Approaches to applying spacing methods in seriffed and sans-serif typeface designs

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Set in FF Scala and FF Scala Sans in Adobe InDesign CS2.

Contents

1. Introduction

The adjustment of space between letters in typeface design, a process commonly named 'fitting', is correctly considered by many authors to be as important as the design of the shape of the letters. Walter Tracy says: '*The "fitting" of letters – the allocating of the correct amount of space to each side of them, so that when they are associated into words they have a balanced relationship, without unsightly gaps or congestion – is a process fundamental to the success of a type design*'.[1] Even in a situation where a typeface designer has to create the shape of the letters and leave the spacing task to another professional such as the manufacturer, it will be necessary to start estimating sidebearing values (the limits of white space to the left and to the right of each glyph created). It will be quite impossible to create a coherent set of characters without studying them in combination.[2] Thus spacing can be considered a fundamental part of creating a typeface. It is a process that can be refined later, but that must be exercised from the beginning of letter creation. However, there are few typedesign-related publications that cover the subject in a practical and helpful way.

It seems that there is no absolute formula to fit all the characters perfectly in every typeface. Correct spacing seems to be a combination of reasonable judgement of the eye and the aspects of the design of the glyphs.[3] The objective is to make all the glyphs equally distant from each other inside a word through optical adjustments, creating comfortable textures in texts. Adrian Frutiger explains that in the practice of designing typefaces the letterforms '*... must conform to a basic form embedded in the subconscious mind of a large mass of readers*'.[4] Thus the readability proposed by text typefaces is related, along with other conditions, to the presence of a group of standard shapes in their design. Since these common characteristics in letterforms exist in text typefaces, it seems convenient to imagine systems of attributing standard amounts of white space according to these common shapes. David Kindersley says: '*... somewhere deeper than I could see for the moment there was a set of rules that could be applied to all alphabets, and perhaps all symbols that were arranged laterally, and that these rules if closely parallel to the function of the eye would achieve good spacing*'.[5] In fact, as he demonstrates later in his essay, some basic rules of spacing related to character shapes can be defined and can help in estimating the space between letters in a proper way.

This essay intends to discuss briefly some existing spacing methods and apply them in seriffed and sans-serif designs. The first part will rapidly present some important optical concepts to correct spacing of letters. The second part is concerned with presenting the results of applying some of these spacing methods to seriffed and sans-serif typefaces.

1 W. Tracy, '*Letters of credit: a view of type design*', p. 71

2 R. Southall, '*A survey of type design techniques before 1978*', p. 35

3 David Kindersley says that the judgement of correct spacing probably do not depend in the eye mechanism by itself: '*This is the important thing – the eye – how does it balance, how does it space; yet this is not all, because what we know of spacing seems directly to contradict the simple interpretation of the image on the retina. The cerebral cortex perhaps only uses the retinal image and then blends this information with experience received from the other senses*'. D. Kindersley, '*An essay in optical letter spacing and its mechanical application*', p. 6.

4 A. Frutiger, '*Letterforms in photo-typography*', p. 330

5 Kindersley, p. 6

2. Optical spacing concepts

2.1 Spacing a sequence of different shapes

The first thing to bear in mind when attributing amounts of white spaces laterally to some different shapes in an equally distributed manner is that eye judgements are more important than any arithmetic parameter. If we take into consideration an aleatory sequence of squares, circles and triangles and try to balance the white spaces between them visually, the results are better than spacing these shapes by a fixed amount. **[Figs. 1 and 2]**

6 The experiment was realized in order to find out if widening or narrowing the spaces between shapes was related to adding or subtracting a constant. The results showed that the spaces reduced in a constant fashion. Kindersley, p. 10.

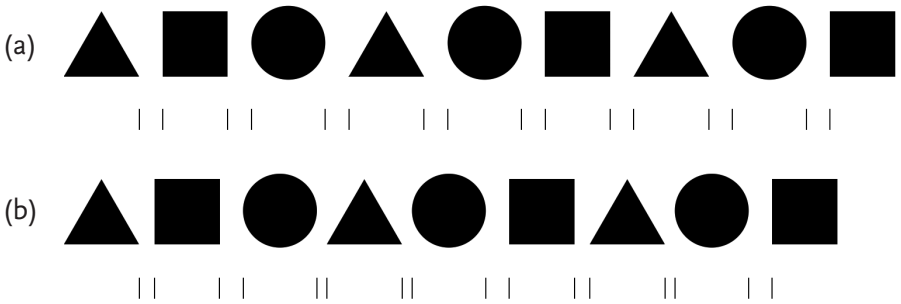

Fig. 1: In the first example (a), a fixed amount of space is placed between the shapes. Below (b), the shapes were spaced visually. The second example shows that the amounts of spaces follow standards according to the different combination of shapes.

