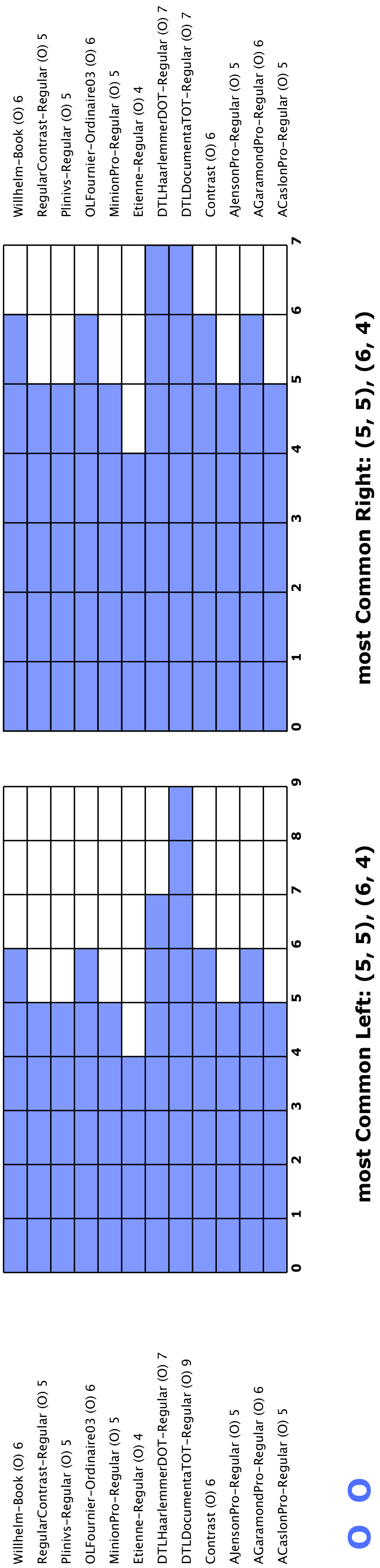

Willhelm-Book (I) 12
RegularContrast-Regular (I) 14
Plinivs-Regular (I) 12
OLFournier-Ordinaire03 (I) 14
MinionPro-Regular (I) 14
Etienne-Regular (I) 14
DTLHaarlemmerDOT-Regular (I) 12
DTLDocumentaTOT-Regular (I) 12
Contrast (I) 15
AJensonPro-Regular (I) 16
AGaramondPro-Regular (I) 16
ACaslonPro-Regular (I) 15
most Common Right: (12, 4), (14, 4)
Willhelm-Book (I) 12
RegularContrast-Regular (I) 14
Plinivs-Regular (I) 12
OLFournier-Ordinaire03 (I) 14
MinionPro-Regular (I) 14
Etienne-Regular (I) 14
DTLHaarlemmerDOT-Regular (I) 13
DTLDocumentaTOT-Regular (I) 12
Contrast (I) 15
AJensonPro-Regular (I) 17
AGaramondPro-Regular (I) 16
ACaslonPro-Regular (I) 15
most Common Left: (14, 4), (12, 3)
I I
Willhelm-Book (J) 11
RegularContrast-Regular (J) 14
Plinivs-Regular (J) 9
OLFournier-Ordinaire03 (J) 12
MinionPro-Regular (J) 12
Etienne-Regular (J) 13
DTLHaarlemmerDOT-Regular (J) 11
DTLDocumentaTOT-Regular (J) 11
Contrast (J) 14
AJensonPro-Regular (J) 14
AGaramondPro-Regular (J) 15
ACaslonPro-Regular (J) 13
most Common Right: (11, 3), (14, 3)
Willhelm-Book (J) 14
RegularContrast-Regular (J) 14
Plinivs-Regular (J) 23
OLFournier-Ordinaire03 (J) 23
MinionPro-Regular (J) 15
Etienne-Regular (J) 15
DTLHaarlemmerDOT-Regular (J) 14
DTLDocumentaTOT-Regular (J) 12
Contrast (J) 15
AJensonPro-Regular (J) 16
AGaramondPro-Regular (J) 18
ACaslonPro-Regular (J) 14
most Common Left: (14, 4), (15, 3)
J J

