

PFA Programming
For Artists

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{CMYK}

splitter

Processing 2.2.1

December, 2014
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| PROJECT BRIEF

During my recent practise I have found that there is no precise RGB to CMYK conversion in Processing. There are some conversion algorithms, however, it is very far from results you get using Photoshop or other advanced image processors.

My suggestion is: the most accurate way to do it – to use pre-defined maps of every single colour of 16.7M (16 777 216) for reference. The main trick is to process such a vast data partly or to transform it into formulas.

The minimal task is to create short script/function based on these maps with a reasonable processing time, as long as one channel map is 4096x4096 pixels matrix ... or ... 16 777 216 pixels in total.

The ideal solution is to ‘hack’ these maps, to find patterns and to design proper formulas for splitting RGB to CMYK channels.

I don’t know math theory so well to be able to construct formulas from complicated patterns, have to try.

That’s the fundamentals of studies.

| MOST POPULAR ALGORITHM

JavaScript version

```
public static int[] rgbToCmyk(int red, int green, int blue) {  
  
    int black = Math.min(Math.min(255 - red, 255 - green), 255 - blue);  
  
    if (black!=255) {  
        int cyan  = (255 - red - black)/(255 - black);  
        int magenta = (255 - green - black)/(255 - black);  
        int yellow = (255 - blue - black)/(255 - black);  
        return new int[] {cyan, magenta, yellow, black};  
    } else {  
        int cyan = 255 - red;  
        int magenta = 255 - green;  
        int yellow = 255 - blue;  
        return new int[] {cyan, magenta, yellow, black};  
    }  
}
```

