

bundles and automation

SESSION 3

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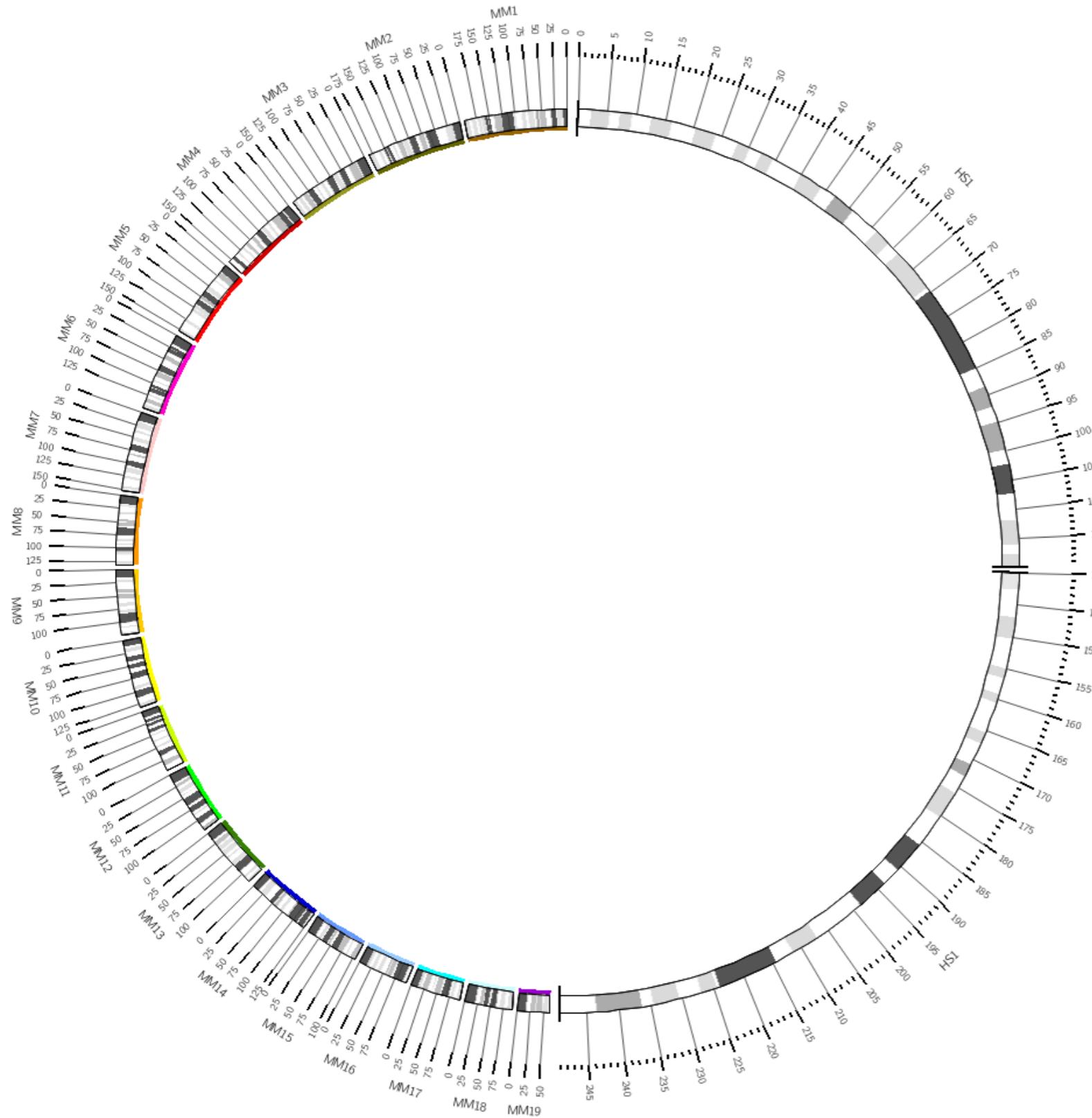
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ideogram layout

LESSON 1

IDEOGRAM LAYOUT



3/1/etc/circos.conf

```
<<include ../../etc/karyotype.and.layout.conf>>
<<include ideogram.conf>>
<<include ticks.conf>>
<<include ../../etc/image.conf>>
<<include etc/colors_fonts_patterns.conf>>
<<include etc/housekeeping.conf>>
```

3/1/../../etc/karyotype.and.layout.conf

```
karyotype =
  ../../data/karyotype/karyotype.human.txt,
  ../../data/karyotype/karyotype.mouse.txt
```

```
chromosomes_units = 1000000
chromosomes_display_default = no
```

```
chromosomes = hs1[hs1a]:0-120;
  hs1[hs1b]:140-);
  /mm\d/
```

```
chromosomes_order = mm19,hs1b,hs1a
```

```
chromosomes_reverse = hs1a,hs1b
```

```
chromosomes_scale = hs1a:0.25r,hs1b:0.25r
```

```
<highlights>
```

```
<highlight>
```

```
file = ../../data/highlight.txt
```

```
r0 = 0.99r
```

```
r1 = 0.999r
```

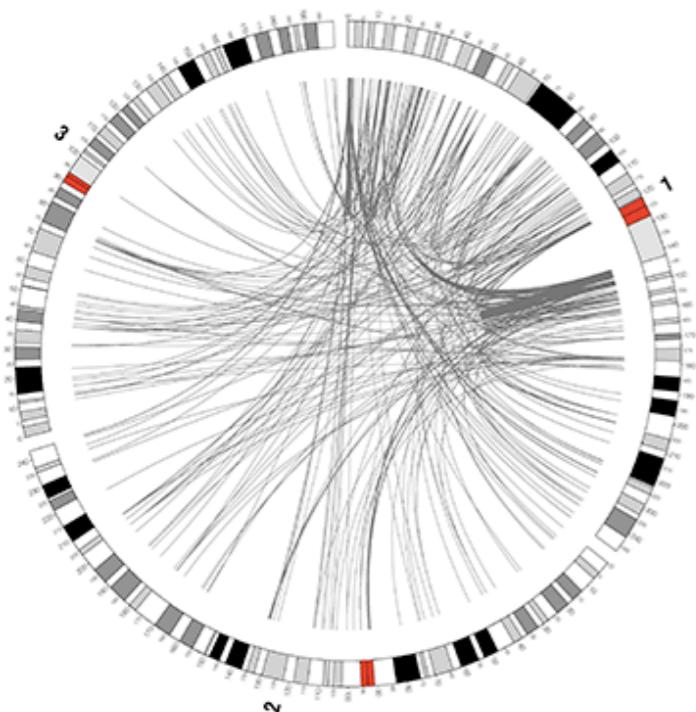
```
</highlight>
```

```
</highlights>
```