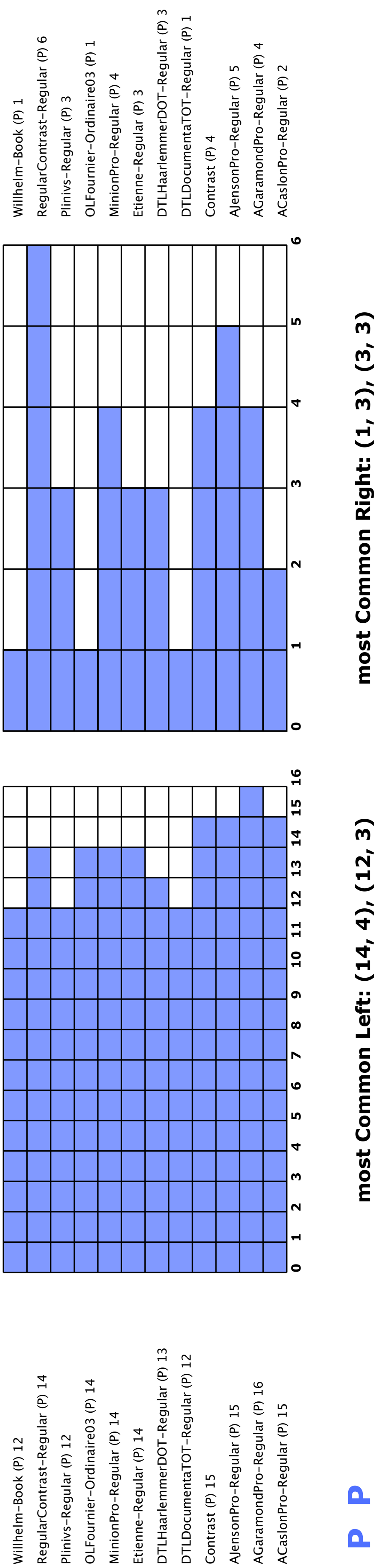

Willhelm-Book (K) 0
RegularContrast-Regular (K) -2
Plinivs-Regular (K) 2
OLFournier-Ordinaire03 (K) 1
MinionPro-Regular (K) 1
Etienne-Regular (K) 0
DTLHaarlemmerDOT-Regular (K) 0
DTLDocumentaTOT-Regular (K) 1
Contrast (K) 2
AJensonPro-Regular (K) 0
AGaramondPro-Regular (K) -3
ACaslonPro-Regular (K) -1
most Common Right: (0, 4), (1, 3)
most Common Left: (14, 4), (12, 3)
Willhelm-Book (K) 12
RegularContrast-Regular (K) 14
Plinivs-Regular (K) 12
OLFournier-Ordinaire03 (K) 14
MinionPro-Regular (K) 14
Etienne-Regular (K) 14
DTLHaarlemmerDOT-Regular (K) 13
DTLDocumentaTOT-Regular (K) 12
Contrast (K) 15
AJensonPro-Regular (K) 15
AGaramondPro-Regular (K) 16
ACaslonPro-Regular (K) 15
K K