| RESULTS

Processing



C

Photoshop CS4



M



M



K



K



| MOST POPULAR ALGORITHM: BLACK

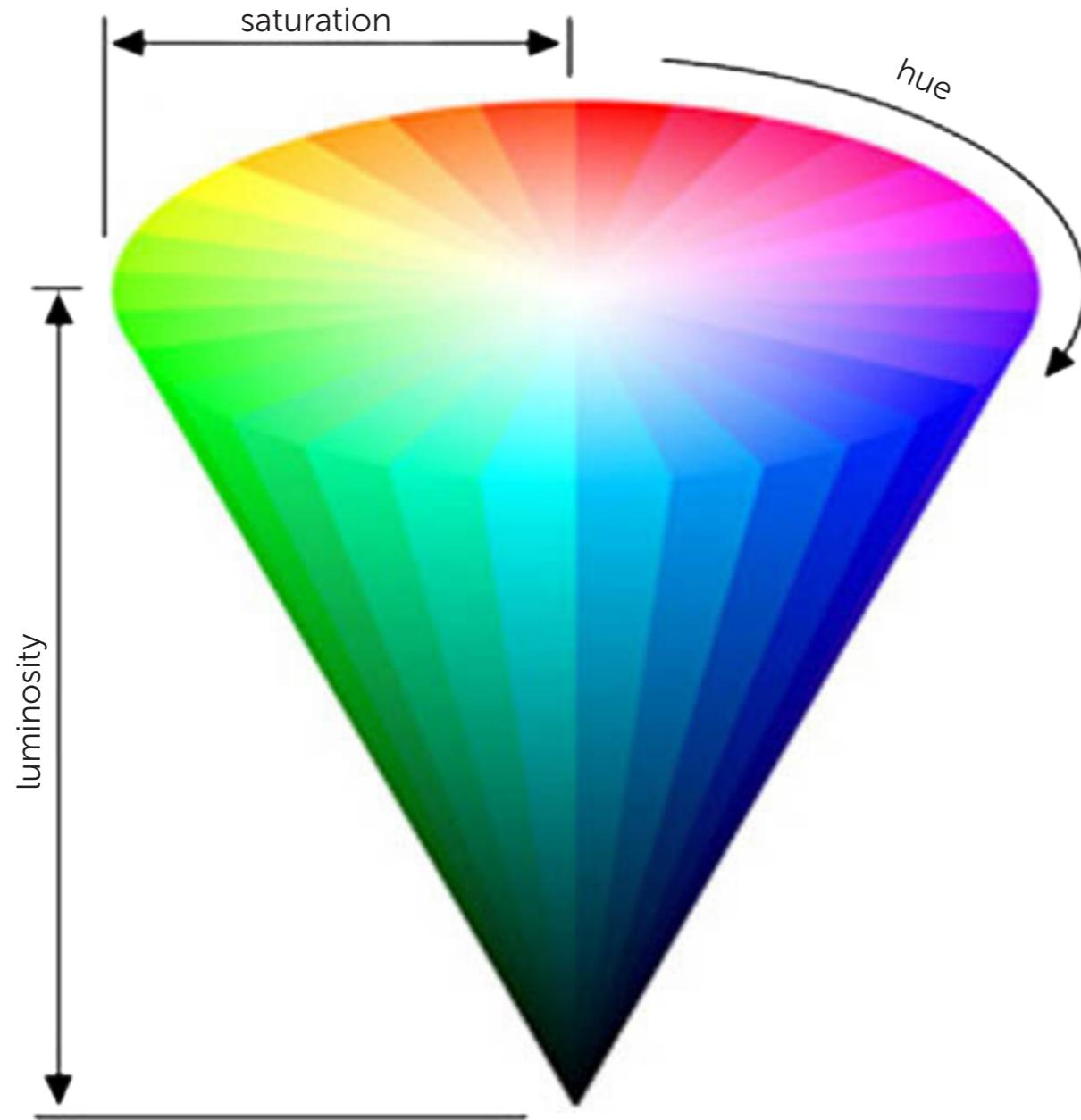
Processing



Photoshop CS4



| RGB COLOUR SPACE



RGB [red, green, blue]

$256 \times 256 \times 256 = 16\,777\,216$ colours

| CMYK COLOUR SPACE



CMYK [cyan, magenta, yellow, key (black)]

$100 \times 100 \times 100 \times 100 = 100\,000\,000?$

In theory, around 10,000,000 shades can be obtained with 4 inks. Since the CMYK has limitations, all these shades are compressed into the CMYK gamut. To make a long story short, none of these 10,000,000 shades will be a bright orange, a limy green or a down-deep purple. So the question is tricky in that sense. Many shades but a very "ordinary" gamut in the end.