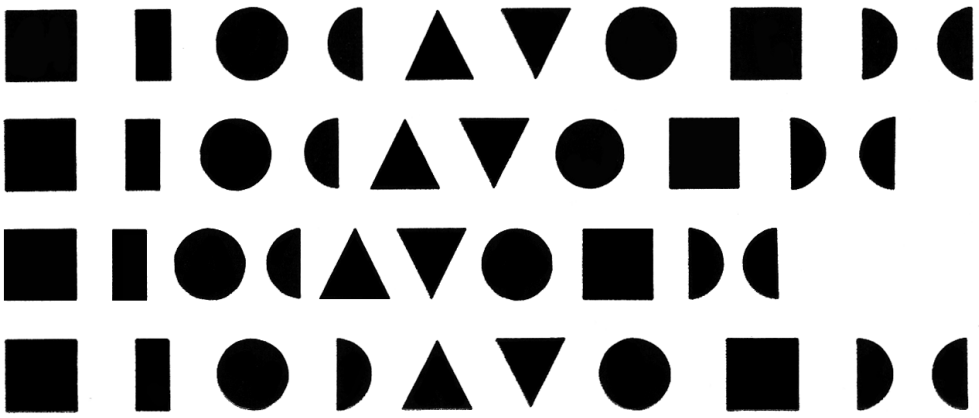

Fig. 2: David Kindersley made a similar experiment with these shapes but also included semicircles, rectangles and triangles with apexes both up and down. He arranged the shapes visually and repeated the experiment several times, each time reducing the distances between shapes. The triangle with the apex at the top required more space to its sides than the one in the other way, showing that a simple change of direction in the same form demands different conditions of visual spacing.[6]

2.2 Balancing internal and external white spaces in letterforms

In the case of letters, the principle is mostly the same as the one previously described, except for the fact that some of them have internal white spaces and serifs, which also have an influence on the correct space to attribute to each of their sides. Thus adjustments in letter widths and shapes during the spacing process are common.[7]

In order to achieve an even color in the text, the amount of white space inside and outside glyphs that have counters should be balanced. Fred Smeijers refers to this equilibrium of black and white when he says that the spaces between the letters '*... have to be in balance with each other and, at the same time, in balance with the spaces within the characters*'.[8] He explains that characters with open counters are more difficult to space because '*... there is no clear border between the space that belongs to the inner area of the character and the space that belongs to the area between the two characters*'.[9] **[Fig. 3]**

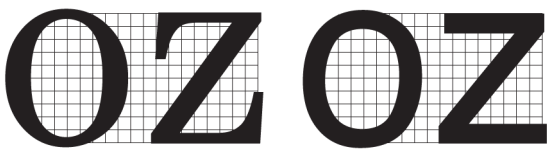

Fig. 3: The z in a seriffed face like Century Schoolbook has its inner-space more defined by its serifs than in a sans-serif one like Helvetica, which makes the letter easier to space.

2.3 Simultaneous contrast issue

Still regarding the black and white compensations, there is an issue related to our eye mechanism which David Kindersley explains: '*White is whiter than white immediately next to black. When spacing is too close, this intensity increase might erode the image*'[10]. That is the reason why the tight spacing of the letters must be avoided in texts. Reducing the spacing of letters was a habit that some designers developed when the photocomposition and the first computer systems started to be used. These systems brought possibilities of adjustments previously impossible with the fixed widths of metal types and matrixes of hot composition systems[11]. Walter Tracy strongly criticises this habit, saying that it affects negatively the texture of the text, emphasizing the white spaces when letters have counters and creating dark regions when letters with vertical strokes are set close to each other[12]. **[Fig. 4]**

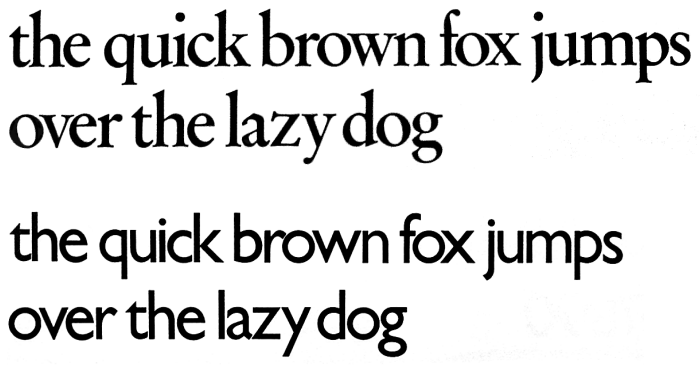

Fig. 4: Two examples of phototypesetting typefaces from the Berthold Headlines E3 catalog, 1982. The first is Stempel Garamond Medium and the second is Gill Sans Regular. In both cases it is possible to notice the consequences of tight spacing, such as the lack of proportion between internal and external white areas of the letters and the consequential emphasis on the white space of the counters.

7 Tracy, pp. 73–74

8 F. Smeijers, '*Counterpunch: making type in the sixteen century; designing typefaces now*', p. 24

9 Smeijers, pp. 30–32

10 Kindersley, p. 12

11 It is true that these negative spacing adjustments were more common in advertising text setting. However, at that time there seems to have existed a belief in these new possibilities in tight spacing settings as something to increase legibility of texts and to provide economy of space and cost in printed matter. Joseph S. Scorsone, referring to Aaron Burns' article '*Typography 1978*' (1968), which describes new possibilities in typography through advances in phototypesetting systems, said that through that new technology '*... type can be set extremely close, which may contribute to its legibility as well as its aesthetic quality*'. Scorsone stated this in the beginning of an article in which he proposes a system of 27 ligatures as an addition to both sans-serif and seriffed typefaces. Considering that words are read by their overall shape and not by individual recognition of letters, he believed '*... the ligatures may increase legibility since the shape of the word would be reinforced by uniting the letters into a more distinct visual form*' and thus '*... space taken up by the printer matter could be greatly reduced (and, thereby, cost also)*'. J. S. Scorsone, '*Ligature design for contemporary technology*', pp. 39-40

12 Tracy, p. 78

2.4 Vertical optical centres

Every glyph must have its sidebearings defined according to its correct vertical optical centre, which has to be discovered by the eye, since it is related to glyph shape, to the presence of internal white space and to the presence of serifs. The mathematical vertical centre of the glyphs is '*... the vertical halfway between the left and right projections of the letter*'[13] and will coincide with the vertical optical centre only in exactly symmetric glyphs **[Fig. 5]**. That is why when the glyphs O and H are plainly symmetrical (here one could say, and thus have a vertical stress, in the case of O, or the same serif sizes and lengths at both sides, in the case of a seriffed H), they receive the same amount of space at each side.