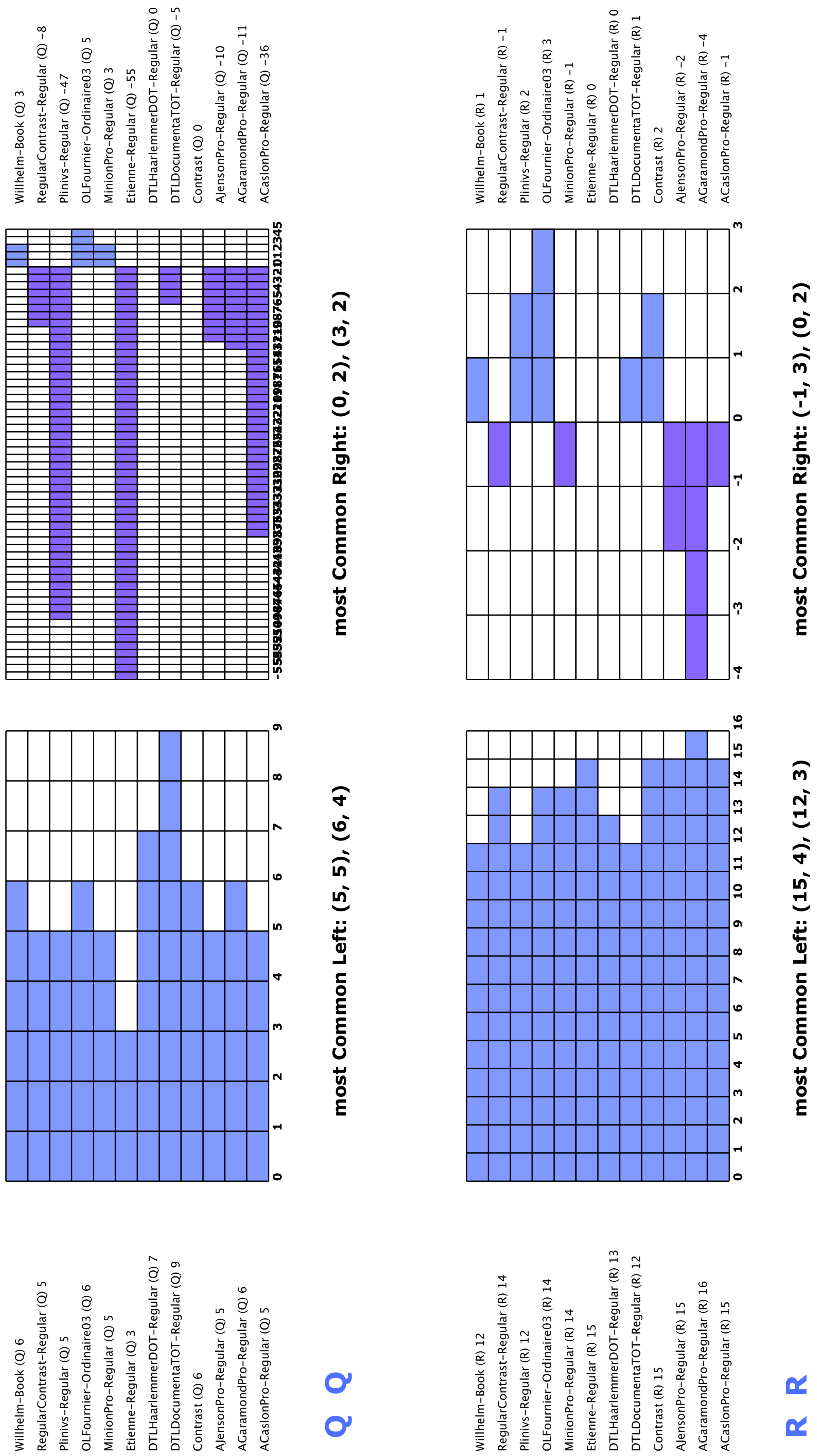

Willhelm-Book (L) 2
RegularContrast-Regular (L) 2
Plinivs-Regular (L) 3
OLFournier-Ordinaire03 (L) 3
MinionPro-Regular (L) 1
Etienne-Regular (L) 1
DTLHaarlemmerDOT-Regular (L) 4
DTLDocumentaTOT-Regular (L) 2
Contrast (L) 2
AJensonPro-Regular (L) 2
AGaramondPro-Regular (L) 0
ACaslonPro-Regular (L) 2
most Common Right: (2, 6), (1, 2)
most Common Left: (14, 4), (12, 3)
Willhelm-Book (L) 12
RegularContrast-Regular (L) 14
Plinivs-Regular (L) 12
OLFournier-Ordinaire03 (L) 14
MinionPro-Regular (L) 14
Etienne-Regular (L) 14
DTLHaarlemmerDOT-Regular (L) 13
DTLDocumentaTOT-Regular (L) 12
Contrast (L) 15
AJensonPro-Regular (L) 16
AGaramondPro-Regular (L) 16
ACaslonPro-Regular (L) 15
L L

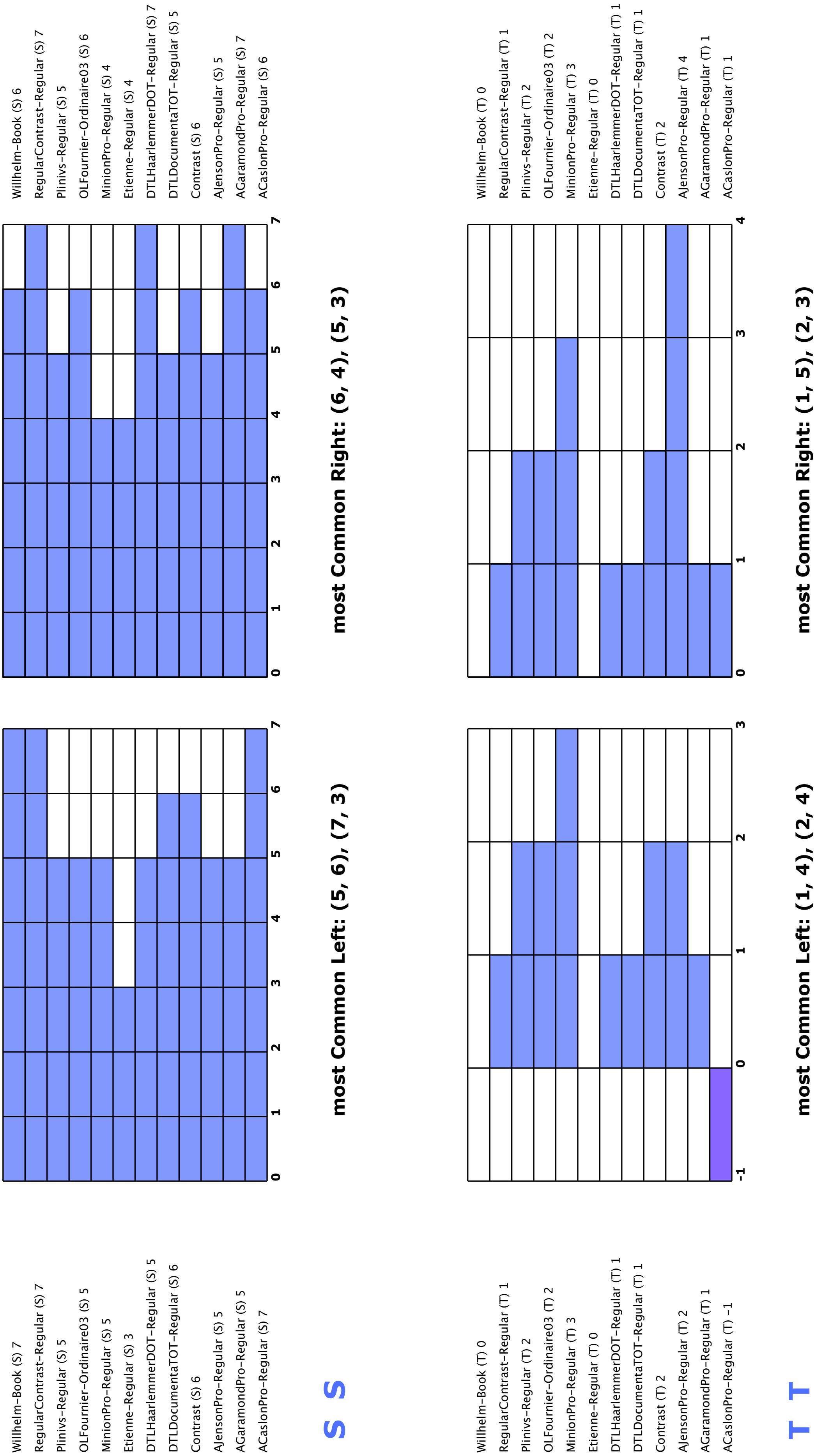

Willhelm-Book (M) 12
RegularContrast-Regular (M) 14
Plinivs-Regular (M) 12
OLFournier-Ordinaire03 (M) 15
MinionPro-Regular (M) 14
Etienne-Regular (M) 14
DTLHaarlemmerDOT-Regular (M) 13
DTLDocumentaTOT-Regular (M) 12
Contrast (M) 15
AJensonPro-Regular (M) 14
AGaramondPro-Regular (M) 15
ACaslonPro-Regular (M) 14
most Common Left: (14, 5), (12, 3)
Willhelm-Book (M) 12
RegularContrast-Regular (M) 14
Plinivs-Regular (M) 12
OLFournier-Ordinaire03 (M) 15
MinionPro-Regular (M) 14
Etienne-Regular (M) 12
DTLHaarlemmerDOT-Regular (M) 12
DTLDocumentaTOT-Regular (M) 13
Contrast (M) 15
AJensonPro-Regular (M) 14
AGaramondPro-Regular (M) 16
ACaslonPro-Regular (M) 15
most Common Right: (12, 4), (14, 3)
M M