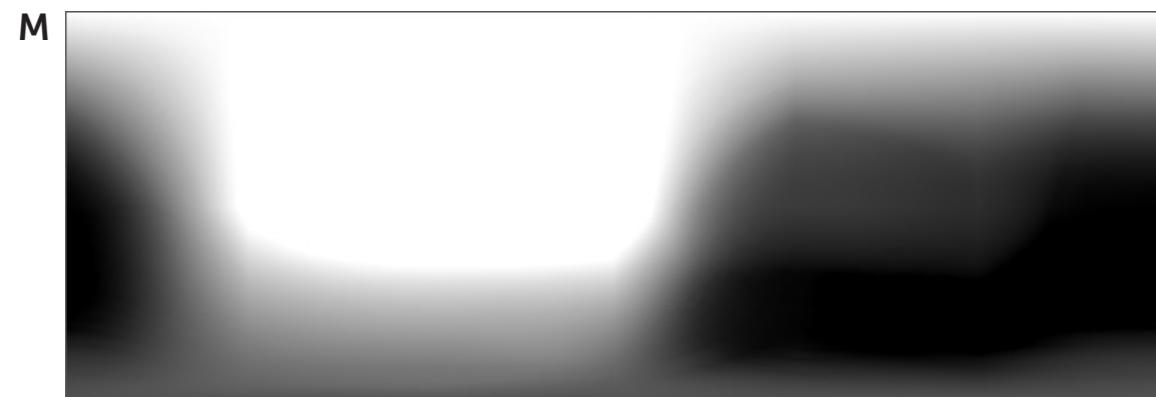
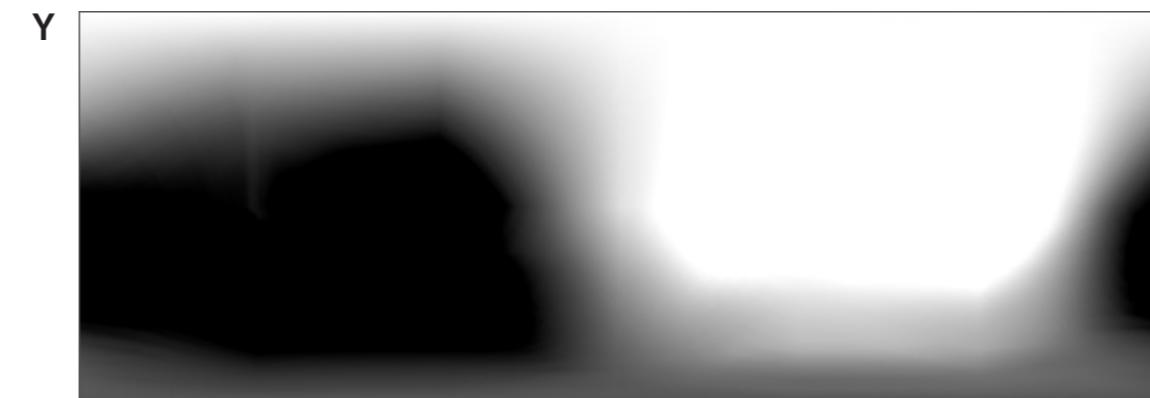
| RGB HSL MAPS