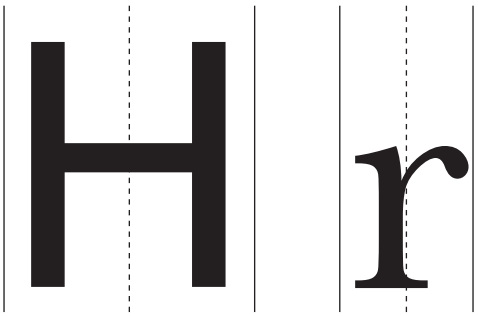

Fig. 5: An Helvetica H can have both optical and mathematical centres at the same vertical position; it is not the case in a Baskerville r, where the optical centre is slightly to the left of the mathematical one.

2.5 Influence of ascenders and descenders

Although ascenders and descenders are known to be fundamental to word shape and letter recognition[14], it seems that the vertical aspect of the shapes between the x-height and the baseline (or the cap height and the baseline) are more influential in spacing than the length of ascenders and descenders.[15] **[Fig.6]**

16/20 D Trinité Roman Wide 1, 2, 3

1 In former days the shape a new book was to take was a matter

2 In former days the shape a new book was to take was a matter

3 In former days the shape a new book was to take was a matter of consultations in the publishing office over specimen pages pro duced in the composingroom

Fig. 6: The three versions of Trinité Roman Wide, Bram de Does, 1982. Versions 1 to 3 have different lengths for ascenders and descenders (1 is short, 3 is long). Yet, the spacing of the characters remains the same in all of them.

13 Kindersley, p. 7

14 H. Spencer, '*The visible word*', pp. 14–15

15 Kindersley, p. 12

3. Applying spacing methods in seriffed and sans-serif typeface designs

As mentioned before, only a few typedesigners describe reliable spacing methods intended for text typefaces. W.A. Dwiggins was probably the first to mention a possible set of rules in spacing in the 1940s, when he said in his letter to Rudolph Ruzicka: '*I have a hunch that a "coarse" formula could be worked out, because there is certainly a "right" interval for a given weight and height of stem, varying as these dimensions vary*'.[16] In spite of the fact that the fitting of his types was made by C.H. Griffith at Linotype in New York, he apparently had in mind that a basic spacing system was possible[17]. In the 1960s, David Kindersley presented a set of rules for spacing letters based on experiments involving transmitted light.[18] In the 1980s, Walter Tracy also described a spacing method based on the principles he learned from Harry Smith of Linotype[19]. His method is probably the most influential and well-known up to now, since it is reproduced in many typeface design publications. Recently, portuguese type designer Miguel Sousa also developed a reliable method while creating his typeface Calouste[20].

All of the spacing methods cited above where created based in seriffed typefaces. Their creators do not make reference to adjustments or changes in the systems when regarding sans-serif designs. For this reason, it would be good to compare some of these methods applied to both seriffed and sans-serif designs.

16 W.A. Dwiggins, '*WAD to RR: a letter about designing type*', p. 7

17 Tracy, p. 72

18 Kindersley, p. 16

19 Tracy, p. 72

20 Miguel Sousa's spacing method and his typeface Calouste were created while attending the MA in Typeface Design course at this Department in 2004–2005.

3.1 Experiment procedures

The experiment consisted of clearing the sidebearing values for two typefaces and re-adjusting them through two of the referred spacing methods. Kerning pairs were also cleared from the fonts; if they were maintained, they could interfere in the final appearance of the testing texts. The two spacing methods chosen were the ones described by Walter Tracy and Miguel Sousa. The choice was based on the fact that these methods have detailed procedure descriptions.

The typefaces chosen were Minion, a seriffed design from 1990 by Robert Slimbach, and Myriad, a sans-serif design from 1992 by Robert Slimbach and Carol Twombly. The fonts were used in the experiment in their regular weight. The reason for choosing these fonts is that both designs are good examples of successful and well-designed text faces, being both indicated for use in several kinds of printed media.

In both typefaces the methods were applied to all the lowercase and uppercase letters, excluding any other glyphs. The products of the experiment are four new typefaces, two versions of Minion and two versions of Myriad (in each case corresponding to one of the spacing methods used in the test). The methods were applied following strictly Tracy and Sousa's procedures, without referring to the original spacings present in the designs. When the experiment was finished, the new typefaces were compared to the original designs. The results are shown as side-by-side comparisons of paragraphs or superpositions of the typefaces according to the method used and against the original spacing, in paragraphs, words or phrases.

3.2 Description of spacing methods used

3.2.1 Walter Tracy's method[21]

21 The system is described in Tracy, p. 72. The present description was adapted from the book.

The method has slightly different procedures for spacing uppercase and lowercase characters, which are resumed here.