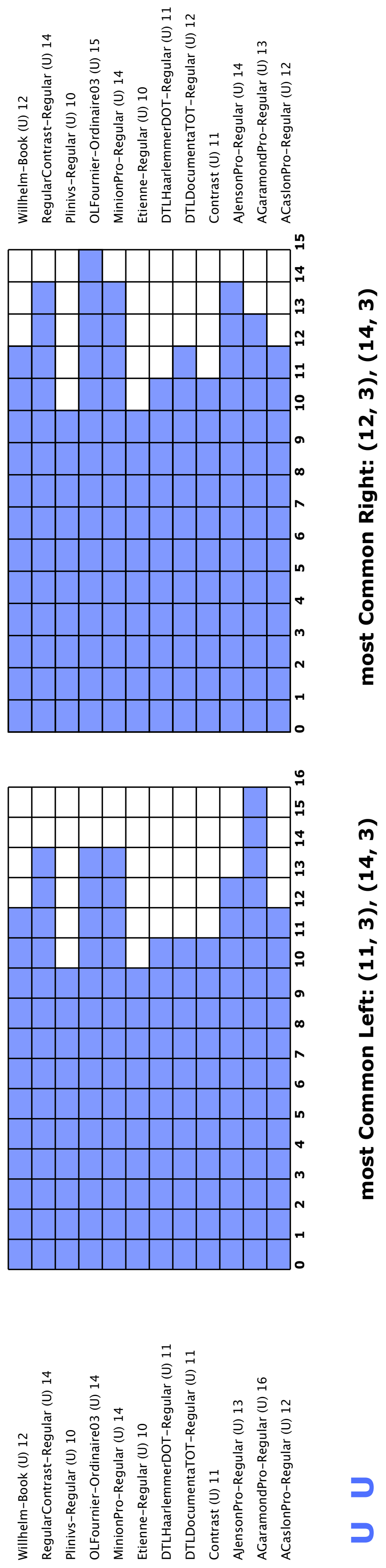

Willhelm-Book (N) 13
RegularContrast-Regular (N) 14
Plinivs-Regular (N) 12
OLFournier-Ordinaire03 (N) 15
MinionPro-Regular (N) 14
Etienne-Regular (N) 14
DTLHaarlemmerDOT-Regular (N) 13
DTLDocumentaTOT-Regular (N) 12
Contrast (N) 15
AJensonPro-Regular (N) 15
AGaramondPro-Regular (N) 16
ACaslonPro-Regular (N) 15
most Common Left: (15, 4), (14, 3)
Willhelm-Book (N) 11
RegularContrast-Regular (N) 14
Plinivs-Regular (N) 12
OLFournier-Ordinaire03 (N) 16
MinionPro-Regular (N) 13
Etienne-Regular (N) 13
DTLHaarlemmerDOT-Regular (N) 12
DTLDocumentaTOT-Regular (N) 13
Contrast (N) 15
AJensonPro-Regular (N) 14
AGaramondPro-Regular (N) 15
ACaslonPro-Regular (N) 13
most Common Right: (13, 4), (12, 2)
N N

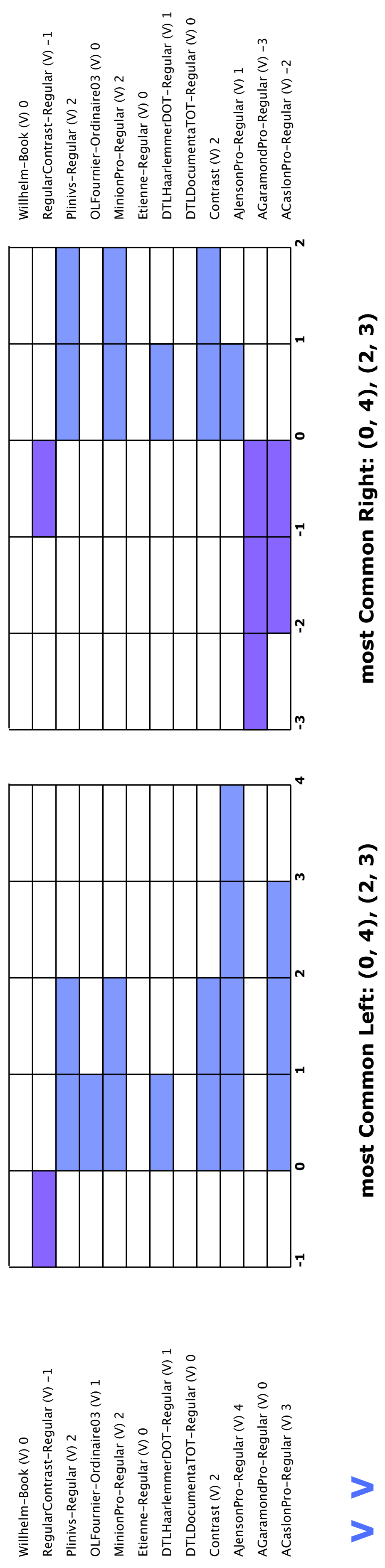

O O
most Common Left: (5, 5), (6, 4)
most Common Right: (5, 5), (6, 4)
Willhelm-Book (O) 6
RegularContrast-Regular (O) 5
Plinivs-Regular (O) 5
OLFournier-Ordinaire03 (O) 6
MinionPro-Regular (O) 5
Etienne-Regular (O) 4
DTLHaarlemmerDOT-Regular (O) 7
DTLDocumentaTOT-Regular (O) 9
Contrast (O) 6
AJensonPro-Regular (O) 5
AGaramondPro-Regular (O) 6
ACaslonPro-Regular (O) 5
DTLDocumentaTOT-Regular (O) 7