X: while hue and saturation have wheel basis, X axis equals to 720°

Y: 256 range from 0 to 255

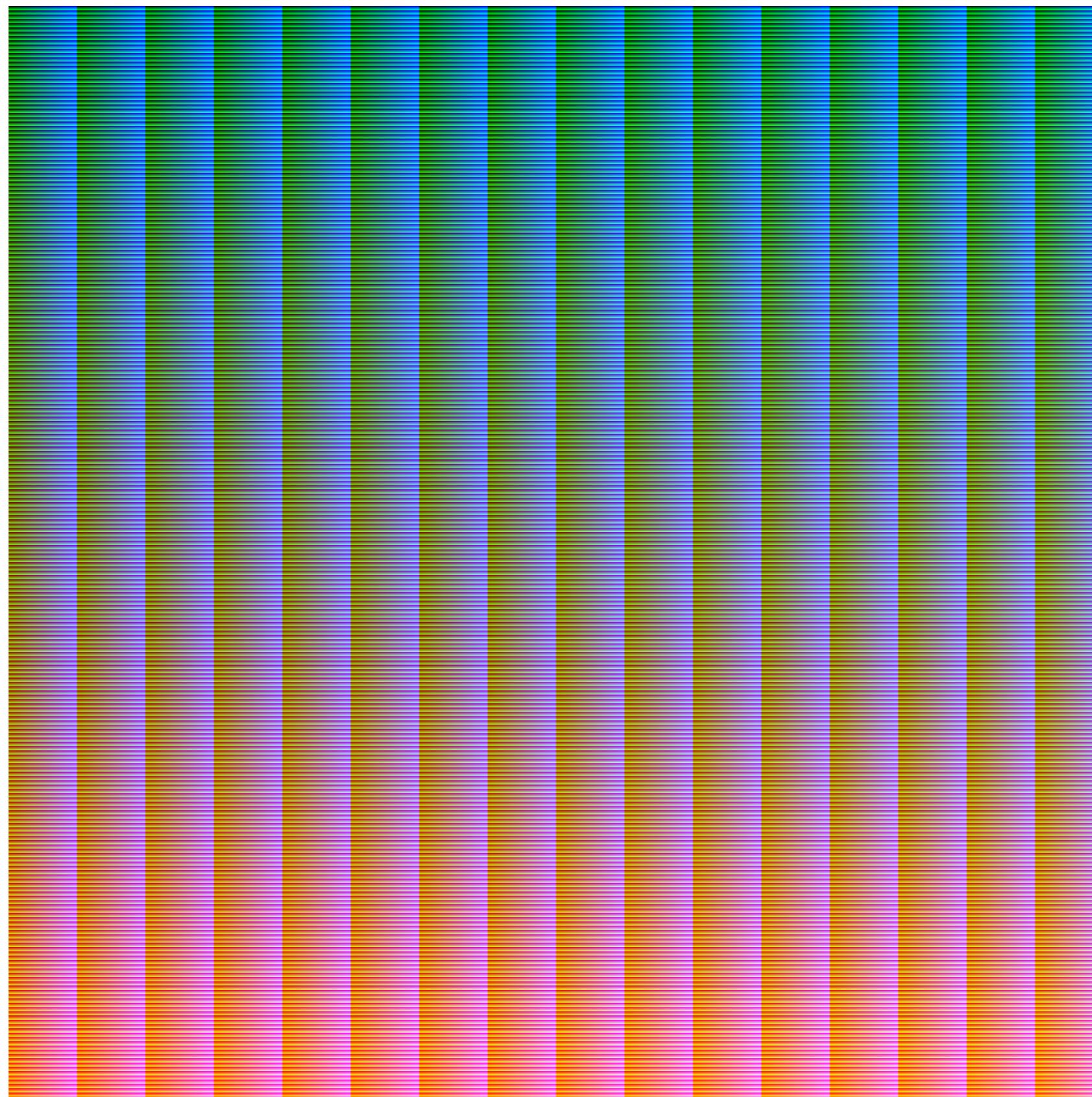
| RGB HSL TO CMYK



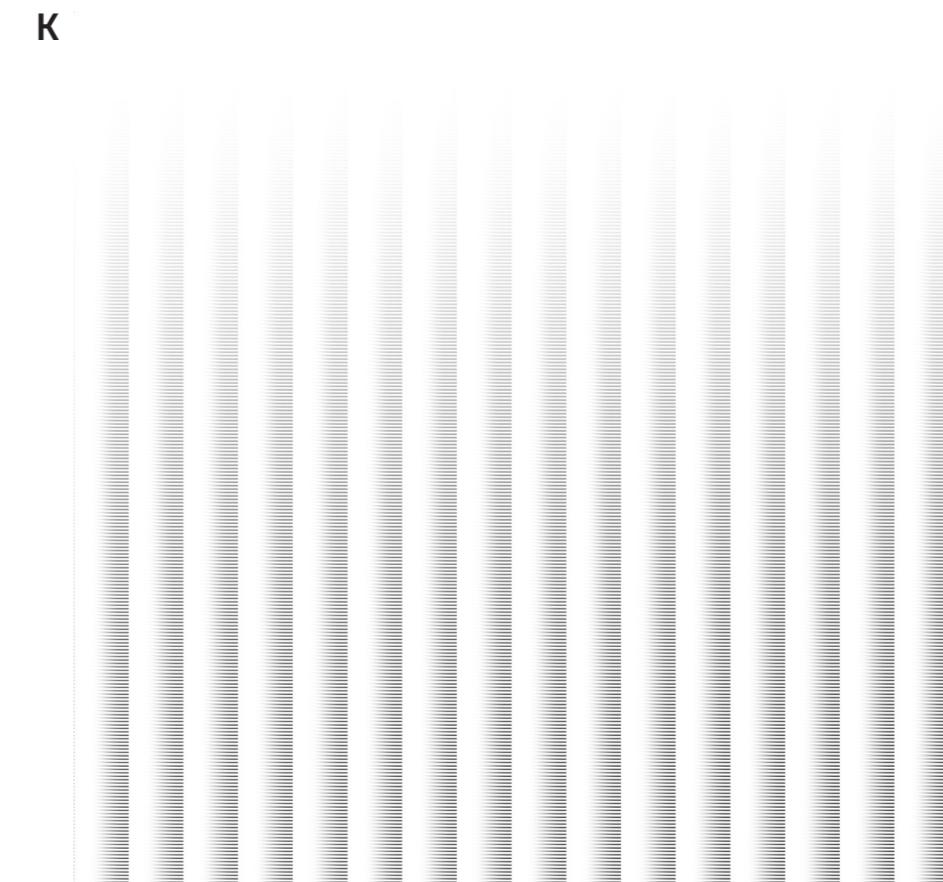
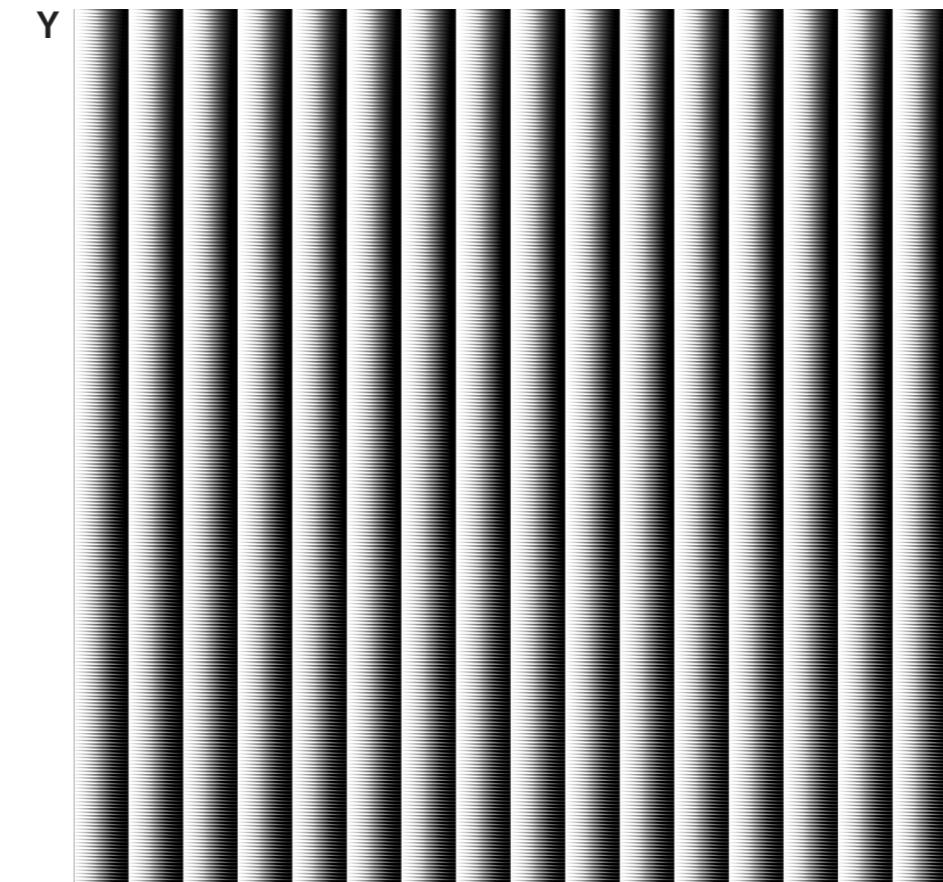