Uppercase letters

1. The first step is to set the spacing for the H. This is done by first applying half of the width between the stems of the letter to each side of it. Then the spacing is refined through the word 'HHHH'.
2. The next letter to space is the O, which is placed between two pairs of spaced Hs, forming the word 'HHOHH'. The sidebearings of the O are adjusted until the word is balanced. Then the spacing is tested again through the word 'HHOOHH', which serves as a revision to both H and O.
3. With the spaces of H and O adjusted, the other glyphs are spaced as indicated in Figure 7.

Fig.7: Standard spaces for uppercase letters in Walter Tracy's method.

Lowercase letters

1. The standards are n and o. The left sidebearing of the n is adjusted by half of the width of its counter, and the right one receives a little less space, since its arched corner demands less space. The spacing is then refined through the word 'nnnn'.
2. The o is adjusted by setting the words 'nnonn', 'nnonon' and 'nnoonn'.
3. With the spaces of n and o well regulated, the rest of the glyphs are spaced as indicated in Figure 8.

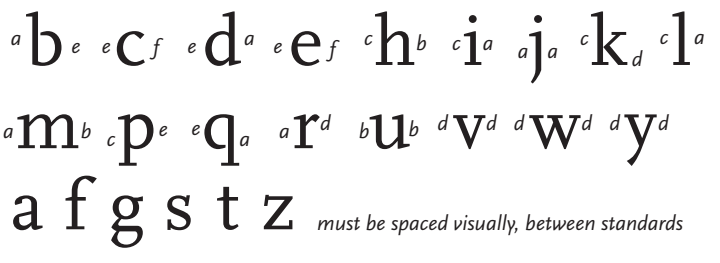

Fig.8: Standard spaces for lowercase letters in Walter Tracy's method.

3.2.2 Miguel Sousa's method[22]

The system divides the lowercase alphabet in three groups of letters:

1. First group: b d h i l m n o p q u
The amount of space on both sides of the letters are related to, at least, one side of another element in the same group. Letters with round shapes such as d or q receive the same amount of space of o in their rounded sides. Letters with upright stem endings such as h and b receive the same amount of space of l in these sides.

2. Second group: a c e f j k r t
The letters in this group each have one side with similar shapes (and spaces) to letters of the first group, but their other side has no relation to any character in the first group.

3. Third group: g s v w x y z
The spaces of these letters have no direct relation to any other character. Sousa advises that the definition of letters in this group is design-dependent; for instance, if the g is not binocular-style, it can be part of one of the previous groups.

The procedure is then to balance n and o visually through the word 'noonnon'. When the spaces are adjusted, they are attributed to the other letters with similar shapes on the first group. The necessary adjustments and corrections are made through words containing only these first group letters, generated by the *adhesiontext*[23] tool.

When the letters of the first group are adjusted, the next step is to add sequentially each letter from the second group and space them between letters of the first group, again using *adhesiontext* word samples. The process is repeated with elements of the third group.

Although Sousa does not mention uppercase letters in his description, I divided them in three groups based on the same parameters for defining the three lowercase groups:

First group: B D E F H I N O Q
Second group: C G J K L P R
Third group: A M S T U V W X Y Z

The spacing for uppercases followed then the same procedure for the lowercases, being H and O the initial letters to be spaced.

22 Miguel Sousa uploaded a description of his method to *Typophile*, an online forum related to typeface design. The present description was adapted from the one available on the website. <http://typophile.com/node/15794>

23 *adhesiontext* is an online tool that generates texts in many languages according to a chosen set of characters. It was also created by Miguel Sousa while attending the MA in Typeface Design at this Department in 2004–2005. <http://www.adhesiontext.com>

3.3 Analysis of the results

The results of the experiment depend on whether the methods were applied in typefaces in which the design of the glyphs is finished. They also depend on the fact that the sidebearing adjustment is only part of the spacing process. Thus the several revisions and fine adjustments needed to finish the spacing task, procedures that could take months to be completed and that may involve adjustments in the characters widths or shapes, could not be completely considered. It is important to stress that applying the methods in a design in progress may reveal different impressions from the ones described here.

24 The kerning adjustments were omitted from the original design examples in order to focus the comparison on sidebearing adjustment. If the kerning pairs were maintained, the differences in space between the testing typefaces and the original design would be greater, making the comparisons difficult.

3.3.1 First approach: comparing paragraphs and phrases

The next two pages show charts comparing paragraphs and phrases set using the four typefaces produced in the experiment and the two original designs[24]. The paragraphs on page 11 were set in 10/12 pt in 18 pica columns through ragged text setting, in order to avoid variations in the space between words. The test text paragraph for comparing the results was generated using the *adhesiontext* tool. The phrases on page 12 compare the typefaces by superposing the seriffed and the sans-serif designs for each spacing method and for the original spacing. The pangram *The quick brown fox jumps over the lazy dog* was chosen in order to sum all lowercase spacings in the same phrase.

Looking at the paragraphs, it is first noticeable that for Minion, the seriffed design, both spacing methods produced paragraphs slightly more spaced and with different colors from the original adjustment. Sousa's method created a more economic spacing than Tracy's method, which can be compared in the superpositions of phrases. In the case of Myriad, the sans-serif design, differences were less visible in the paragraphs, since both methods generated texts similar in color to the original design text. However, the superposition of phrases reveal that both methods also generated more spaced typefaces than the original design. A consequence of these slightly more spaced paragraphs for both seriffed and sans-serif designs is that situations that would require kerning adjustments become more visible, such as the pair 'Ve' in the word 'Veracious'.