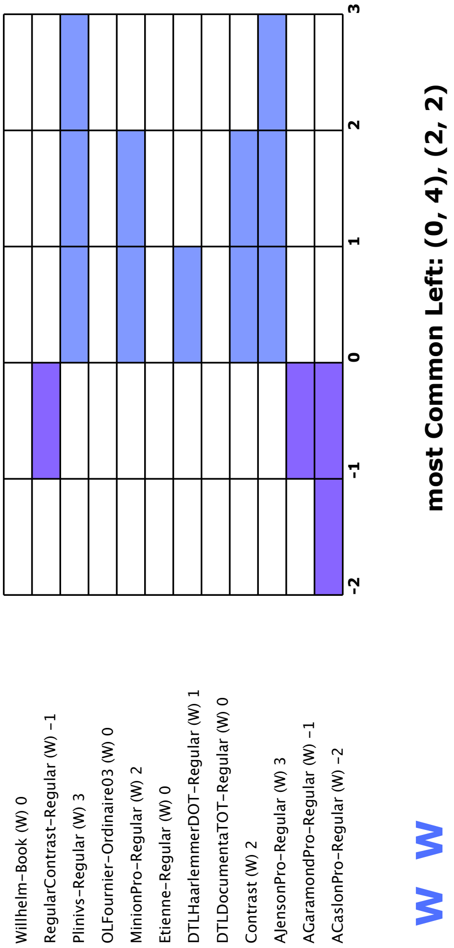

P P
most Common Left: (14, 4), (12, 3)
most Common Right: (1, 3), (3, 3)
Willhelm-Book (P) 12
RegularContrast-Regular (P) 14
Plinivs-Regular (P) 12
OLFournier-Ordinaire03 (P) 14
MinionPro-Regular (P) 14
Etienne-Regular (P) 14
DTLHaarlemmerDOT-Regular (P) 13
DTLDocumentaTOT-Regular (P) 12
Contrast (P) 15
AJensonPro-Regular (P) 15
AGaramondPro-Regular (P) 16
ACaslonPro-Regular (P) 15
Willhelm-Book (P) 1
RegularContrast-Regular (P) 6
Plinivs-Regular (P) 3
OLFournier-Ordinaire03 (P) 1
MinionPro-Regular (P) 4
Etienne-Regular (P) 3
DTLHaarlemmerDOT-Regular (P) 3
DTLDocumentaTOT-Regular (P) 1
Contrast (P) 4
AJensonPro-Regular (P) 5
AGaramondPro-Regular (P) 4
ACaslonPro-Regular (P) 2

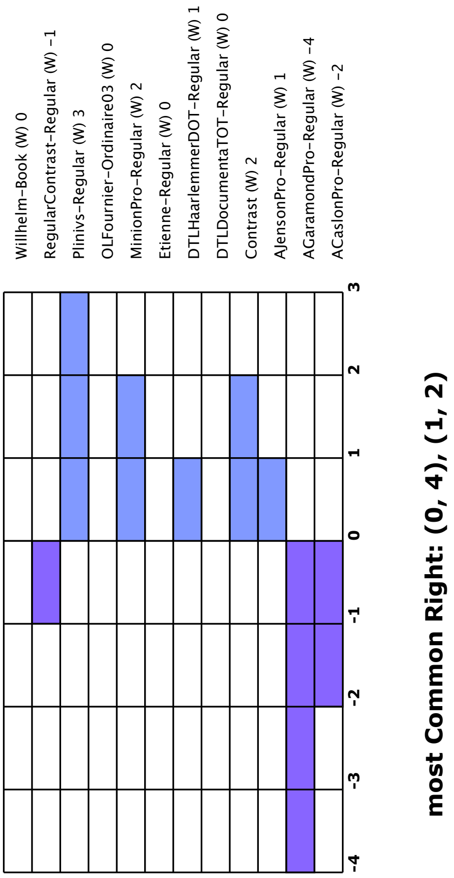

Q Q
Willhelm–Book (Q) 6
RegularContrast–Regular (Q) 5
Plinivs–Regular (Q) 5
OLFournier–Ordinaire03 (Q) 6
MinionPro–Regular (Q) 5
Etienne–Regular (Q) 3
DTLHaarlemmerDOT–Regular (Q) 7
DTLDocumentaTOT–Regular (Q) 9
Contrast (Q) 6
AJensonPro–Regular (Q) 5
AGaramondPro–Regular (Q) 6
ACaslonPro–Regular (Q) 5
most Common Left: (5, 5), (6, 4)
Willhelm–Book (Q) 3
RegularContrast–Regular (Q) –8
Plinivs–Regular (Q) –47
OLFournier–Ordinaire03 (Q) 5
MinionPro–Regular (Q) 3
Etienne–Regular (Q) –55
DTLHaarlemmerDOT–Regular (Q) 0
DTLDocumentaTOT–Regular (Q) –5
Contrast (Q) 0
AJensonPro–Regular (Q) –10
AGaramondPro–Regular (Q) –11
ACaslonPro–Regular (Q) –36
most Common Right: (0, 2), (3, 2)
R R
Willhelm–Book (R) 12
RegularContrast–Regular (R) 14
Plinivs–Regular (R) 12
OLFournier–Ordinaire03 (R) 14
MinionPro–Regular (R) 14
Etienne–Regular (R) 15
DTLHaarlemmerDOT–Regular (R) 13
DTLDocumentaTOT–Regular (R) 12
Contrast (R) 15
AJensonPro–Regular (R) 15
AGaramondPro–Regular (R) 16
ACaslonPro–Regular (R) 15
most Common Left: (15, 4), (12, 3)
Willhelm–Book (R) 1
RegularContrast–Regular (R) –1
Plinivs–Regular (R) 2
OLFournier–Ordinaire03 (R) 3
MinionPro–Regular (R) –1
Etienne–Regular (R) 0
DTLHaarlemmerDOT–Regular (R) 0
DTLDocumentaTOT–Regular (R) 1
Contrast (R) 2
AJensonPro–Regular (R) –2
AGaramondPro–Regular (R) –4
ACaslonPro–Regular (R) –1
most Common Right: (-1, 3), (0, 2)