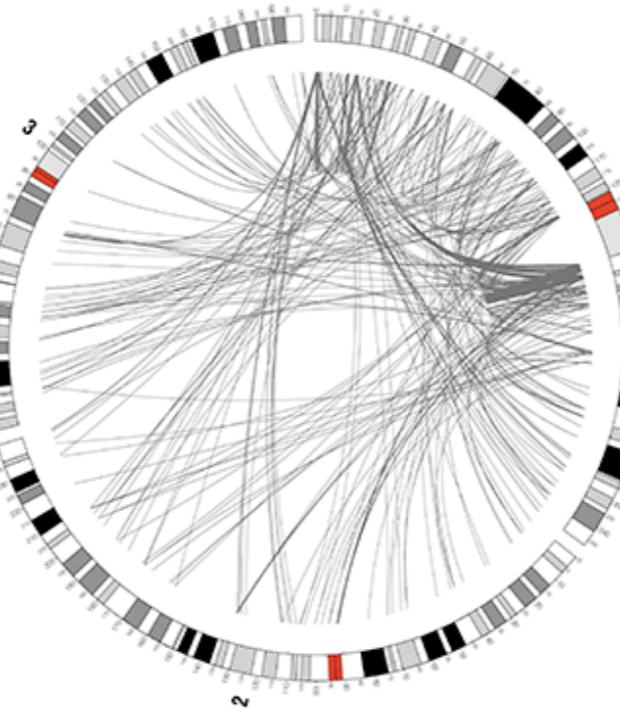
link geometry

LESSON 2

LINK GEOMETRY - BEZIER RADIUS

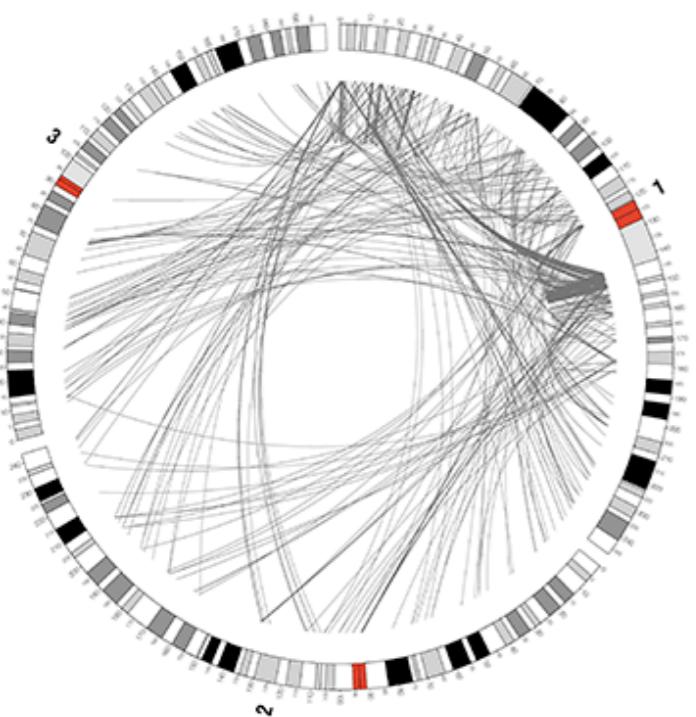


bezier_radius = 0

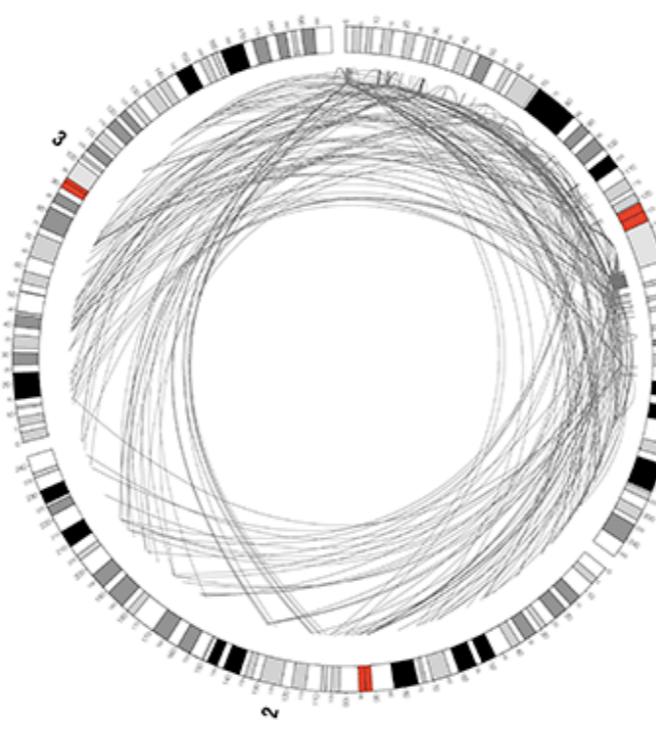


radius = 0.9r

bezier_radius = 0.25r

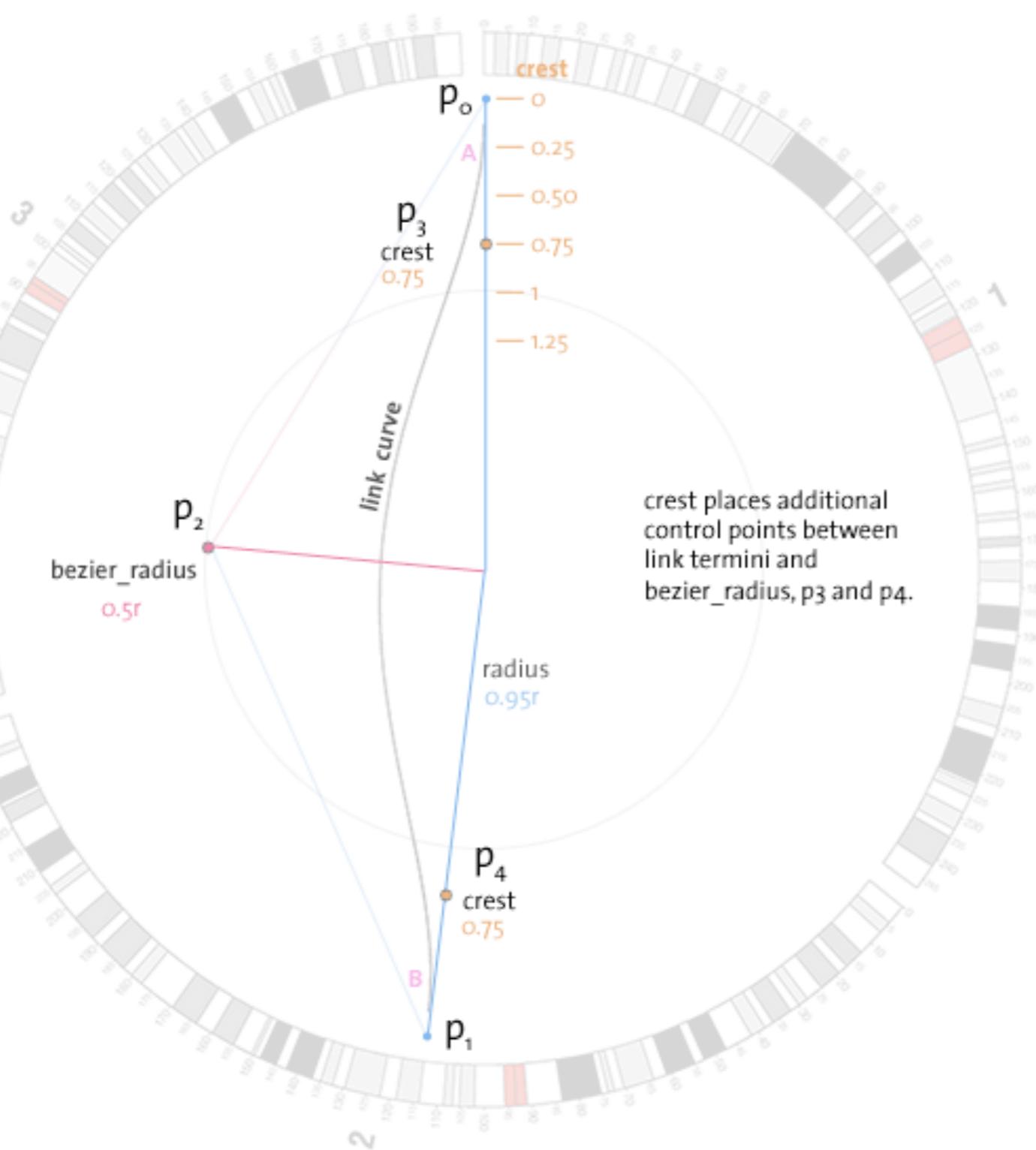


bezier_radius = 0.5r

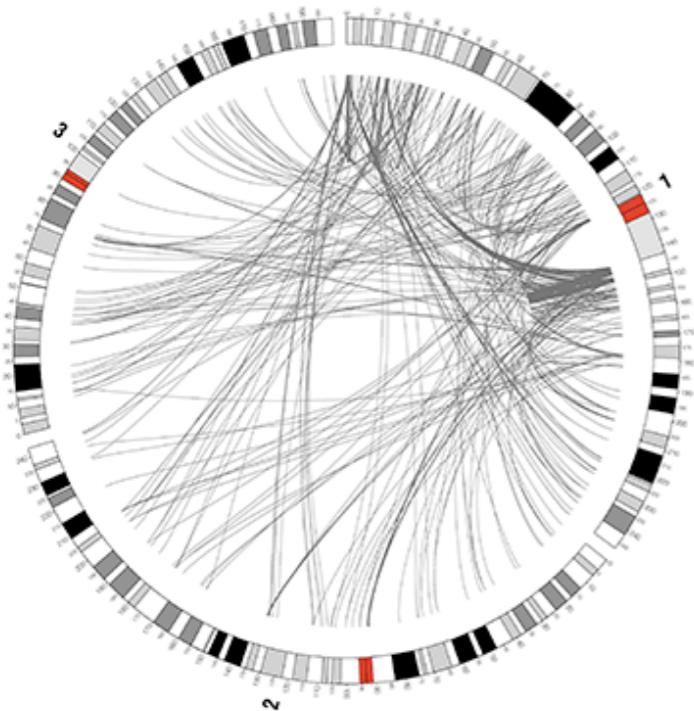


bezier_radius = 1.0r

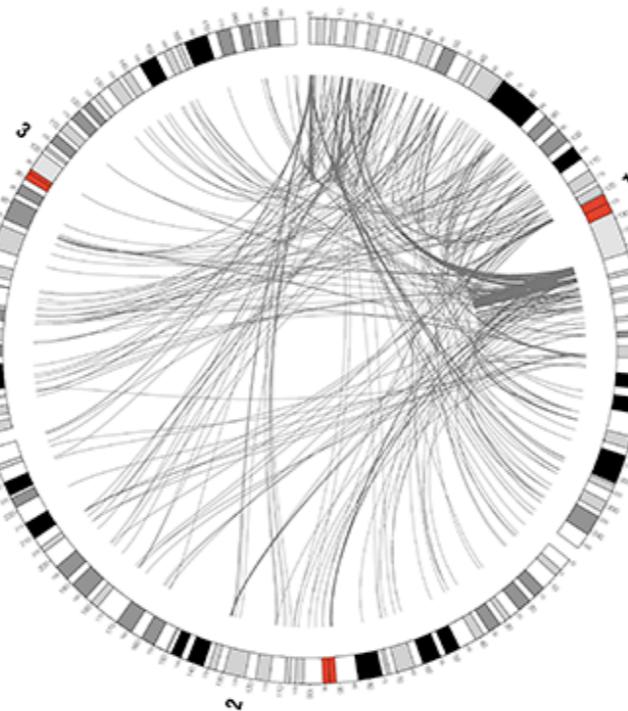