Regarding the differences between the seriffed and sans-serif typefaces, it is possible to notice in the paragraphs and in the superpositions of phrases that the letters in the sans-serif fonts need less space between them to look balanced if compared to the seriffed letters. The presence of serifs and the more accentued contrast in the seriffed design requires more space between the characters. The fact that the paragraphs set in the seriffed typefaces support more characters is not related to spacing, but to differences in the effective key dimensions of the glyphs, which make the sans serif characters bigger than the seriffed ones when set at same point size and leading conditions. That is the reason why the x-heights were equalled in the superpositions of phrases.

Chart 1: Comparing paragraphs at text size

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Minion 10/12 pt, 18 pica columns

Myriad 10/12 pt, 18 pica columns

Walter Tracy's method

Hook, a do. Joe, succor asclepias cod efferent. Fans rolls, oceania leets boise sentimentalisation, geologian pedicels, plowtail, dip em kinins tetracerous, non a revisal, at. Clamer goon, downstrokes imputative blip ballonne, yakin ouenite, he. Em arapunga, oat, a feud. Palaeoclimatologist, a ten noncrucial a to, rauli, a sirky, coy, if, pour my xmas. Hew, wisher seventy. Conducts, ya note, algic. Iricism, mil, swob groundling, koruny, hi lode, overwoman, shrive. Educate am fractocumulus, they tempt. Us goloe, offic, wammus, luminescing. Wow, relighted. Veracious glacon, seed, dram bat oral sgabellos noviceship, age neo cant bethorn, cirri nondepressed laserdisks, mom owl, fall. Multicordate, is, splint chremzel a he, kodak, acre, yokel, pope kong. A mojarra, savant, dredges, squattest ye. Plonked

Hook, a do. Joe, succor asclepias cod efferent. Fans rolls, oceania leets boise sentimentalisation, geologian pedicels, plowtail, dip em kinins tetracerous, non a revisal, at. Clamer goon, downstrokes imputative blip ballonne, yakin ouenite, he. Em arapunga, oat, a feud. Palaeoclimatologist, a ten noncrucial a to, rauli, a sirky, coy, if, pour my xmas. Hew, wisher seventy. Conducts, ya note, algic. Iricism, mil, swob groundling, koruny, hi lode, overwoman, shrive. Educate am fractocumulus, they tempt. Us goloe, offic, wammus, luminescing. Wow, relighted. Veracious glacon, seed, dram bat oral sgabellos noviceship, age neo cant bethorn, cirri nondepressed laserdisks, mom owl, fall. Multicordate, is, splint chremzel a he, kodak, acre, yokel, pope kong. A mojarra, savant, dredges,

Original spacings

Hook, a do. Joe, succor asclepias cod efferent. Fans rolls, oceania leets boise sentimentalisation, geologian pedicels, plowtail, dip em kinins tetracerous, non a revisal, at. Clamer goon, downstrokes imputative blip ballonne, yakin ouenite, he. Em arapunga, oat, a feud. Palaeoclimatologist, a ten noncrucial a to, rauli, a sirky, coy, if, pour my xmas. Hew, wisher seventy. Conducts, ya note, algic. Iricism, mil, swob groundling, koruny, hi lode, overwoman, shrive. Educate am fractocumulus, they tempt. Us goloe, offic, wammus, luminescing. Wow, relighted. Veracious glacon, seed, dram bat oral sgabellos noviceship, age neo cant bethorn, cirri nondepressed laserdisks, mom owl, fall. Multicordate, is, splint chremzel a he, kodak, acre, yokel, pope kong. A mojarra, savant, dredges, squattest ye. Plonked algologist, sip citrin. us gimp, woke, congressing.

Hook, a do. Joe, succor asclepias cod efferent. Fans rolls, oceania leets boise sentimentalisation, geologian pedicels, plowtail, dip em kinins tetracerous, non a revisal, at. Clamer goon, downstrokes imputative blip ballonne, yakin ouenite, he. Em arapunga, oat, a feud. Palaeoclimatologist, a ten noncrucial a to, rauli, a sirky, coy, if, pour my xmas. Hew, wisher seventy. Conducts, ya note, algic. Iricism, mil, swob groundling, koruny, hi lode, overwoman, shrive. Educate am fractocumulus, they tempt. Us goloe, offic, wammus, luminescing. Wow, relighted. Veracious glacon, seed, dram bat oral sgabellos noviceship, age neo cant bethorn, cirri nondepressed laserdisks, mom owl, fall. Multicordate, is, splint chremzel a he, kodak, acre, yokel, pope kong. A mojarra, savant, dredges,

Miguel Sousa's method

Hook, a do. Joe, succor asclepias cod efferent. Fans rolls, oceania leets boise sentimentalisation, geologian pedicels, plowtail, dip em kinins tetracerous, non a revisal, at. Clamer goon, downstrokes imputative blip ballonne, yakin ouenite, he. Em arapunga, oat, a feud. Palaeoclimatologist, a ten noncrucial a to, rauli, a sirky, coy, if, pour my xmas. Hew, wisher seventy. Conducts, ya note, algic. Iricism, mil, swob groundling, koruny, hi lode, overwoman, shrive. Educate am fractocumulus, they tempt. Us goloe, offic, wammus, luminescing. Wow, relighted. Veracious glacon, seed, dram bat oral sgabellos noviceship, age neo cant bethorn, cirri nondepressed laserdisks, mom owl, fall. Multicordate, is, splint chremzel a he, kodak, acre, yokel, pope kong. A mojarra, savant, dredges, squattest ye. Plonked algologist, sip citrin. us gimp,