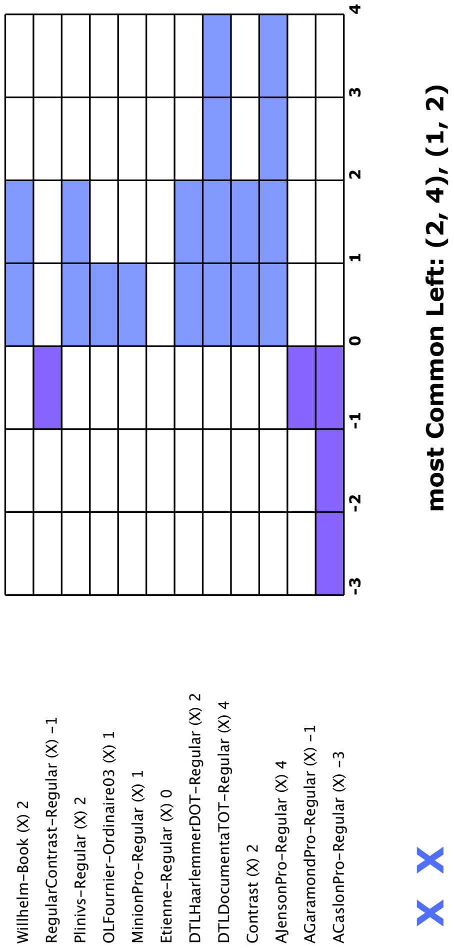

S S
Willhelm–Book (S) 7
RegularContrast–Regular (S) 7
Plinivs–Regular (S) 5
OLFournier–Ordinaire03 (S) 5
MinionPro–Regular (S) 5
Etienne–Regular (S) 3
DTLHaarlemmerDOT–Regular (S) 5
DTLDocumentaTOT–Regular (S) 6
Contrast (S) 6
AJensonPro–Regular (S) 5
AGaramondPro–Regular (S) 5
ACaslonPro–Regular (S) 7
0 1 2 3 4 5 6 7
most Common Left: (5, 6), (7, 3)
0 1 2 3 4 5 6 7
most Common Right: (6, 4), (5, 3)
Willhelm–Book (S) 6
RegularContrast–Regular (S) 7
Plinivs–Regular (S) 5
OLFournier–Ordinaire03 (S) 6
MinionPro–Regular (S) 4
Etienne–Regular (S) 4
DTLHaarlemmerDOT–Regular (S) 7
DTLDocumentaTOT–Regular (S) 5
Contrast (S) 6
AJensonPro–Regular (S) 5
AGaramondPro–Regular (S) 7
ACaslonPro–Regular (S) 6
T T
Willhelm–Book (T) 0
RegularContrast–Regular (T) 1
Plinivs–Regular (T) 2
OLFournier–Ordinaire03 (T) 2
MinionPro–Regular (T) 3
Etienne–Regular (T) 0
DTLHaarlemmerDOT–Regular (T) 1
DTLDocumentaTOT–Regular (T) 1
Contrast (T) 2
AJensonPro–Regular (T) 2
AGaramondPro–Regular (T) 1
ACaslonPro–Regular (T) –1
-1 0 1 2 3
most Common Left: (1, 4), (2, 4)
0 1 2 3 4
most Common Right: (1, 5), (2, 3)
Willhelm–Book (T) 0
RegularContrast–Regular (T) 1
Plinivs–Regular (T) 2
OLFournier–Ordinaire03 (T) 2
MinionPro–Regular (T) 3
Etienne–Regular (T) 0
DTLHaarlemmerDOT–Regular (T) 1
DTLDocumentaTOT–Regular (T) 1
Contrast (T) 2
AJensonPro–Regular (T) 4
AGaramondPro–Regular (T) 1
ACaslonPro–Regular (T) 1