LINK GEOMETRY - CREST



LINK GEOMETRY - CREST

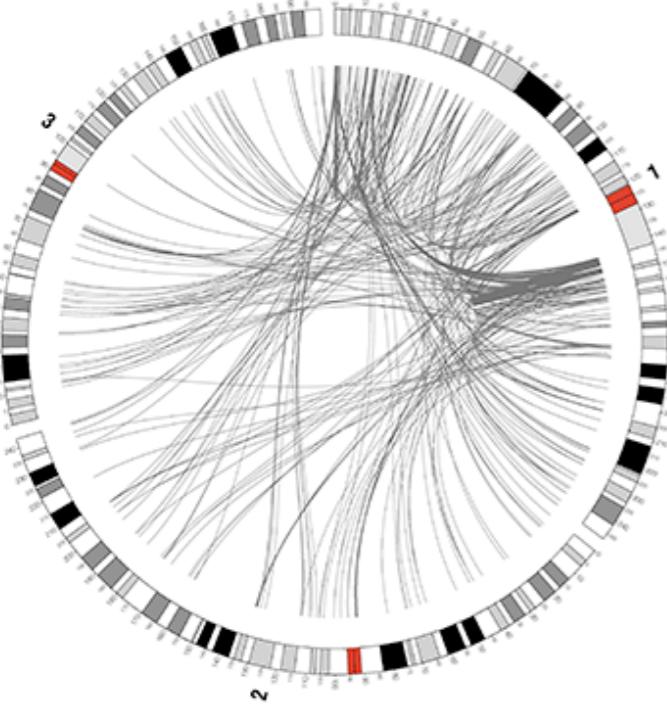


crest = 0.2

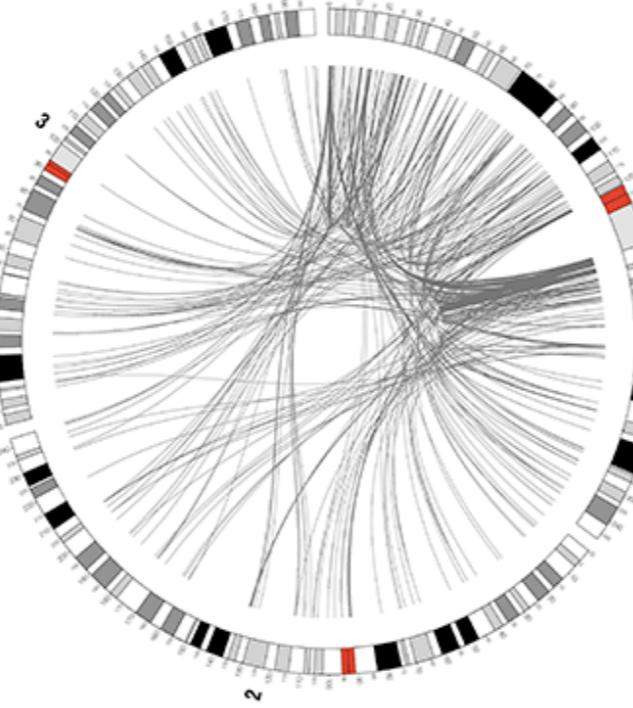


crest = 0.4

radius = 0.9r
bezier_radius = 0.3r

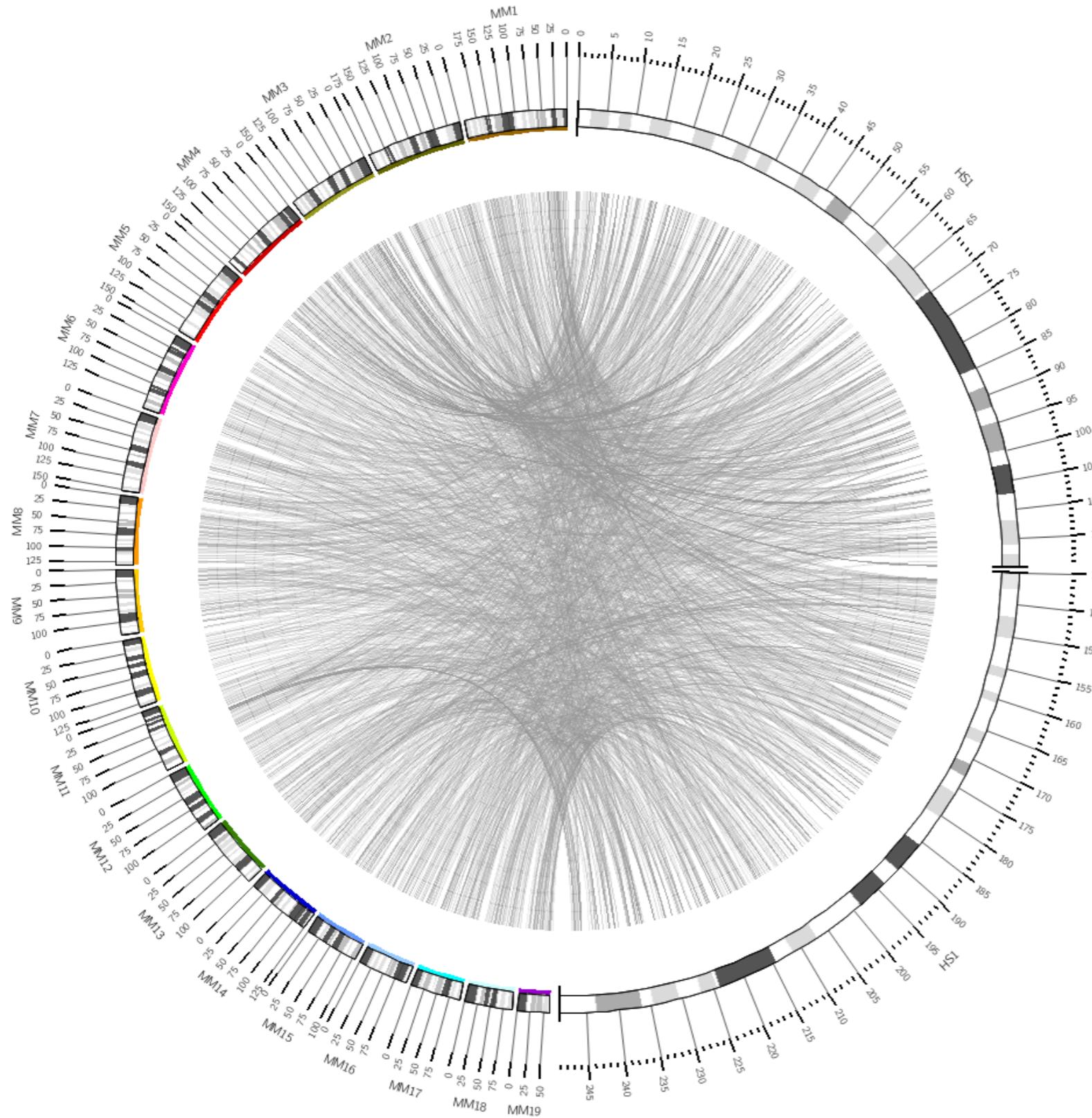


crest = 0.7



crest = 1.0

LINKS



3/2/etc/circos.conf

<links>

<link>

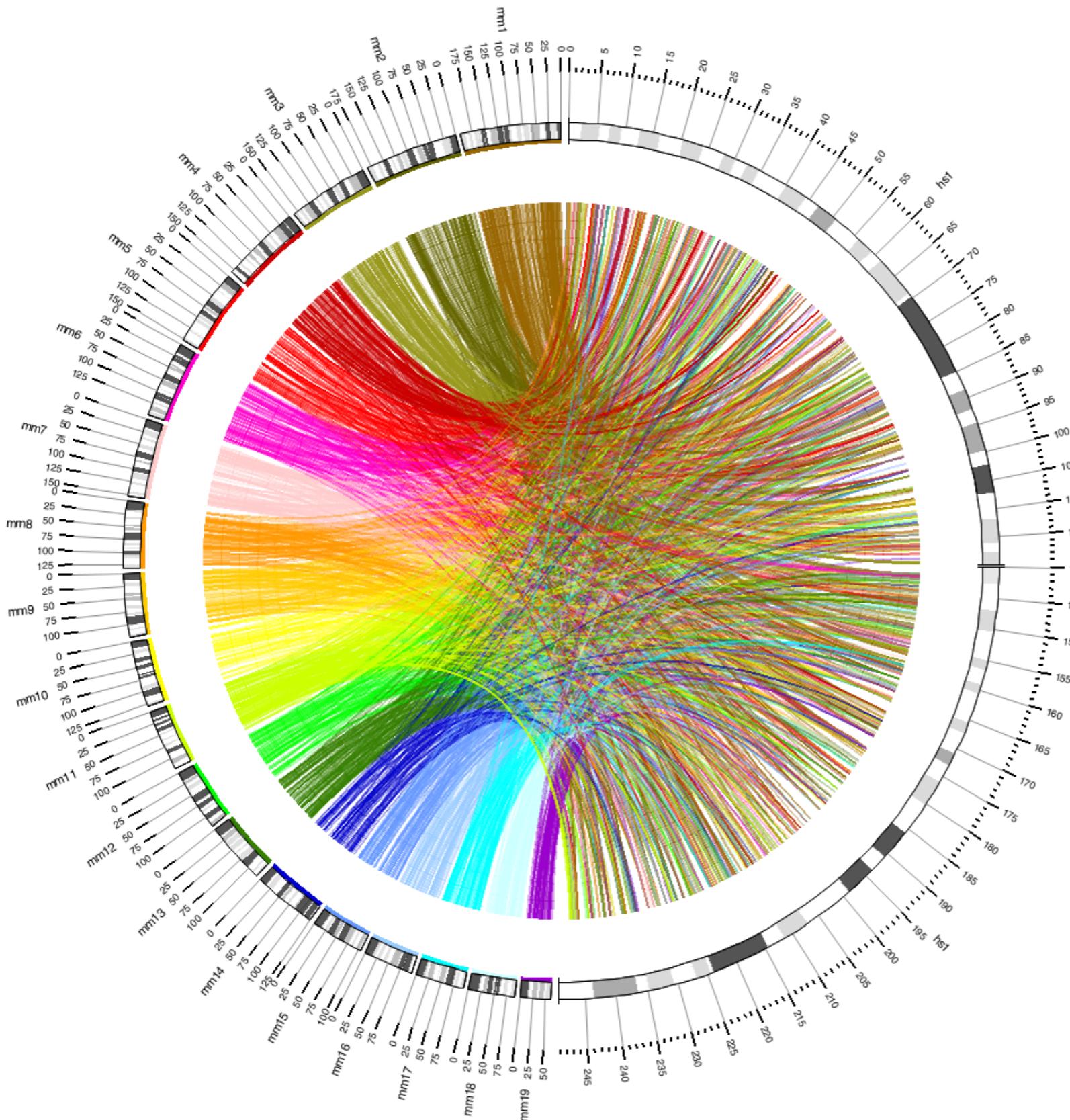
file = ../../data/links.txt
