A METAFONT for rustic capitals

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1 Introduction

Littera capitalis rustica (literally *country capital letters*) are a script of the Latin alphabet, the earliest examples of which date back to the first century CE, notably on election posters in the city of Pompeii (see Figure 1). They were gradually regularised in the fourth and fifth centuries and remained in use until the ninth and tenth centuries, but mostly for titles and distinctions [1].

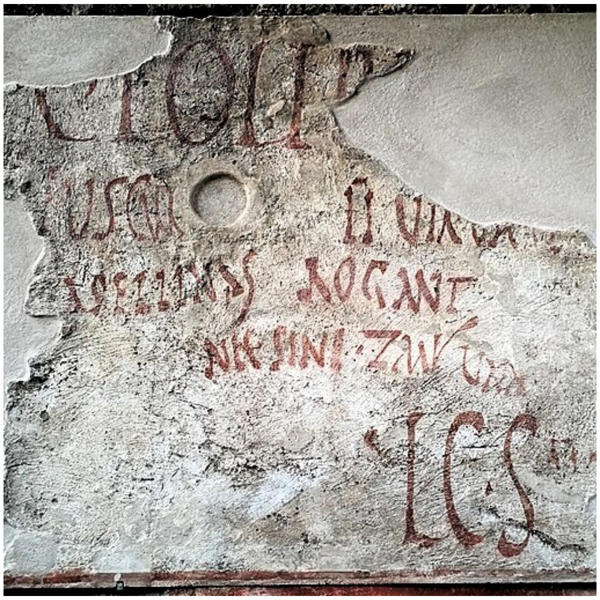

Figure 1: Election poster in Asellina's tavern, Pompeii

Many manuscripts contain splendid examples of rustic capitals. These include the *Vergilius Vaticanus* [7] and the fifth-century *Vergilius Romanus* and *Codex Mediceus*. The first one, an incomplete copy of Virgil's *Aeneid* and *Georgics*, will be the main reference for our work, although we will attempt to rationalise its handwriting with the METAFONT system [3] — while maintaining a sense of authenticity — rather than to reproduce it exactly, imperfection for imperfection. Thus, in the spectrum of type revivals described by Olocco and Patanè [6, Chapter 1], which ranges from literal reproduction to reinvention, we intend to occupy a middle ground.

Whenever possible, we use the same terminology as that found in [2, Chapter 2].

2 Design of the repeating components

Our METAFONT project is divided into several files, ruscap.mf defines the macros and characters, while ruscap10.mf, ruscap14.mf, &c. define the dimensions to be used for rendering to a particular font size. In the rest of this article all values are taken from ruscap10.mf.

2.1 Lengths and angles

After numerous measurements on various fragments of the manuscript that we use as a reference, it appeared that the vertical space could be divided into twelve units, from which we also define s (for sidebearing) and o (for overshoot).

```
u# := 10/12 pt#; % unit
s# := 3/4 u#; % sidebearing
o# := 1/4 u#; % overshoot
```

Then, most capitals occupy nine units above the baseline, some eleven (such as 'F' and 'L'), and the letter 'Q' (and 'G' in one variant) goes down one unit below it. The crossbar in 'E', the junction of the two lobes of 'B', &c. are slightly above half of the upper space.

```
cap_height# := 9 u#;
asc_height# := 11 u#;
desc_height# := 1 u#;
crossbar_height# := 5 u#;
```

Next, the serifs in our font have the shape of a tilde, so all we need to specify is a width and an angle (0 would mean the serif is just a horizontal stroke); see the next section and [3, p. 152].

```
serif_width# := 5/2 u#;
serif_angle := 90 / 6;
```

Two dimensions are also needed for components of some characters, namely the angle of the stroke in the letters 'A', 'N', &c., and the width and angle of the spurs.

```
diag_angle := 90 + 35;
spur_width# := 1/2 u#;
spur_angle := 0;
```

Finally, the virtual pencil used is defined by the thickness of the thickest and thinnest strokes it can draw, and by its slope, here 35 degrees. Rustic capitals are known to be written with a very inclined tool [1].

```
thick# := 5/4 u#;
thin# := 1/3 u#;
pen_angle := 65; % 90 - 35
```

2.2 Macros

Let us give the code of some macros we have written to improve consistency and limit repetition in the project.

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2.2.1 draw_serif

To create a serif, we constrain its ends to be horizontally aligned and serif_width apart, and draw a line between them with the same initial and final angles.

```
def draw_serif(suffix i, j)(expr width) =
    rt x.j - lft x.i = width;
    y.i = y.j;
    draw z.i{dir serif_angle}
         .. {dir serif_angle}z.j;
enddef;
```

See, for example, the top arm of the letter ‘F’ in Figure 2.

