

color Schemes for Scientific Data with the SRON-COLORS package

Benjamin Weiss
weissbenjamin@me.com

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1 Introduction













Colors for scientific data must be chosen very carefully. The SRON-COLORS package makes the color schemes proposed by Paul Tol in his [SRON Technical Note](#) easily accessible with LaTeX.

2 SRON color palettes

The SRON Technical Note describes two different distinct color palettes











































`palette1` The following table lists the colors of palette 1.

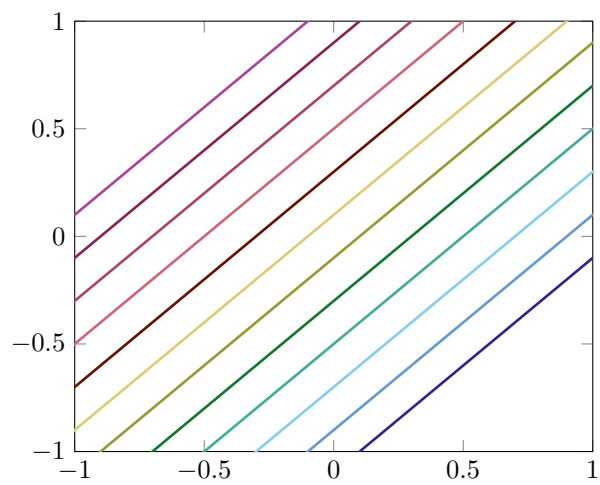
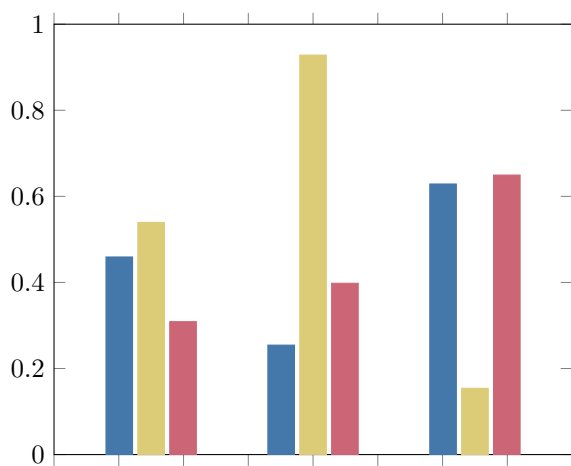
| Name | RGB | HTML |
|----------------|---|--|
| palette1color0 |  68 119 170 |  4477AA |
| palette1color1 |  51 34 136 |  332288 |
| palette1color2 |  102 153 204 |  6699CC |
| palette1color3 |  136 204 238 |  88CCEE |
| palette1color4 |  68 170 153 |  44AA99 |
| palette1color5 |  17 119 51 |  117733 |
| palette1color6 |  153 153 51 |  999933 |

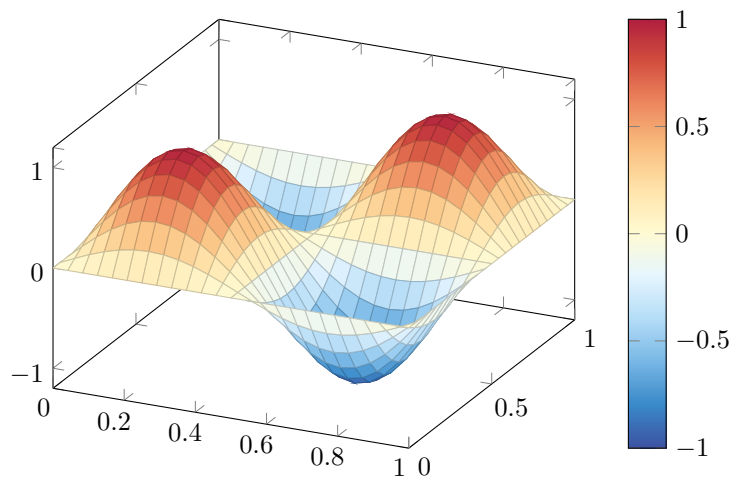
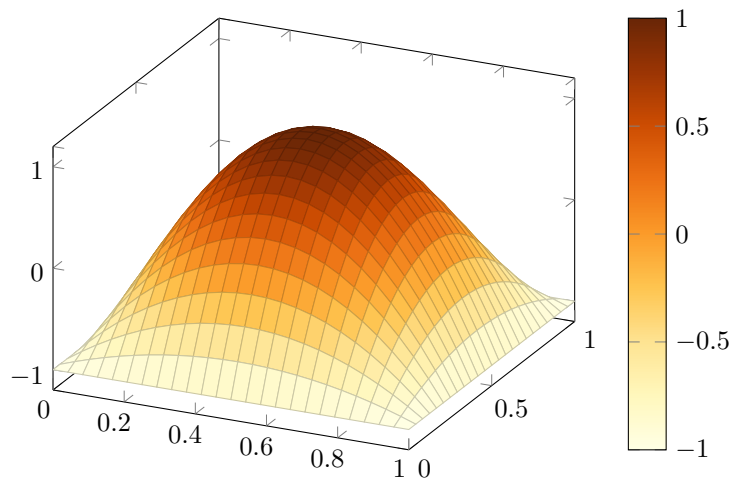
| | | |
|-----------------|---|--|
| palette1color7 |  221 204 119 |  DDCC77 |
| palette1color8 |  102 17 0 |  661100 |
| palette1color9 |  204 102 119 |  CC6677 |
| palette1color10 |  170 68 102 |  AA4466 |
| palette1color11 |  136 34 85 |  882255 |
| palette1color12 |  170 68 153 |  AA4499 |