bezier_radius = 0r
radius = 0.85r
thickness = 1p
color = grey_a5
</link>

</links>

color rules

LESSON 3

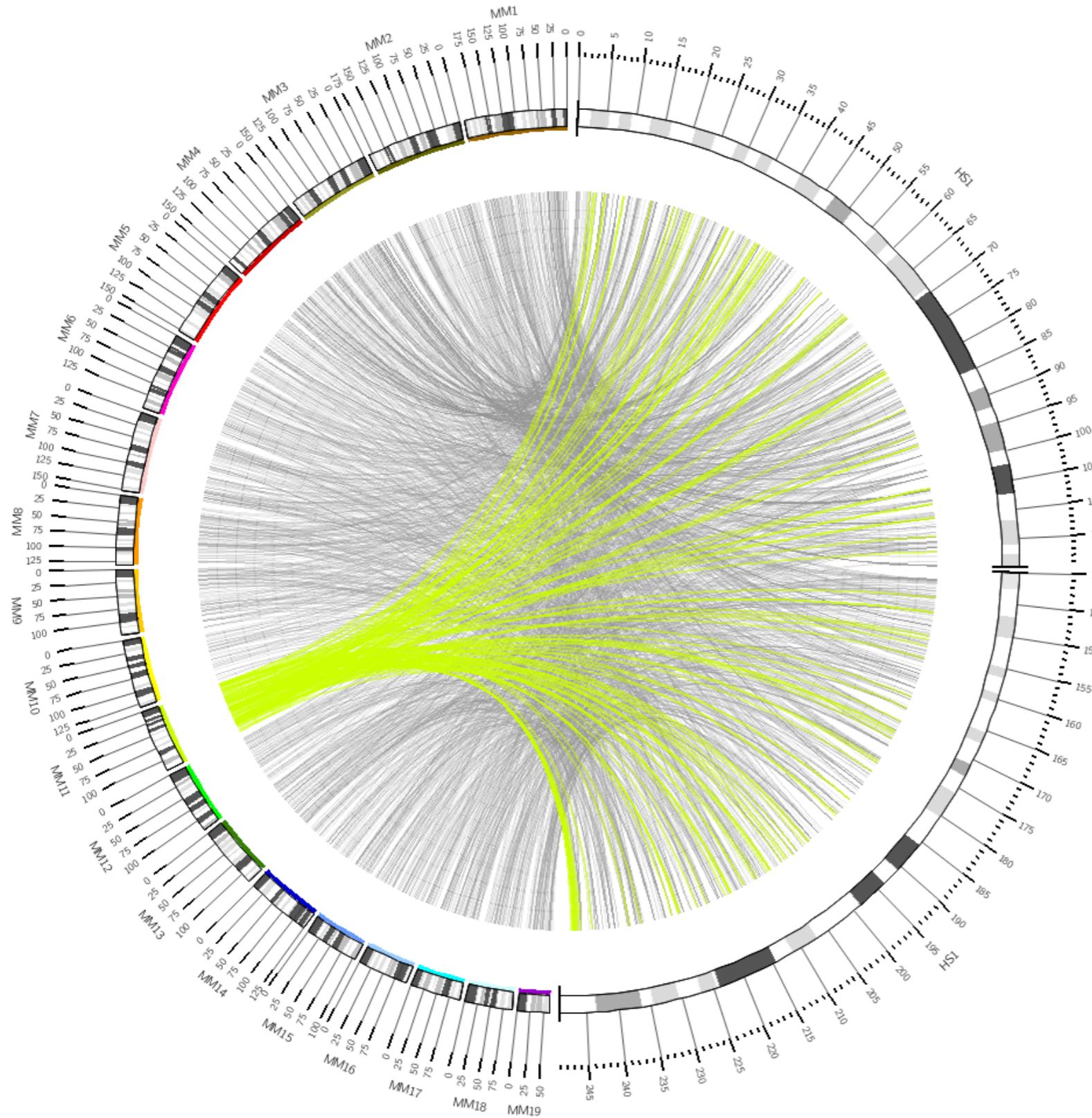
SINGLE RULE THAT ALWAYS TRIGGERS



3/3/etc/circos.conf

```
<rule>
  condition = 1
  color      = eval(
    sprintf("chr%s_a4",substr(var(chr2),2))
  )
  z          = eval(-var(size1))
  thickness  = 2p
  flow       = stop
</rule>
```