2.2.2 draw_diag_stroke

With the spurs defined at both ends of the stroke, all we need to do is set the angle between them and connect all the points. We have increased the tension in the main part so that it is almost straight but still smoothly connects the spurs.

```
def draw_diag_stroke(suffix i, j)(expr a) =
    z.i - z.i.l = z.j.r - z.j
                = spur_width * dir 0;
    z.j - z.i = whatever * (dir angle);
    draw z.i.l .. z.i
         .. tension 3
         .. z.j .. z.j.r;
enddef;
```

In most cases the angle parameter will take the value diag_angle, but this is not always the case. For example, the two diagonal strokes in the letter ‘M’ don’t have the same angle.

2.2.3 draw_I

We use the same code to draw the letters ‘I’ and ‘L’, and the left part of the letters ‘B’, ‘P’, ‘R’, &c.

```
def draw_I(suffix i, j, k, l)(expr sw) =
    x.i = x.j;  % vertical stem
    top y.i = h; bot y.j = 0;
    z.i - z.i.l
      = spur_width * dir spur_angle;

    % Serif
    rt (2 x.j - x.k) - lft x.k
      = serif_width;
    y.j = y.k;
    draw_serif(k, l)(sw);

    draw z.i.l .. z.i .. tension 5 .. z.j;
enddef;
```

The way we constrain the position of the serif ends may require some explanation. The sw variable stores the total width of the serif to be drawn. Generally it is not centred around the stem; the right part can be as long as needed and only the width of the left part is constant and should be half the value s of serif_width. To achieve this, the following equation should hold:

$$x_k + 2(x_j - x_k) = x_k + s$$

which, after rewriting and taking into account the size of the pencil nib, gives the above code.

3 Design of the characters and kerning

3.1 Example of the letter ‘T’

```
beginchar("T", 6u# + 2s#, cap_height#, 0);
    "Rustic␣T";
    pickup rustic_pen;
    x1 = w - x2; top y1 = h;
    draw_serif(1, 2)(w - 2s);
    x3 = w - x4; bot y3 = 0;
    draw_serif(3, 4)(serif_width);
    draw 1/2 [z1, z2] .. 1/2 [z3, z4];
    labels(range 1 thru 4);
endchar;
```

3.2 Example of the letter ‘N’

The letters ‘M’ and ‘N’ are the most involved we have designed, but the code is still straightforward.

```
beginchar("N", 7u# + 2s#, cap_height#, 0);
    "Rustic␣N";
    pickup rustic_pen;

    % Diagonal stroke
    x1 + x2 = w; top y1 = h; bot y2 = 0;
    draw_diag_stroke(1, 2)(diag_angle);

    % Left stem
    bot y3 = 0; lft x3 = s;
    draw z1 .. z3;
    1/2 (z3.l + z3.r) = z3;
    draw_serif(3.l, 3.r, serif_width);

    % Right stem
    x4 = x5 = x2.r;  % vertical stem
    top y4 = h; bot y5 = 0;
    z4 - z4.l
      = spur_width * dir spur_angle;
    draw z4.l .. z4 -- z5;
    labels(range 1 thru 5);
endchar;
```

Perhaps the most debatable choice we have made is the angled left-hand stem and straight right-hand stem, but we think it works well with letters such as ‘A’ and ‘L’.

3.3 Example of the letter ‘S’

The design of the letter ‘S’ is peculiar in that it consists of a single stroke and doesn’t call any of our custom macros.

```
beginchar("S", 4u# + s#, cap_height#, 0);
    "Rustic␣S";
    pickup rustic_pen;
    lft x2 = s; x2 = x4;
    rt x1 = w; x1 = x3;
    top y1 = h - u; bot y4 = o;
    h - y2 = y3;
    z2 - z3 = whatever * dir diag_angle;
    draw z1{curl 2} .. z2
         .. z3 .. {curl 1}z4;
endchar;
```

Note the slight asymmetry introduced by a different curl value at each end.

3.4 Side-bearing and kerning

We chose a uniform side-bearing throughout the typeface and corrected glaring kerning problems with a ligature table.

```
ligtable "A": "C" kern -.5u#, "T" kern -u#;
ligtable "K": "O" kern -.5u#;
ligtable "L": "O" kern -.5u#, "T" kern -u#;
ligtable "N": "V" kern .5u#;
...
```

We believe that fine-tuning the interletter spacing does not align with our goal of authenticity.

3.5 Remarks

While scanning various manuscripts and online resources, we came across two variants of the letter ‘G’ [5, 8]. In the final design, we chose the one that looks more like a square capital as the main variant, and made the other available as ‘g’.

4 Comparison with other typefaces

See Figures 3, 4 and 5 for a comparison of fragments of *Vergilius Vaticanus* with the typefaces designed by (a) Landers [4], (b) Wilson [9] and (c) the author respectively. The (b) and (c) typefaces were created with the METAFONT system, (a) was not.