palette1cycleX Using the color palette **palette1** 12 different **pgfplotsstylelists** are defined. Just replace the X with the number of colors you need in your plot. Then those colors are selected, that they are most distinct to each other.

palette2 The following table lists the colors of palette 2.

| Name | RGB | HTML |
|----------------------|---|--|
| palette2color0light |  119 170 221 |  77AADD |
| palette2color1light |  119 204 204 |  77CCCC |
| palette2color2light |  136 204 170 |  88CCAA |
| palette2color3light |  221 221 119 |  DDDD77 |
| palette2color4light |  221 170 119 |  DDAA77 |
| palette2color5light |  221 119 136 |  DD7788 |
| palette2color6light |  204 153 187 |  CC99BB |
| palette2color0medium |  68 119 170 |  4477AA |
| palette2color1medium |  68 170 170 |  44AAAA |
| palette2color2medium |  68 170 119 |  44AA77 |
| palette2color3medium |  170 170 68 |  AAAA44 |
| palette2color4medium |  170 119 68 |  AA7744 |
| palette2color5medium |  170 68 85 |  AA4455 |
| palette2color6medium |  170 68 136 |  AA4488 |
| palette2color0dark |  17 68 119 |  114477 |
| palette2color1dark |  17 119 119 |  117777 |
| palette2color2dark |  17 119 68 |  117744 |
| palette2color3dark |  119 119 17 |  777711 |
| palette2color4dark |  119 68 17 |  774411 |
| palette2color5dark |  119 17 34 |  771122 |
| palette2color6dark |  119 17 85 |  771155 |





3 Implementation

3.1 Required Packages

Load required packages.

```

1 \RequirePackage{etoolbox}
2 \RequirePackage{tikz}
3 \RequirePackage{pgfplots}
4 \RequirePackage{pgffor}

```

3.2 Helper Macros

`\sroncreateplotcyclelist` Helper macro to conveniently create plotcyclelists.

```
5 \newcommand{\sroncreateplotcyclelist}[3]{
6   % check if key otherwise treat it like a macro list
7   \pgfkeysifdefined{#2}{
8     \pgfkeys{#2/.get = \@sron@list}
9   }{
10    \let\@sron@list#2
11  }
12
13  % create helper macro on
14  \def\@sron@tempcmd{ }
15  \foreach \drawtype in {#3} {
16    \global\exppto\@sron@tempcmd{\drawtype=\noexpand\color,}
17  }
18  % create custom
19  \def\@sron@temp{ }
20  \foreach \color in \@sron@list {
21    \ifx\color\@empty\else
22      \global\exppto\@sron@temp{{\@sron@tempcmd}, }
23    \fi
24  }
25  % create plot cyle list based on http://tex.stackexchange.com/a/14418/30195
26  \begingroup
27  \edef\@sron@createcyclelist{%
28    \noexpand\pgfplotscreateplotcyclelist{#1}{%
29      \unexpanded\expandafter{\@sron@temp}%
30    }%
31  }%
32  \expandafter
33  \endgroup\@sron@createcyclelist
34 }
```