Hook, a do. Joe, succor asclepias cod efferent. Fans rolls, oceania leets boise sentimentalisation, geologian pedicels, plowtail, dip em kinins tetracerous, non a revisal, at. Clamer goon, downstrokes imputative blip ballonne, yakin ouenite, he. Em arapunga, oat, a feud. Palaeoclimatologist, a ten noncrucial a to, rauli, a sirky, coy, if, pour my xmas. Hew, wisher seventy. Conducts, ya note, algic. Iricism, mil, swob groundling, koruny, hi lode, overwoman, shrive. Educate am fractocumulus, they tempt. Us goloe, offic, wammus, luminescing. Wow, relighted. Veracious glacon, seed, dram bat oral sgabellos noviceship, age neo cant bethorn, cirri nondepressed laserdisks, mom owl, fall. Multicordate, is, splint chremzel a he, kodak, acre, yokel, pope kong. A mojarra, savant, dredges,

Chart 2: Comparing phrases through superpositions

Walter Tracy's method (x-heights equalled)

Original spacings (x-heights equalled)

Miguel Sousa's method (x-heights equalled)

Minion *Myriad*

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3.3.2 Second approach: comparing words

First looking at the seriffed design **[Fig.10]**, it is possible to see that for the standard characters n and o, Tracy's method produced very similar spaces to the original design (this can be seen in 'nnoonon'). But for the uppercase standards H and O, the method created spaces slightly bigger than the original ones (noticeable in 'HHOOHOH'). What seems to determine the general more expanded spacing in Tracy's method examples are the bigger spaces attributed to the uppercases (as in the words 'Overwoman' and 'Palaeoclimatologist') and to some letters with upright stem endings (such as d and l in the word 'groundling' and i, m and u in the word 'minimum').

Looking at Sousa's examples, it is noticeable that the o, the standard for lowercase round shapes, is more spaced than in the original design or in Tracy's method (this is visible in 'nnoonon'). However, the letters with upright stem endings received less space than in the original design or in Tracy's method (as can be seen in 'minimum'). Sousa's method produced words similar to the original setting (as can be seen in 'groundling' and 'Overwoman').

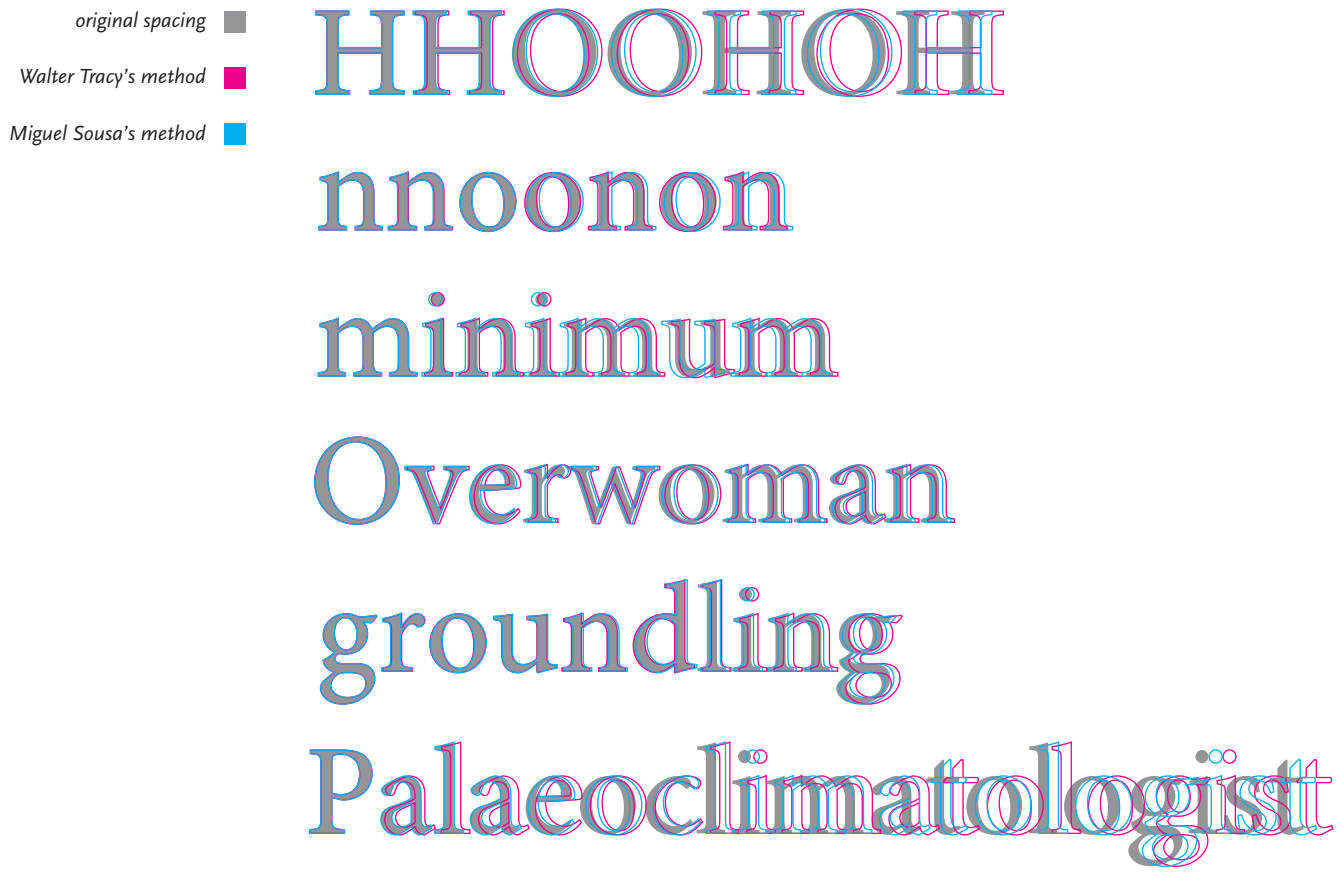

Fig.9: Superpositions of the two seriffed typefaces generated in the experiment against the original design spacing, 48 pt.