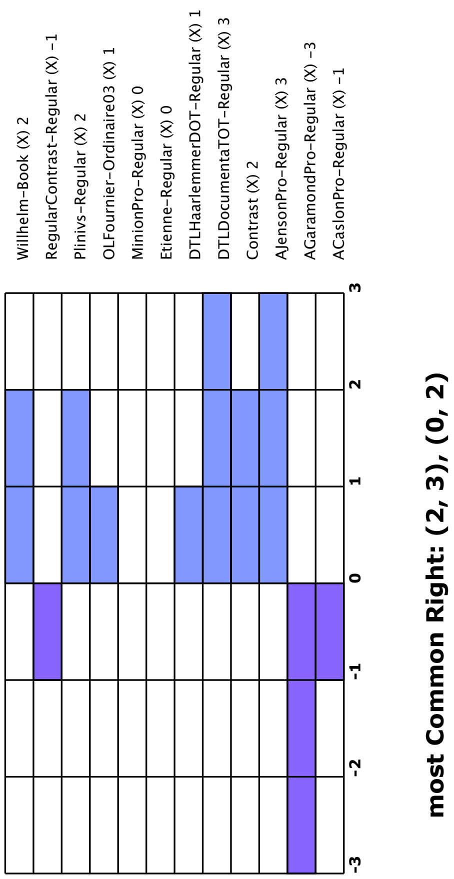

Willhelm-Book (U) 12
RegularContrast-Regular (U) 14
Plinivs-Regular (U) 10
OLFournier-Ordinaire03 (U) 14
MinionPro-Regular (U) 14
Etienne-Regular (U) 10
DTLHaarlemmerDOT-Regular (U) 11
DTLDocumentaTOT-Regular (U) 11
Contrast (U) 11
AJensonPro-Regular (U) 13
AGaramondPro-Regular (U) 16
ACaslonPro-Regular (U) 12
most Common Left: (11, 3), (14, 3)
Willhelm-Book (U) 12
RegularContrast-Regular (U) 14
Plinivs-Regular (U) 10
OLFournier-Ordinaire03 (U) 15
MinionPro-Regular (U) 14
Etienne-Regular (U) 10
DTLHaarlemmerDOT-Regular (U) 11
DTLDocumentaTOT-Regular (U) 12
Contrast (U) 11
AJensonPro-Regular (U) 14
AGaramondPro-Regular (U) 13
ACaslonPro-Regular (U) 12
most Common Right: (12, 3), (14, 3)
U U

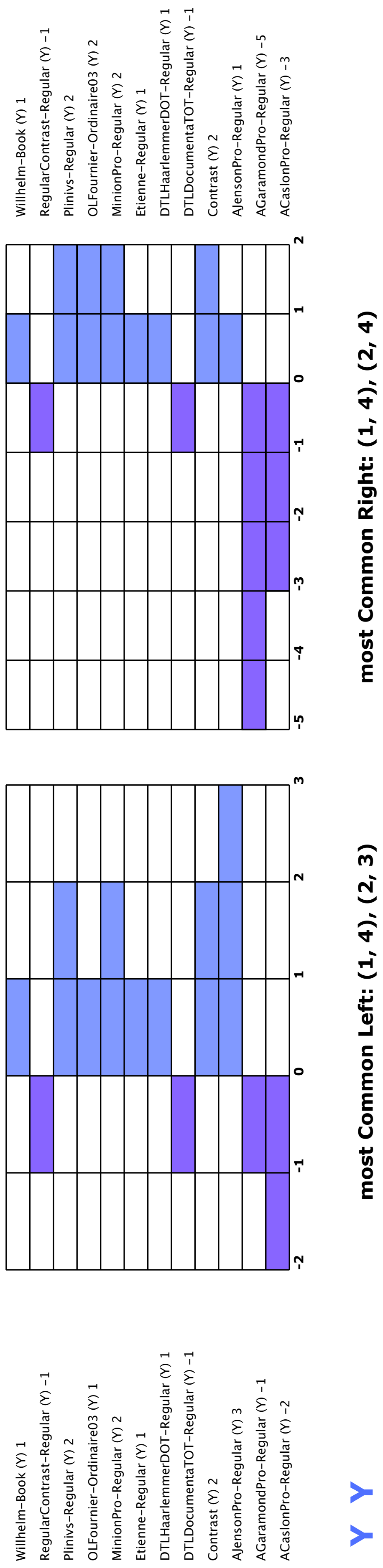

Willhelm-Book (V) 0
RegularContrast-Regular (V) –1
Plinivs-Regular (V) 2
OLFournier-Ordinaire03 (V) 1
MinionPro-Regular (V) 2
Etienne-Regular (V) 0
DTLHaarlemmerDOT-Regular (V) 1
DTLDocumentaTOT-Regular (V) 0
Contrast (V) 2
AJensonPro-Regular (V) 4
AGaramondPro-Regular (V) 0
ACaslonPro-Regular (V) 3
most Common Left: (0, 4), (2, 3)
Willhelm-Book (V) 0
RegularContrast-Regular (V) –1
Plinivs-Regular (V) 2
OLFournier-Ordinaire03 (V) 0
MinionPro-Regular (V) 2
Etienne-Regular (V) 0
DTLHaarlemmerDOT-Regular (V) 1
DTLDocumentaTOT-Regular (V) 0
Contrast (V) 2
AJensonPro-Regular (V) 1
AGaramondPro-Regular (V) –3
ACaslonPro-Regular (V) –2
most Common Right: (0, 4), (2, 3)
V V