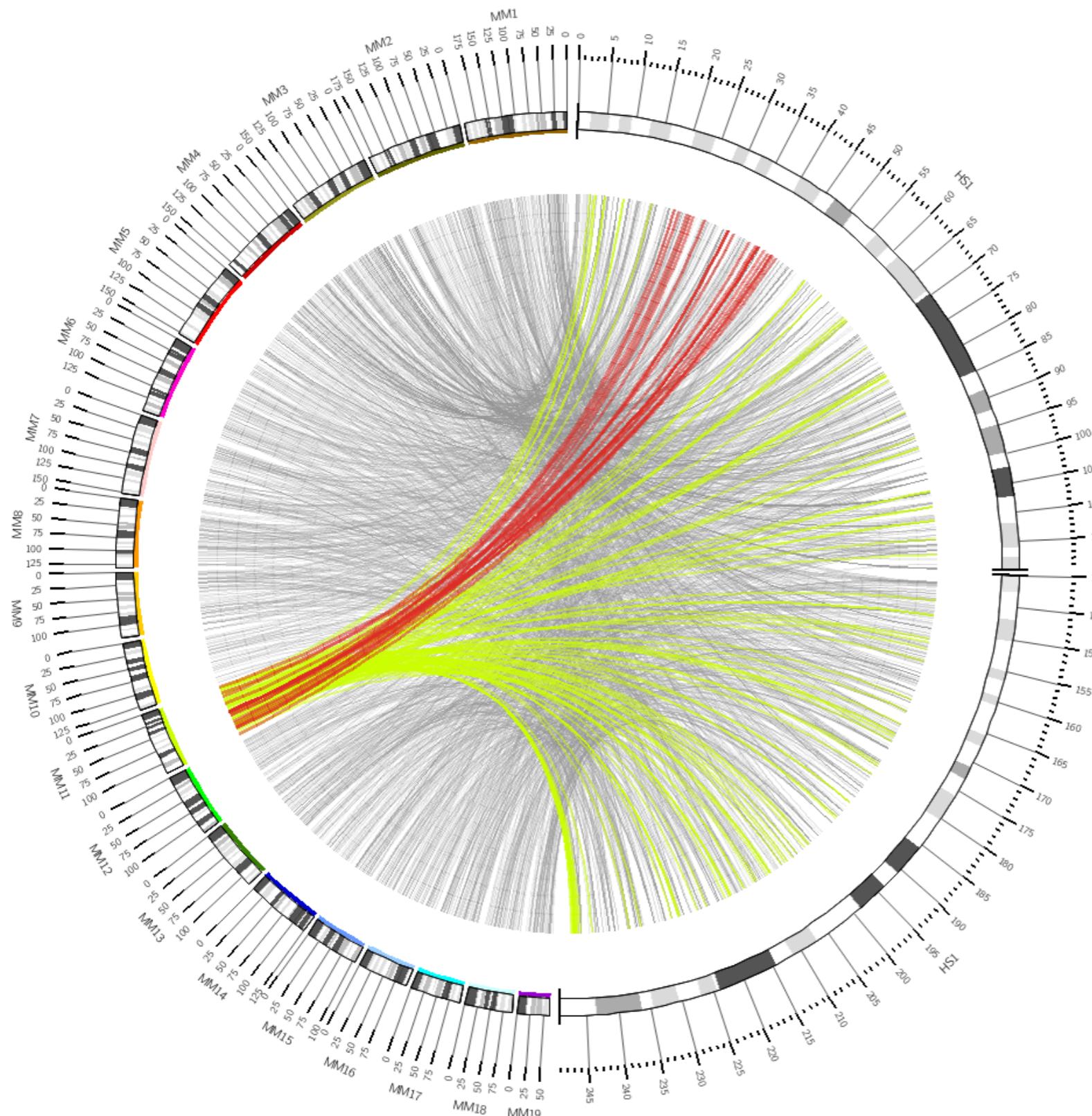
SINGLE RULE WITH CONDITION



3/3/etc/circos.conf

```
<rule>
  condition = on(mm11)
  color      = chr11_a3
  z          = 10
  thickness = 2p
  flow       = stop
</rule>
```

MULTIPLE RULES, WITH FLOW



3/3/etc/circos.conf

<rule>

condition = on(mm11)

color = chr11_a3

z = 10

thickness = 2p

flow = goto between_20_50 if true

flow = stop

</rule>

<rule>

tag = between_20_50

condition = var(start1) > 20e6 && var(end1) < 50e6

color = reds-5-seq-4_a3

z = 20

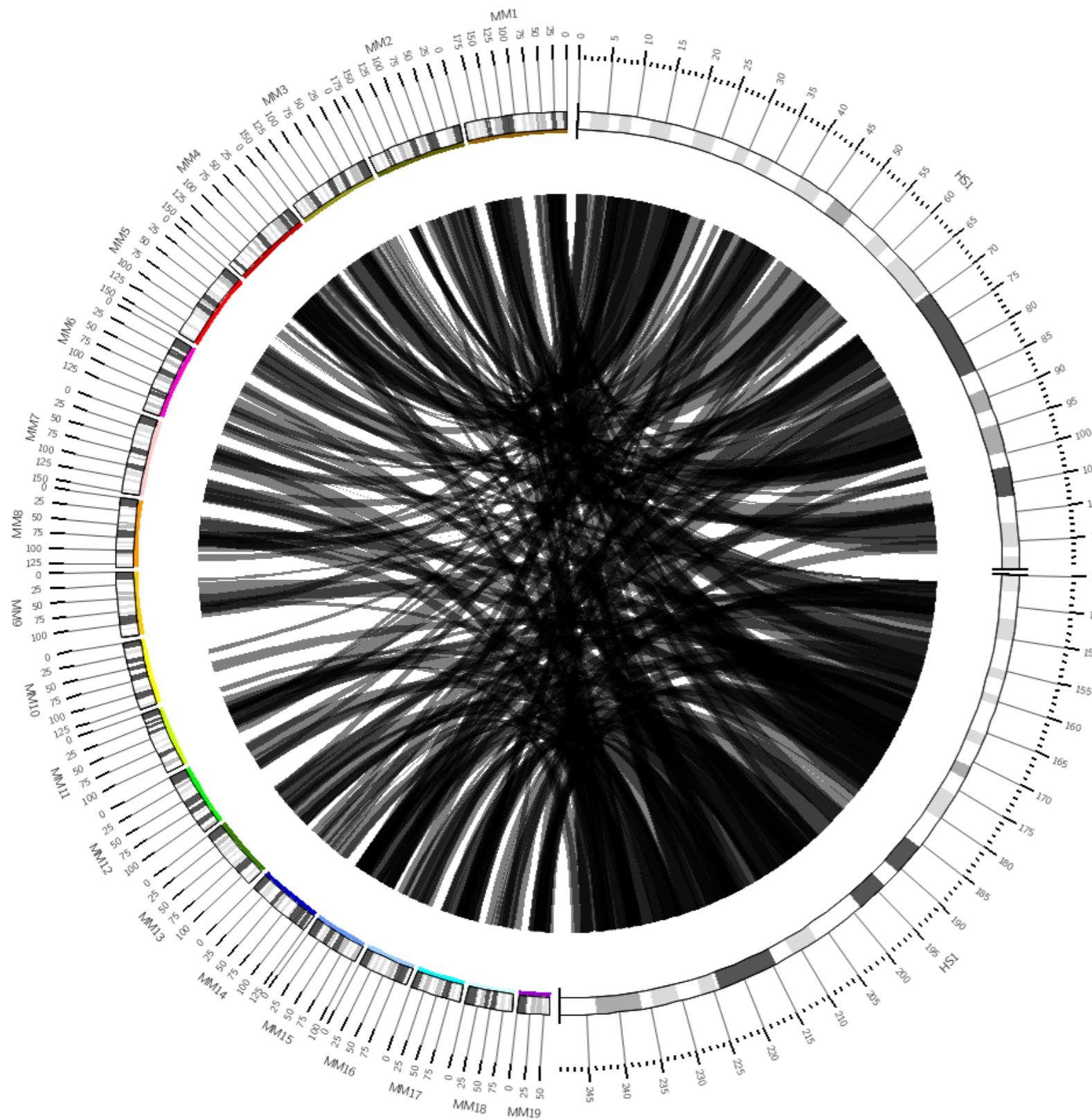
thickness = 3p

</rule>

bundles

LESSON 4

RIBBON LINKS

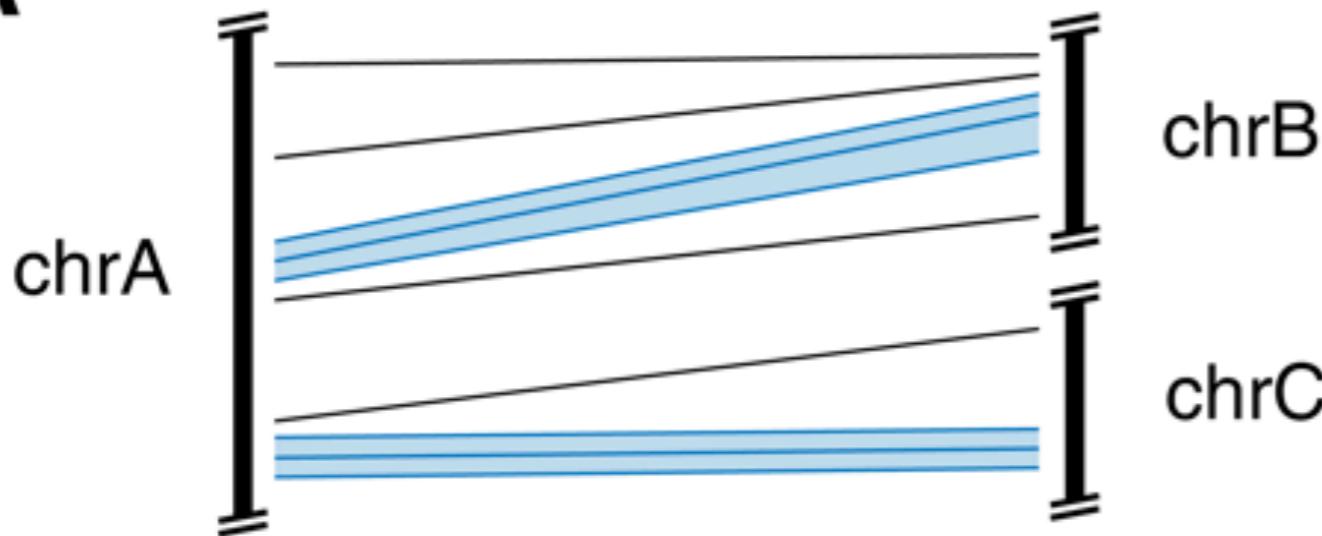


3/4/etc/circos.conf

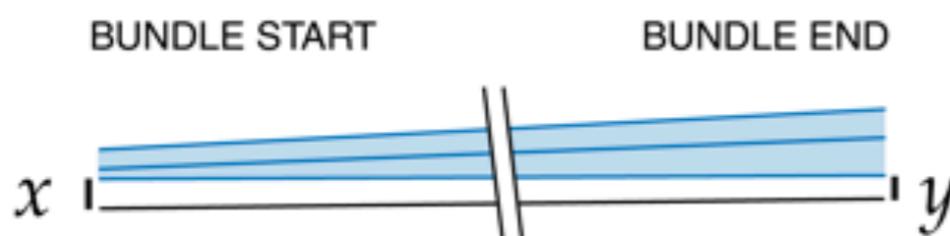
```
<link>
ribbon
file      = ./data/bundles.txt
bezier_radius = 0r
radius    = 0.85r
thickness = 0p
color     = black_a3
</link>
```