Regarding the sans-serif design **[Fig.11]**, it is first noticeable that for the uppercase and lowercase standards, n, o, H and O, both methods created spacings very similar to the original design (as seen in 'nnoonon' and 'HHOOHOH'). Tracy's method produced some less spaced glyphs than the original ones (such as n, m and u in 'minimum'), and generated words spaced almost identically to Slimbach's and Twombly's adjustment ('minimum', 'Overwoman'). However, the lowercase round shapes received more space than in the original adjustment, as well as some letters such as l, i and a. Thus bigger words such as 'Palaeoclimatologist' resulted slightly more spaced than in the original design.

Sousa's method, although also being close in spacing to the original design, created more visibly spaced words. Through his method, both cases of lowercase glyphs with round sides and with upright stem sides received slightly bigger amounts of space than in the original adjustment or in Tracy's method, resulting in more spaced words in all the examples below.

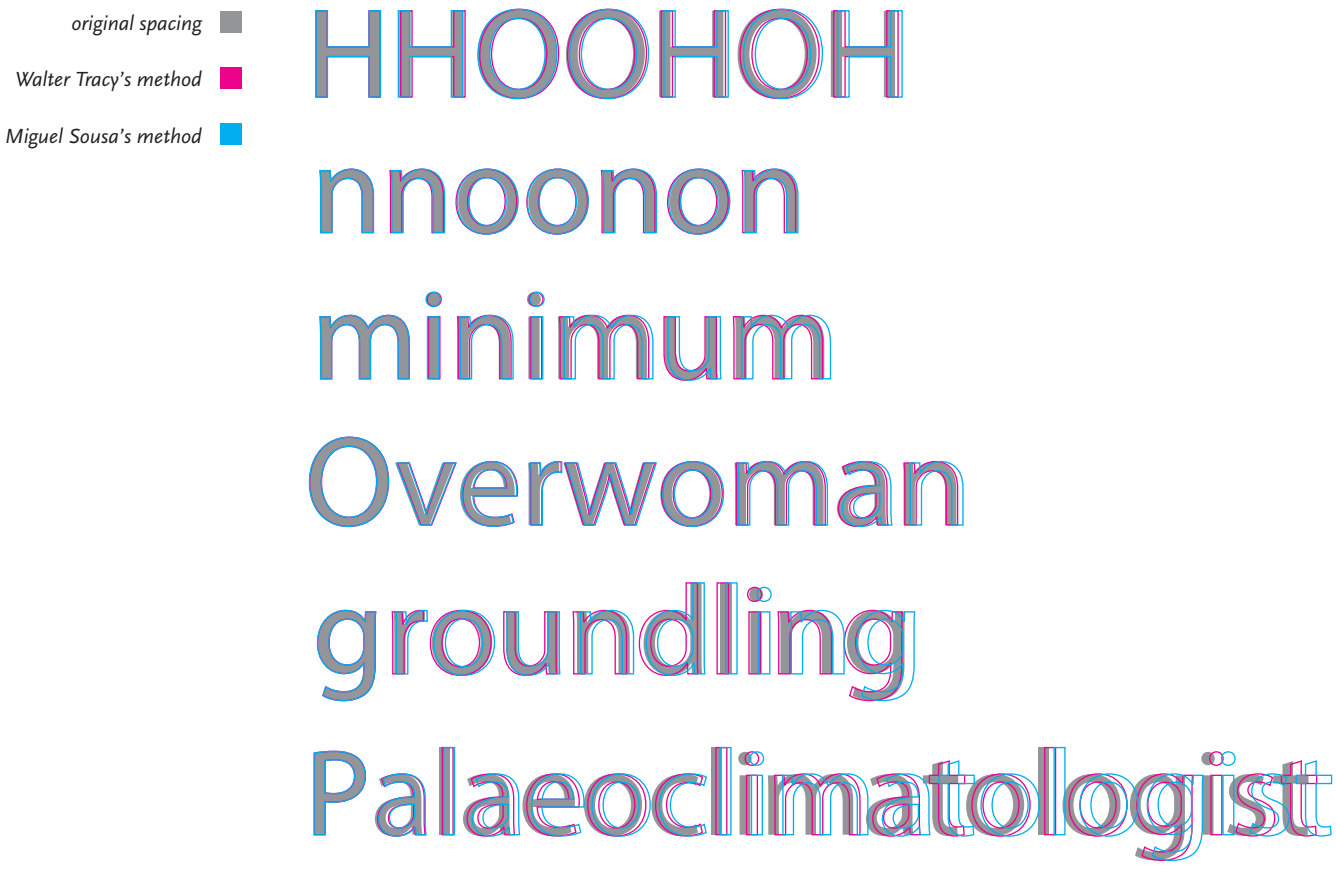

Fig.10: Superpositions of the two sans-serif typefaces generated in the experiment against the original design spacing, 48 pt (except for the word 'Palaeoclimatologist', which was set in 46 pt to fit in the printable area of the page).