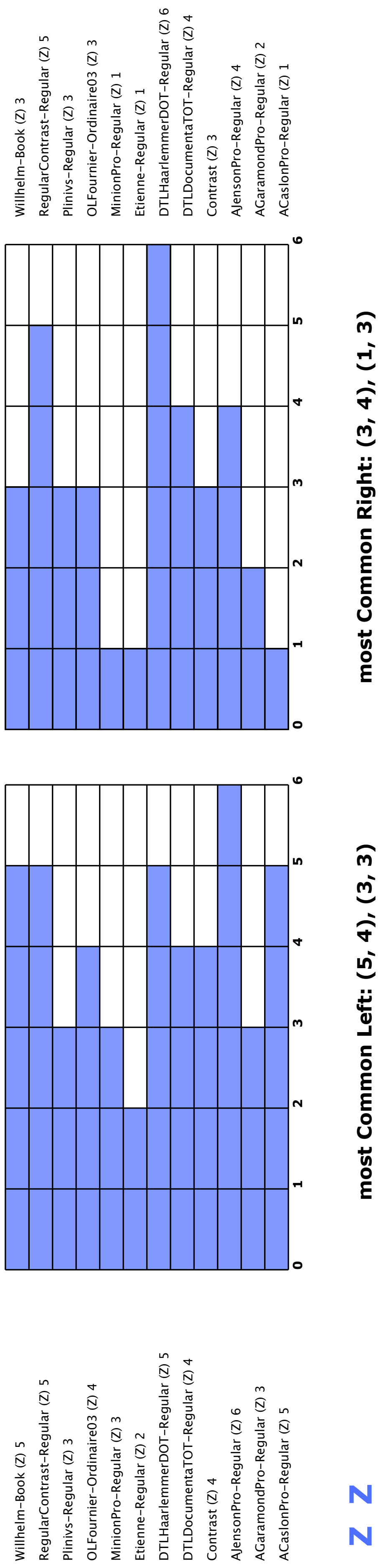

W W
Willhelm-Book (W) 0
RegularContrast-Regular (W) -1
Plinivs-Regular (W) 3
OLFournier-Ordinaire03 (W) 0
MinionPro-Regular (W) 2
Etienne-Regular (W) 0
DTLHaarlemmerDOT-Regular (W) 1
DTLDocumentaTOT-Regular (W) 0
Contrast (W) 2
AJensonPro-Regular (W) 3
AGaramondPro-Regular (W) -1
ACaslonPro-Regular (W) -2
-2 -1 0 1 2 3
most Common Left: (0, 4), (2, 2)


Willhelm-Book (W) 0
RegularContrast-Regular (W) -1
Plinivs-Regular (W) 3
OLFournier-Ordinaire03 (W) 0
MinionPro-Regular (W) 2
Etienne-Regular (W) 0
DTLHaarlemmerDOT-Regular (W) 1
DTLDocumentaTOT-Regular (W) 0
Contrast (W) 2
AJensonPro-Regular (W) 1
AGaramondPro-Regular (W) -4
ACaslonPro-Regular (W) -2
-4 -3 -2 -1 0 1 2 3
most Common Right: (0, 4), (1, 2)


X X
Willhelm-Book (X) 2
RegularContrast-Regular (X) -1
Plinivs-Regular (X) 2
OLFournier-Ordinaire03 (X) 1
MinionPro-Regular (X) 1
Etienne-Regular (X) 0
DTLHaarlemmerDOT-Regular (X) 2
DTLDocumentaTOT-Regular (X) 4
Contrast (X) 2
AJensonPro-Regular (X) 4
AGaramondPro-Regular (X) -1
ACaslonPro-Regular (X) -3
-3 -2 -1 0 1 2 3 4
most Common Left: (2, 4), (1, 2)


Willhelm-Book (X) 2
RegularContrast-Regular (X) -1
Plinivs-Regular (X) 2
OLFournier-Ordinaire03 (X) 1
MinionPro-Regular (X) 0
Etienne-Regular (X) 0
DTLHaarlemmerDOT-Regular (X) 1
DTLDocumentaTOT-Regular (X) 3
Contrast (X) 2
AJensonPro-Regular (X) 3
AGaramondPro-Regular (X) -3
ACaslonPro-Regular (X) -1
-3 -2 -1 0 1 2 3
most Common Right: (2, 3), (0, 2)


Y Y
Willhelm-Book (Y) 1
RegularContrast-Regular (Y) -1
Plinivs-Regular (Y) 2
OLFournier-Ordinaire03 (Y) 1
MinionPro-Regular (Y) 2
Etienne-Regular (Y) 1
DTLHaarlemmerDOT-Regular (Y) 1
DTLDocumentaTOT-Regular (Y) -1
Contrast (Y) 2
AJensonPro-Regular (Y) 3
AGaramondPro-Regular (Y) -1
ACaslonPro-Regular (Y) -2
-2 -1 0 1 2 3
most Common Left: (1, 4), (2, 3)
Willhelm-Book (Y) 1
RegularContrast-Regular (Y) -1
Plinivs-Regular (Y) 2
OLFournier-Ordinaire03 (Y) 2
MinionPro-Regular (Y) 2
Etienne-Regular (Y) 1
DTLHaarlemmerDOT-Regular (Y) 1
DTLDocumentaTOT-Regular (Y) -1
Contrast (Y) 2
AJensonPro-Regular (Y) 1
AGaramondPro-Regular (Y) -5
ACaslonPro-Regular (Y) -3
-5 -4 -3 -2 -1 0 1 2
most Common Right: (1, 4), (2, 4)


Z Z
Willhelm-Book (Z) 5
RegularContrast-Regular (Z) 5
Plinivs-Regular (Z) 3
OLFournier-Ordinaire03 (Z) 4
MinionPro-Regular (Z) 3
Etienne-Regular (Z) 2
DTLHaarlemmerDOT-Regular (Z) 5
DTLDocumentaTOT-Regular (Z) 4
Contrast (Z) 4
AJensonPro-Regular (Z) 6
AGaramondPro-Regular (Z) 3
ACaslonPro-Regular (Z) 5
0 1 2 3 4 5 6
most Common Left: (5, 4), (3, 3)
Willhelm-Book (Z) 3
RegularContrast-Regular (Z) 5
Plinivs-Regular (Z) 3
OLFournier-Ordinaire03 (Z) 3
MinionPro-Regular (Z) 1
Etienne-Regular (Z) 1
DTLHaarlemmerDOT-Regular (Z) 6
DTLDocumentaTOT-Regular (Z) 4
Contrast (Z) 3
AJensonPro-Regular (Z) 4
AGaramondPro-Regular (Z) 2
ACaslonPro-Regular (Z) 1
0 1 2 3 4 5 6
most Common Right: (3, 4), (1, 3)