BUNDLING - CREATING RIBBONS

A



B



LINK ADDED TO BUNDLE IF

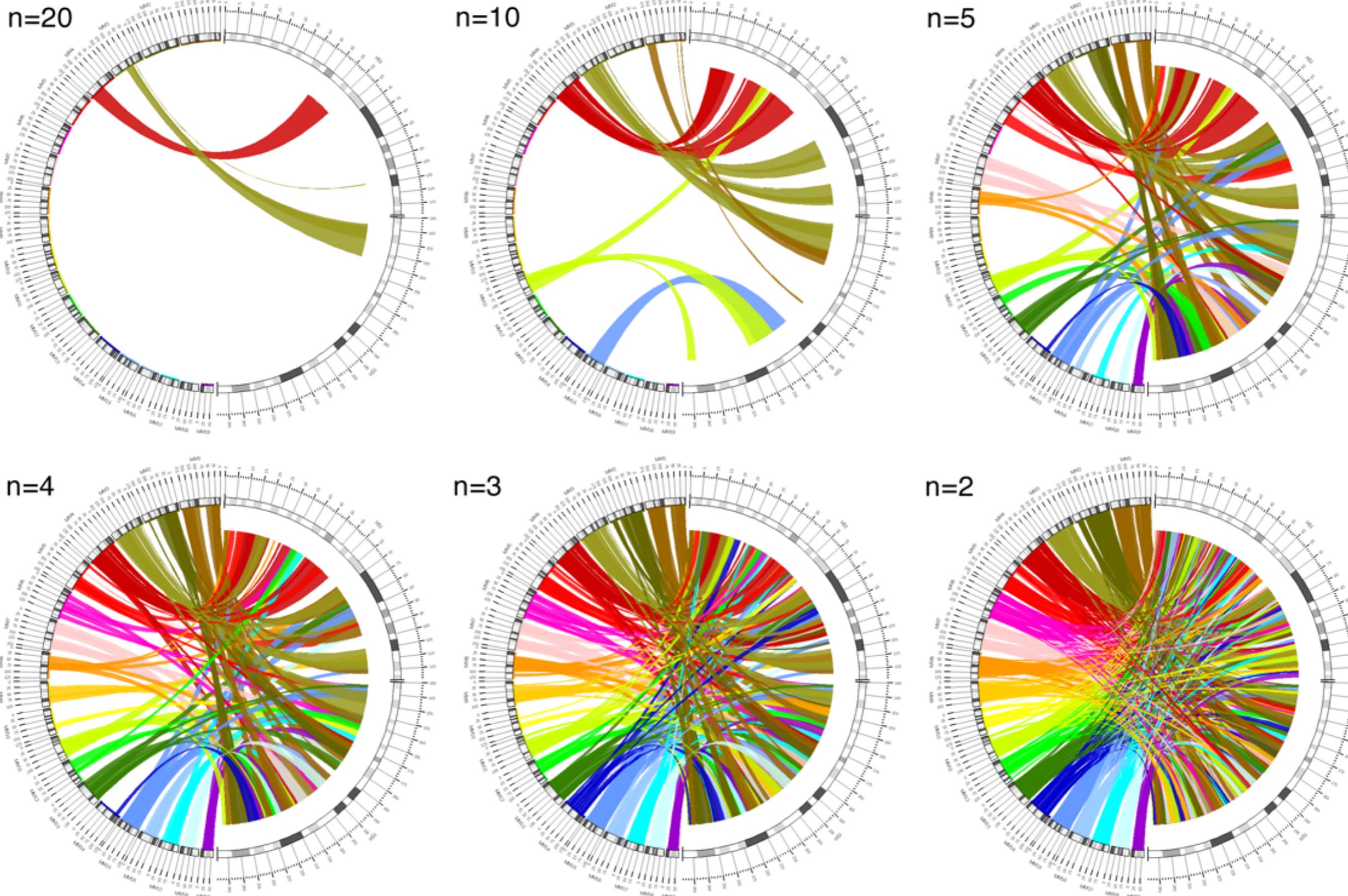
$$x, y \leq \text{max_gap}$$

OR

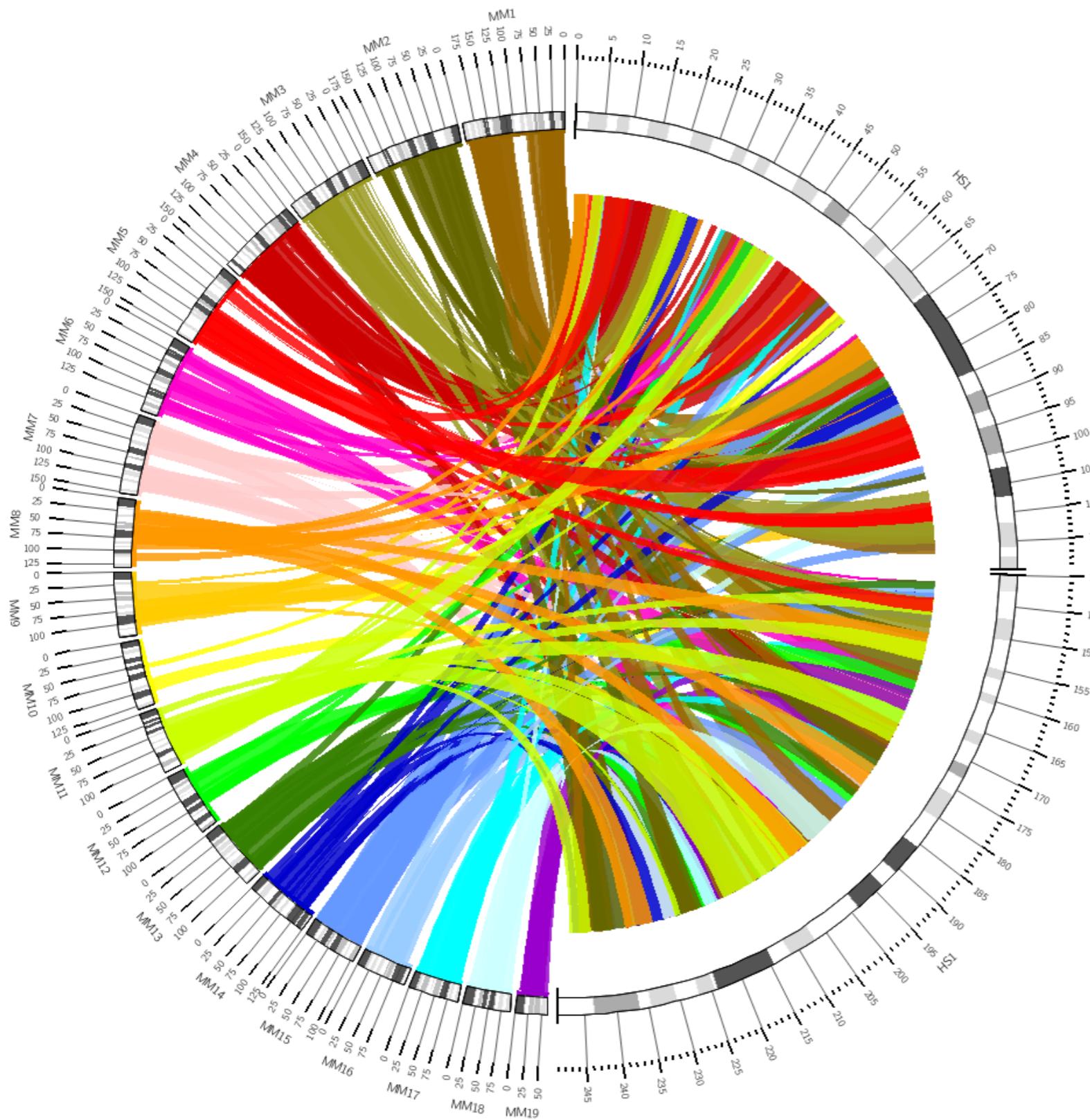
$$x \leq \text{max_gap_start}$$

$$y \leq \text{max_gap_end}$$

LINKS IN A BUNDLE



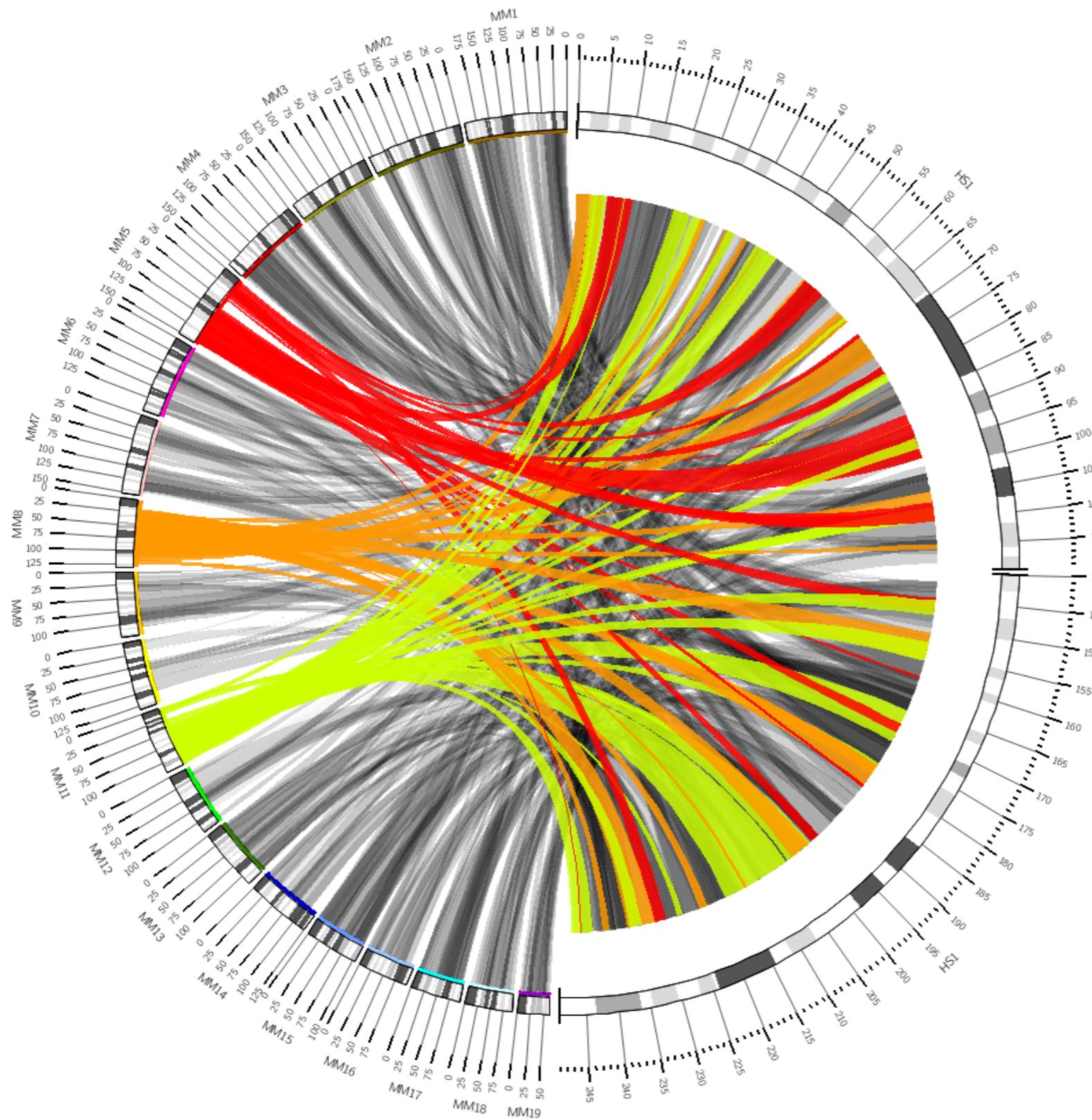
SINGLE RULE



3/4/etc/circos.conf

```
<rule>
  condition = 1
  color      = eval(
    sprintf("chr%s_a1",substr(var(chr2),2))
  )
  radius2   = 0.99r