3.3 Color Palettes

3.3.1 Palette 1

`palette1` Define the colors of palette 1.

```
35 \definecolor{palette1color0}{HTML}{4477AA}
36 \definecolor{palette1color1}{HTML}{332288}
37 \definecolor{palette1color2}{HTML}{6699CC}
38 \definecolor{palette1color3}{HTML}{88CCEE}
39 \definecolor{palette1color4}{HTML}{44AA99}
40 \definecolor{palette1color5}{HTML}{117733}
41 \definecolor{palette1color6}{HTML}{999933}
42 \definecolor{palette1color7}{HTML}{DDCC77}
43 \definecolor{palette1color8}{HTML}{661100}
44 \definecolor{palette1color9}{HTML}{CC6677}
45 \definecolor{palette1color10}{HTML}{AA4466}
46 \definecolor{palette1color11}{HTML}{882255}
47 \definecolor{palette1color12}{HTML}{AA4499}
```

`palette1cycle1` Define SRON palettes 1 cycles with different number of colors

```
48 \pgfkeys{
49   /sron/palette 1/.cd,
50   cycle 1/.initial = {%
51     palette1color0,
52   },
53   cycle 2/.initial = {%
54     palette1color0,
55     palette1color9
56   },
57   cycle 3/.initial = {%
58     palette1color0,
59     palette1color7,
60     palette1color9,
61   },
62   cycle 4/.initial = {%
63     palette1color0,
64     palette1color5,
65     palette1color7,
```

```

66     palette1color9
67 },
68 cycle 5/.initial = {%
69     palette1color1,
70     palette1color3,
71     palette1color5,
72     palette1color7,
73     palette1color9,
74 },
75 cycle 6/.initial = {%
76     palette1color1,
77     palette1color3,
78     palette1color5,
79     palette1color7,
80     palette1color9,
81     palette1color12,
82 },
83 cycle 7/.initial = {%
84     palette1color1,
85     palette1color3,
86     palette1color4,
87     palette1color5,
88     palette1color7,
89     palette1color9,
90     palette1color12,
91 },
92 cycle 8/.initial = {%
93     palette1color1,
94     palette1color3,
95     palette1color4,
96     palette1color5,
97     palette1color6,
98     palette1color7,
99     palette1color9,
100    palette1color12,
101 },
102 cycle 9/.initial = {%
103     palette1color1,
104     palette1color3,
105     palette1color4,

```

```

106     palette1color5,
107     palette1color6,
108     palette1color7,
109     palette1color9,
110     palette1color11,
111     palette1color12,
112 },
113 cycle 10/.initial = {%
114     palette1color1,
115     palette1color3,
116     palette1color4,
117     palette1color5,
118     palette1color6,
119     palette1color7,
120     palette1color8,
121     palette1color9,
122     palette1color11
123     palette1color12,
124 },
125 cycle 11/.initial = {%
126     palette1color1,
127     palette1color2,
128     palette1color3,
129     palette1color4,
130     palette1color5,
131     palette1color6,
132     palette1color7,
133     palette1color8,
134     palette1color9,
135     palette1color11,
136     palette1color12,
137 },
138 cycle 12/.initial = {%
139     palette1color1,
140     palette1color2,
141     palette1color3,
142     palette1color4,
143     palette1color5,
144     palette1color6,
145     palette1color7,

```



```

146     palette1color8,
147     palette1color9,
148     palette1color10,
149     palette1color11,
150     palette1color12,
151   },
152 }

```

palette1cycleX For every number of colors from 1 to 12 define a **pgfplotsstylelist**.

```

153 \sroncreateplotcyclelist{palette1cycle1}{/sron/palette 1/cycle 1}{color}
154 \sroncreateplotcyclelist{palette1cycle2}{/sron/palette 1/cycle 2}{color}
155 \sroncreateplotcyclelist{palette1cycle3}{/sron/palette 1/cycle 3}{color}
156 \sroncreateplotcyclelist{palette1cycle4}{/sron/palette 1/cycle 4}{color}
157 \sroncreateplotcyclelist{palette1cycle5}{/sron/palette 1/cycle 5}{color}
158 \sroncreateplotcyclelist{palette1cycle6}{/sron/palette 1/cycle 6}{color}
159 \sroncreateplotcyclelist{palette1cycle7}{/sron/palette 1/cycle 7}{color}
160 \sroncreateplotcyclelist{palette1cycle8}{/sron/palette 1/cycle 8}{color}
161 \sroncreateplotcyclelist{palette1cycle9}{/sron/palette 1/cycle 9}{color}
162 \sroncreateplotcyclelist{palette1cycle10}{/sron/palette 1/cycle 10}{color}
163 \sroncreateplotcyclelist{palette1cycle11}{/sron/palette 1/cycle 11}{color}
164 \sroncreateplotcyclelist{palette1cycle12}{/sron/palette 1/cycle 12}{color}