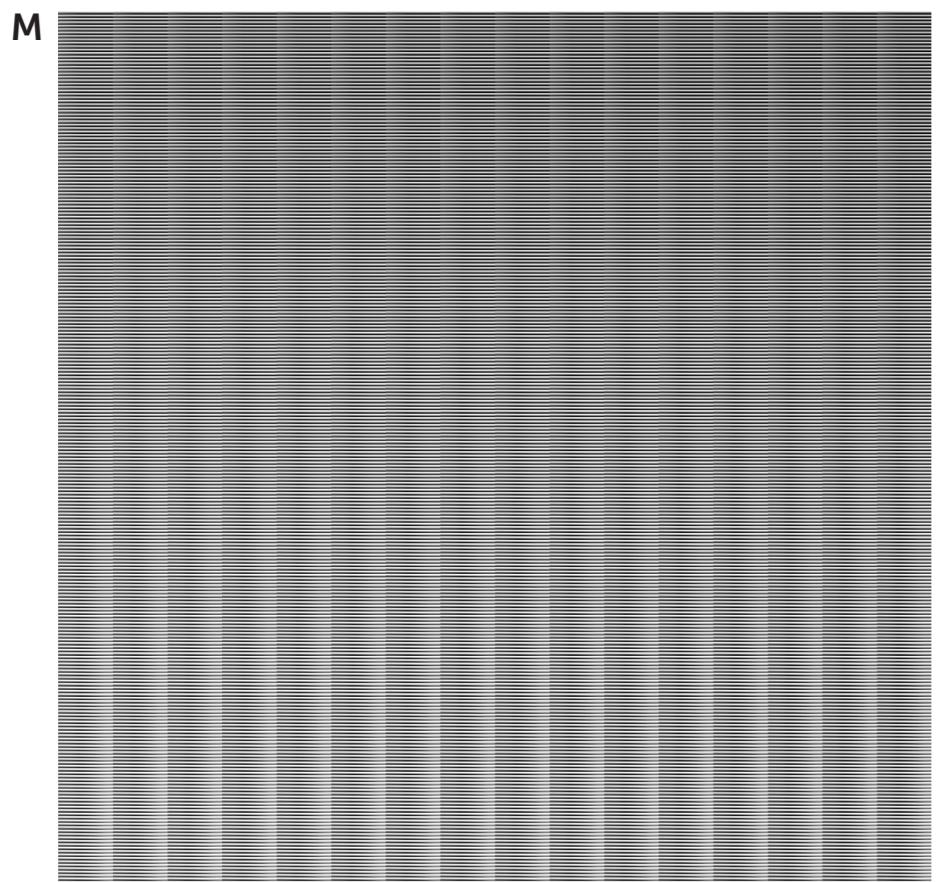
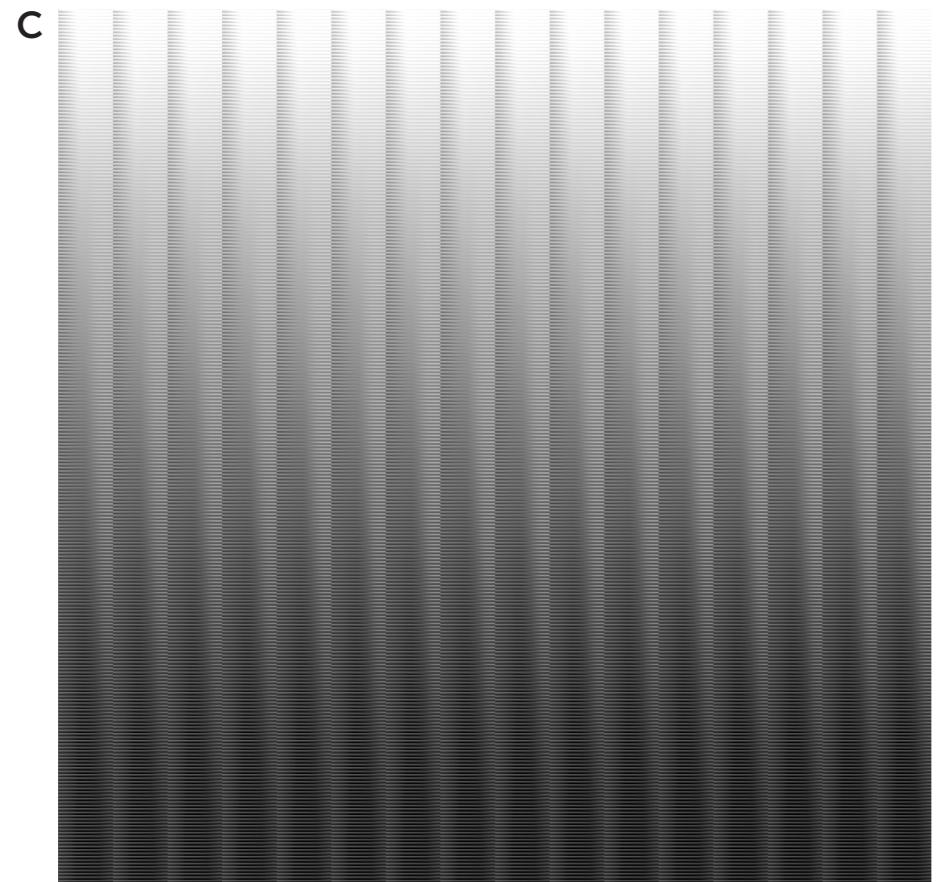
RGB [red, green, blue]