  z         = eval(-var(size2))
  flow      = stop
</rule>
```

MULTIPLE RULES WITH FLOW



```
# 3/4/etc/circos.conf
```

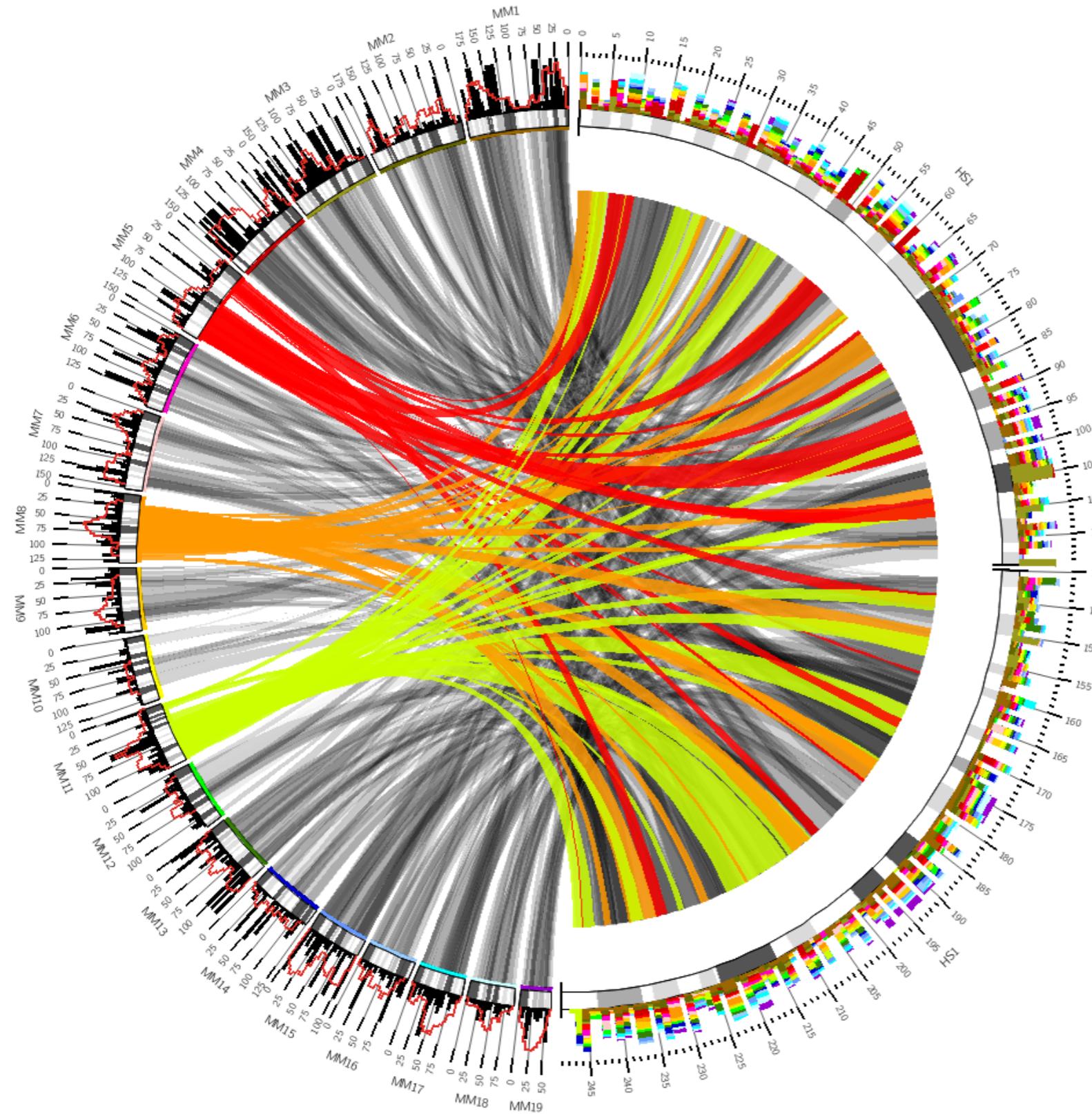
```
<rule>
condition = 1
color      = eval(
    sprintf("greys-9-seq-%d_a5",
    remap_round(var(size1),0,1e6,2,9)
)
radius2   = 0.99r
z         = eval(-var(size2))
flow     = continue
</rule>

<rule>
condition = on(mm(5|8|11))
color      = eval(
    sprintf("chr%s_a1",substr(_CHR2_,2))
)
z         = 10
</rule>
```