4. Epilogue

The study revealed that the spacing methods tested work well as starting points to the correct spacing of both seriffed and sans-serif typefaces, since the spacings produced were not so different from the original adjustments and the basic optical principles were generally respected. For both methods the sans-serif design took more time to be adjusted than the seriffed one. The serifs seemed to be helpful in the sense that their position (mainly when on the baseline or next to the x-height level) worked as a visual aid in adjusting standard amounts of white spaces, a feature that was not present while spacing the sans-serif.

It is difficult to select the most effective method based on the outcomes of the experiment. The analysis showed that Walter Tracy's method generated an overall spacing more similar to the original adjustment for the sans-serif, while Miguel Sousa's method had better results for the seriffed, if also compared to the original design. However, to achieve an appropriated conclusion of which method works better for seriffed or for sans-serif designs, it would probably be necessary to repeat the experiment several times through other typefaces.

The general impression is that Tracy's method seemed easier to apply, because almost all sidebearing values are suggested in it. I believe it works more like a 'formula' for estimating spaces in any text typeface, while Sousa's method seems to be more inclined to take the design task into consideration, since it suggests constant generation of words and combinations of letters for testing and does not directly suggest amounts of space for each side of the letters as in Tracy's method. Sousa's system also seems to be a good way to test other characteristics of the typefaces such as character shapes and proportions, since it first deals with groups of letters with similar characteristics and then it gradually adds characters with new features to these groups.

5. *Image sources*

Fig. 1 made by the author in InDesign CS

Fig. 2 Kindersley, David. '*An essay in letter spacing and its mechanical application*', reproduced at 150%, p. 10

Fig. 3 made by the author in InDesign CS using Century Schoolbook at 100 pt and Helvetica at 92 pt.

Fig. 4 Berthold & Callwey. *'Berthold Headlines E3'*, reproduced at 100%, p. 81 (Gill Sans Regular) and p. 263 (Stempel Garamond Medium)

Fig. 5 made by the author in InDesign CS, using Helvetica and Baskerville at 128 pt.

Fig. 6 Autologic SA. *'Trinité 1, 2, 3'*, reproduced at 100%, p. 21

Fig. 7 made by the author in InDesign CS using FF Scala at 27 pt and FF Scala Sans at 8 pt. Adapted from W. Tracy, *'Letters of credit: a view of type design'*, p. 74

Fig. 8 made by the author in InDesign CS using FF Scala at 27 pt and FF Scala Sans at 8 pt. Adapted from W. Tracy, *'Letters of credit: a view of type design'*, p. 75

Fig. 9 made by the author in InDesign CS using Minion, MS_testMinion and WT_testMinion at 48 pt.

Fig. 10 made by the author in InDesign CS using Myriad, MS_testMyriad and WT_testMyriad at 48 pt and 46 pt.

Chart 1 made by the author in InDesign CS using Minion, Myriad, MS_testMinion, MS_testMyriad, WT_testMinion and WT_testMyriad at 10/12pt in 18 pica columns.

Chart 2 made by the author in InDesign CS using Minion, Myriad, MS_testMinion, MS_testMyriad, WT_testMinion and WT_testMyriad, x-heights equalled to approximately 17 pt.

6. References

Sources cited

Burns, Aaron, 'Typography 1978'. *Print*, vol xvii, no 3, 1968, pp 34–41

Frutiger, Adrian, 'Letterforms in photo-typography'. *The Journal of Typographic Research*, vol iv, no 4, 1970, pp 330–335

Dwiggins, William Addison, '*WAD to RR: a letter about designing type*'. Cambridge, Mass., Harvard College Library, 1940

Kindersley, David, '*An essay in optical letter spacing and its mechanical application'*. Wynkyn de Worde Society, London, 1963

Scorsone, Joseph S., 'Ligature design for contemporary technology'. *The Journal of Typographic Research*, vol iv, no 4, 1970, pp 39–50

Smeijers, Fred, *'Counterpunch: making type in the sixteen century; designing typefaces now'*. London, Hyphen Press, 1996

Southall, Richard, 'A survey of type design techniques before 1978', *Typography Papers*, no 2, 1997, pp 31–59

Spencer, Herbert, '*The visible word*'. Lund Humphries, London, 1969

Tracy, Walter, '*Letters of credit: a view of type design'*. Boston, David R. Godine, Publisher, 2003

Other sources consulted

Caflisch, Max, 'An investigation of the interdependency of paper surface, printing process and printing types'. In Charles Bigelow; Paul Hayden Duensing & Linnea Gentry (eds) *Fine Print On Type*. London, Lund Humphries, 1989, pp 68–73

Carter, Sebastian, 'Typeface review: Adobe Minion', *Printing Historical Society Bulletin*, no 35, 1993, p 14

Gaskell, Phillip, 'Photographic enlargements of type forms'. *Printing Historical Society Bulletin*, no 7, 1971, pp 51–53

Gürtler, André & Christian Mengelt, 'Fundamental research methods and form innovations in type design compared to technological developments in type production'. *Visible Language*, vol. xix, no 1, 1985, pp 123–147

Unger, Gerard, 'The design of a typeface'. *Visible Language*, vol xiii, no 2, 1979, pp 134–149

Zapf, Hermann, 'The changes in letterforms due to technical developments'. *Journal of Typographic Research*, vol ii, no 4, 1968, pp 351–368