256 x 256 x 256 = 16 777 216 colours

| RGB REFERENCE MAP



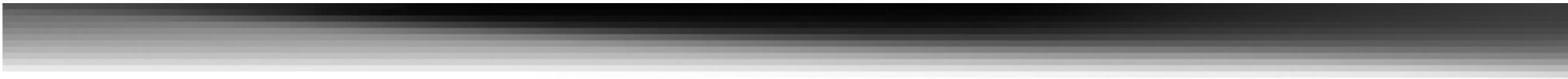
| RGB REFERENCE MAP SPLITS



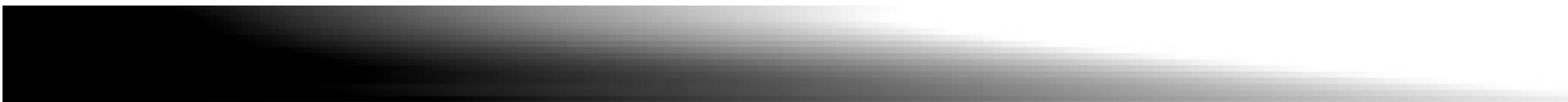
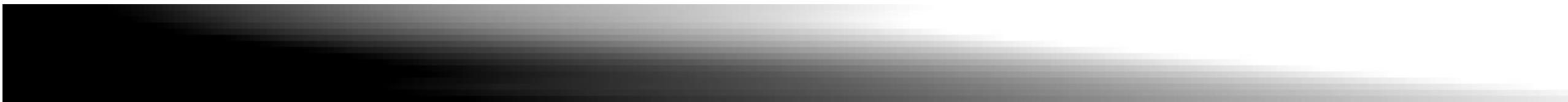
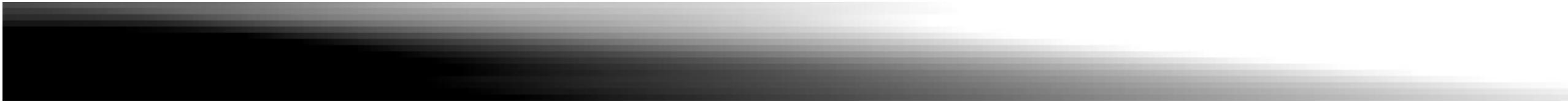
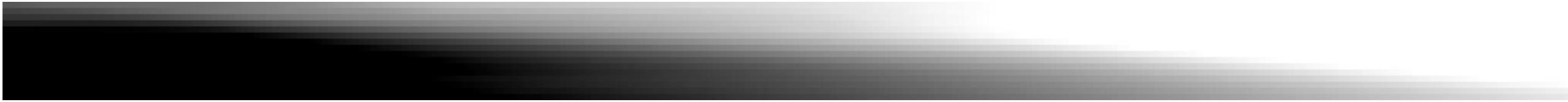
| RGB REFERENCE MAP PATTERNS: CYAN



| RGB REFERENCE MAP PATTERNS: MAGENTA



| RGB REFERENCE MAP PATTERNS: YELLOW



| RGB REFERENCE MAP PATTERNS: BLACK