While the former designs may be well suited to their authors’ aims, they do not correspond to the one we stated in the introduction. In particular, we would like to draw the reader’s attention to the following points:

- in (a), the letters are slightly angled to the right,
- in (a), the letters ‘E’ and ‘N’ are not the same height, and neither are the letters ‘S’ and ‘U’,
- in (a), the letters ‘D’ and ‘R’ feature a large spur,
- in (b), the crossbar of the letter ‘E’ is long and sinuous,
- in (b), the strokes become significantly thicker as they descend,
- in (a) and (b), some paths are quite steep, such as the letter ‘D’ in (a) and the letter ‘G’ in (b).

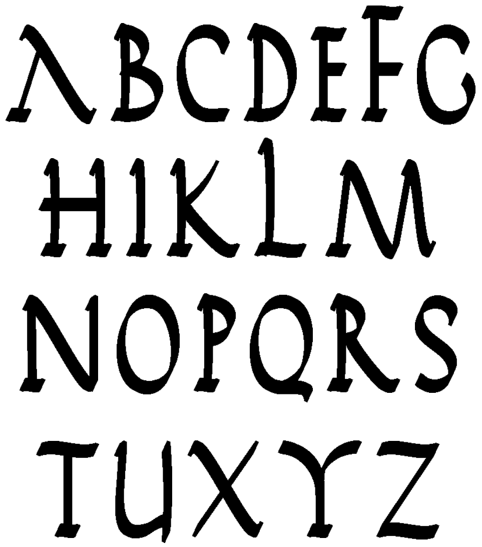

Figure 2: Character set of the ruscap typeface

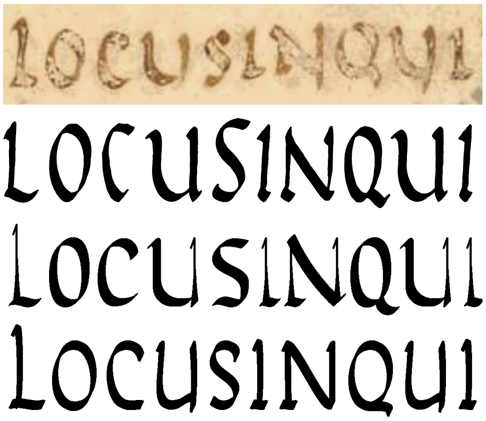

Figure 3: The words “locus in qui” rendered in different typefaces

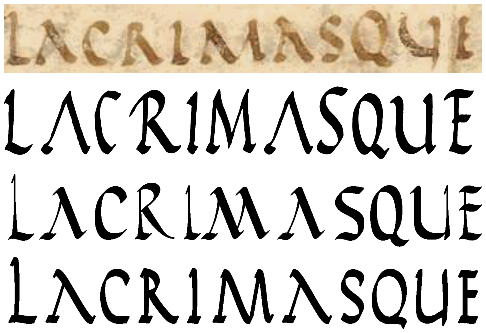

Figure 4: The word "lacrimasque" rendered in different typefaces

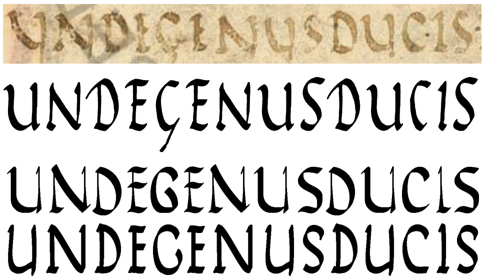

Figure 5: The words "unde genus ducis" rendered in different typefaces

It also seems to us that our METAFONT code is simpler than that written by Wilson, partly, but not only, because our character set is smaller.

5 Conclusion and future work

In this article, we have limited ourselves to presenting just one font from the ruscap family, but METAFONT makes it easy to achieve a variety of designs, including different weights, by changing just a few parameters. For example, the result of setting a uniform pen thickness, a serif angle of 0 and a slightly higher crossbar height is shown in Figure 6.

In the near future, we plan to iterate on the shapes of some characters (particularly 'M' and 'U'), consider the revisions made during the TUG 2023 event, and finally submit our typeface to the Comprehensive TEX Archive Network (CTAN) for everyone to use freely.

We will also consider extending the character set to include the two "Ramist letters" 'J' and 'U', the letter 'W' and the Indo-Arabic digits.

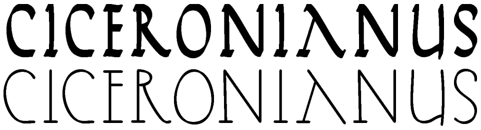

Figure 6: The word 'ciceronianus' rendered in two fonts of the ruscap family

Acknowledgement

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References

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