```

palette1cycleXbar For every number of colors from 1 to 12 define a **pgfplotsstylelist** for bar charts.

```

165 \sroncreateplotcyclelist{palette1cycle1bar}{/sron/palette 1/cycle 1}{draw,fill}
166 \sroncreateplotcyclelist{palette1cycle2bar}{/sron/palette 1/cycle 2}{draw,fill}
167 \sroncreateplotcyclelist{palette1cycle3bar}{/sron/palette 1/cycle 3}{draw,fill}
168 \sroncreateplotcyclelist{palette1cycle4bar}{/sron/palette 1/cycle 4}{draw,fill}
169 \sroncreateplotcyclelist{palette1cycle5bar}{/sron/palette 1/cycle 5}{draw,fill}
170 \sroncreateplotcyclelist{palette1cycle6bar}{/sron/palette 1/cycle 6}{draw,fill}
171 \sroncreateplotcyclelist{palette1cycle7bar}{/sron/palette 1/cycle 7}{draw,fill}
172 \sroncreateplotcyclelist{palette1cycle8bar}{/sron/palette 1/cycle 8}{draw,fill}
173 \sroncreateplotcyclelist{palette1cycle9bar}{/sron/palette 1/cycle 9}{draw,fill}
174 \sroncreateplotcyclelist{palette1cycle10bar}{/sron/palette 1/cy-
    cle 10}{draw,fill}
175 \sroncreateplotcyclelist{palette1cycle11bar}{/sron/palette 1/cy-
    cle 11}{draw,fill}
176 \sroncreateplotcyclelist{palette1cycle12bar}{/sron/palette 1/cy-
    cle 12}{draw,fill}

```

3.3.2 Palette 2

`palette2` Define the colors of palette 2.

```
177 \definecolor{palette2color0light}{HTML}{77AADD}
178 \definecolor{palette2color1light}{HTML}{77CCCC}
179 \definecolor{palette2color2light}{HTML}{88CCAA}
180 \definecolor{palette2color3light}{HTML}{DDDD77}
181 \definecolor{palette2color4light}{HTML}{DDAA77}
182 \definecolor{palette2color5light}{HTML}{DD7788}
183 \definecolor{palette2color6light}{HTML}{CC99BB}
184 \definecolor{palette2color0medium}{HTML}{4477AA}
185 \definecolor{palette2color1medium}{HTML}{44AAAA}
186 \definecolor{palette2color2medium}{HTML}{44AA77}
187 \definecolor{palette2color3medium}{HTML}{AAAA44}
188 \definecolor{palette2color4medium}{HTML}{AA7744}
189 \definecolor{palette2color5medium}{HTML}{AA4455}
190 \definecolor{palette2color6medium}{HTML}{AA4488}
191 \definecolor{palette2color0dark}{HTML}{114477}
192 \definecolor{palette2color1dark}{HTML}{117777}
193 \definecolor{palette2color2dark}{HTML}{117744}
194 \definecolor{palette2color3dark}{HTML}{777711}
195 \definecolor{palette2color4dark}{HTML}{774411}
196 \definecolor{palette2color5dark}{HTML}{771122}
197 \definecolor{palette2color6dark}{HTML}{771155}
```

3.4 Color Maps

`colormapSeqPal` Define palette of color map for sequential data.

```
198 \definecolor{colormapSeqpalcolor0}{HTML}{FFFFE5}
199 \definecolor{colormapSeqpalcolor1}{HTML}{FFF7BC}
200 \definecolor{colormapSeqpalcolor2}{HTML}{FEE391}
201 \definecolor{colormapSeqpalcolor3}{HTML}{FEC44F}
202 \definecolor{colormapSeqpalcolor4}{HTML}{FB9A29}
203 \definecolor{colormapSeqpalcolor5}{HTML}{EC7014}
204 \definecolor{colormapSeqpalcolor6}{HTML}{CC4C02}
205 \definecolor{colormapSeqpalcolor7}{HTML}{993404}
206 \definecolor{colormapSeqpalcolor8}{HTML}{662506}
```

colormapSeq Color map for sequential data.

```
207 \pgfplotscreatecolormap{colormapSeq}{%
208   color(0cm)=(colormapSeqpalcolor0);
209   color(1cm)=(colormapSeqpalcolor1);
210   color(2cm)=(colormapSeqpalcolor2);
211   color(3cm)=(colormapSeqpalcolor3);
212   color(4cm)=(colormapSeqpalcolor4);
213   color(5cm)=(colormapSeqpalcolor5);
214   color(6cm)=(colormapSeqpalcolor6);
215   color(7cm)=(colormapSeqpalcolor7);
216   color(8cm)=(colormapSeqpalcolor8);
217 }
```

Style with color map for sequential data.

```
218 \pgfplotsset{
219   /pgfplots/colormap/colormapSeq/.style={
220     /pgfplots/colormap name = colormapSeq
221   }
222 }
```

colormapDivpal Define palette of color map for diverging data.

```
223 \definecolor{colormapDivpalcolor0}{HTML}{3D52A1}
224 \definecolor{colormapDivpalcolor1}{HTML}{3A89C9}
225 \definecolor{colormapDivpalcolor2}{HTML}{77B7E5}
226 \definecolor{colormapDivpalcolor3}{HTML}{B4DDF7}
227 \definecolor{colormapDivpalcolor4}{HTML}{E6F5FE}
228 \definecolor{colormapDivpalcolor5}{HTML}{FFFAD2}
229 \definecolor{colormapDivpalcolor6}{HTML}{FFE3AA}
230 \definecolor{colormapDivpalcolor7}{HTML}{F9BD7E}
231 \definecolor{colormapDivpalcolor8}{HTML}{ED875E}
232 \definecolor{colormapDivpalcolor9}{HTML}{D24D3E}
233 \definecolor{colormapDivpalcolor10}{HTML}{AE1C3E}
```

colormapDiv Color map for diverging data.

```
234 \pgfplotscreatecolormap{colormapDiv}{%
235   color(0cm)=(colormapDivpalcolor0);
236   color(1cm)=(colormapDivpalcolor1);
237   color(2cm)=(colormapDivpalcolor2);
```

```

238 color(3cm)=(colormapDivpalcolor3);
239 color(4cm)=(colormapDivpalcolor4);
240 color(5cm)=(colormapDivpalcolor5);
241 color(6cm)=(colormapDivpalcolor6);
242 color(7cm)=(colormapDivpalcolor7);
243 color(8cm)=(colormapDivpalcolor8);
244 color(9cm)=(colormapDivpalcolor9);
245 color(10cm)=(colormapDivpalcolor10);
246 }

```

Style with color map for diverging data.

```

247 \pgfplotsset{
248   /pgfplots/colormap/colormapDiv/.style={
249     /pgfplots/colormap name = colormapDiv
250   }
251 }

```

colormapRainpal Define palette for color map with a continuous rainbow scheme.

```

252 \definecolor{colormapRainpalcolor0}{HTML}{781C81}
253 \definecolor{colormapRainpalcolor1}{HTML}{413B93}
254 \definecolor{colormapRainpalcolor2}{HTML}{4065B1}
255 \definecolor{colormapRainpalcolor3}{HTML}{488BC2}
256 \definecolor{colormapRainpalcolor4}{HTML}{55A1B1}
257 \definecolor{colormapRainpalcolor5}{HTML}{63AD99}
258 \definecolor{colormapRainpalcolor6}{HTML}{7FB972}
259 \definecolor{colormapRainpalcolor7}{HTML}{B5BD4C}
260 \definecolor{colormapRainpalcolor8}{HTML}{D9AD3C}
261 \definecolor{colormapRainpalcolor9}{HTML}{E68E34}
262 \definecolor{colormapRainpalcolor10}{HTML}{E6642C}
263 \definecolor{colormapRainpalcolor11}{HTML}{D92120}

```

colormapRain Color map with rainbow scheme.

```

264 \pgfplotscreatecolormap{colormapRain}{%
265   color(0cm)=(colormapRainpalcolor0);
266   color(1cm)=(colormapRainpalcolor1);
267   color(2cm)=(colormapRainpalcolor2);
268   color(3cm)=(colormapRainpalcolor3);
269   color(4cm)=(colormapRainpalcolor4);

```

```

270 color(5cm)=(colormapRainpalcolor5);
271 color(6cm)=(colormapRainpalcolor6);
272 color(7cm)=(colormapRainpalcolor7);
273 color(8cm)=(colormapRainpalcolor8);
274 color(9cm)=(colormapRainpalcolor9);
275 color(10cm)=(colormapRainpalcolor10);
276 color(11cm)=(colormapRainpalcolor11);
277 }

```

Style for color map with rainbow scheme.

```

278 \pgfplotsset{
279   /pgfplots/colormap/colormapRain/.style={
280     /pgfplots/colormap name = colormapRain
281   }
282 }

```