stacked histograms

LESSON 5

HISTOGRAMS



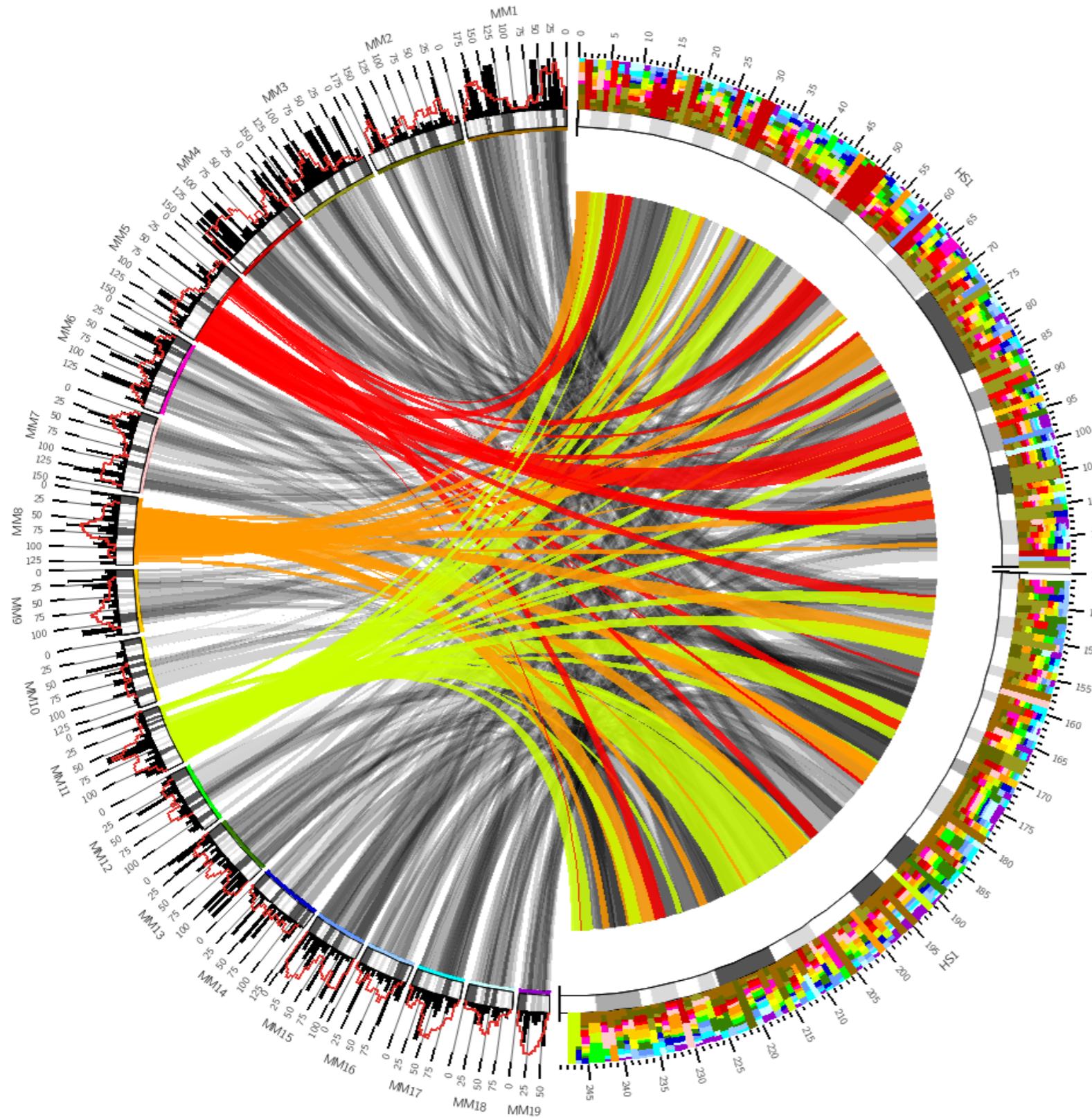
3/5/etc/circos.conf

```
<plot>
type      = histogram
min       = 0
max       = 50e3
r0        = 1r
r1        = 1r+43p
file      = ../data/histogram.mm.txt
fill_color = black
thickness  = 0
</plot>

<plot>
type      = histogram
min       = 0
max       = 35e6
r0        = 1r
r1        = 1r+43p
file      = ../data/histogram.mm.bundles.txt
thickness = 2
color     = reds-5-seq-4
z         = 10
</plot>

<plot>
type      = histogram
min       = 0
max       = 25
r0        = 1r
r1        = 1r+43p
file      = ../data/histogram.hs.stacked.txt
#file    = ../data/
#           histogram.hs.stacked.norm.txt
thickness = 0
fill_color = chrs
#sort_bin_values = yes
</plot>
```

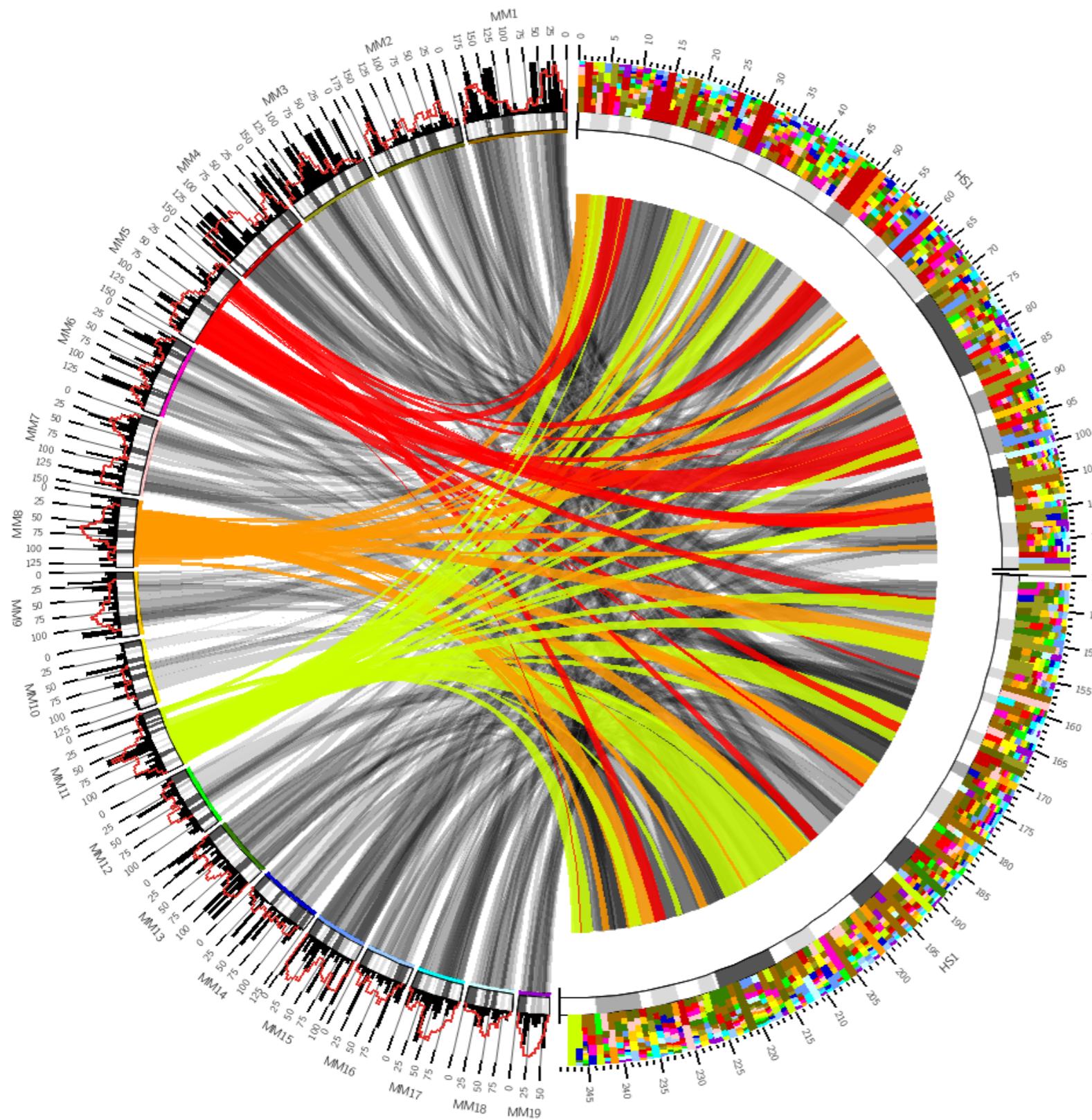
NORMALIZED HISTOGRAM



```
# 3/5/etc/circos.conf
```

```
<plot>
type      = histogram
min       = 0
max       = 1
r0        = 1r
r1        = 1r+43p
file      = ../data/
           histogram.hs.stacked.norm.txt
thickness = 0
fill_color = chrs
#sort_bin_values = yes
</plot>
```

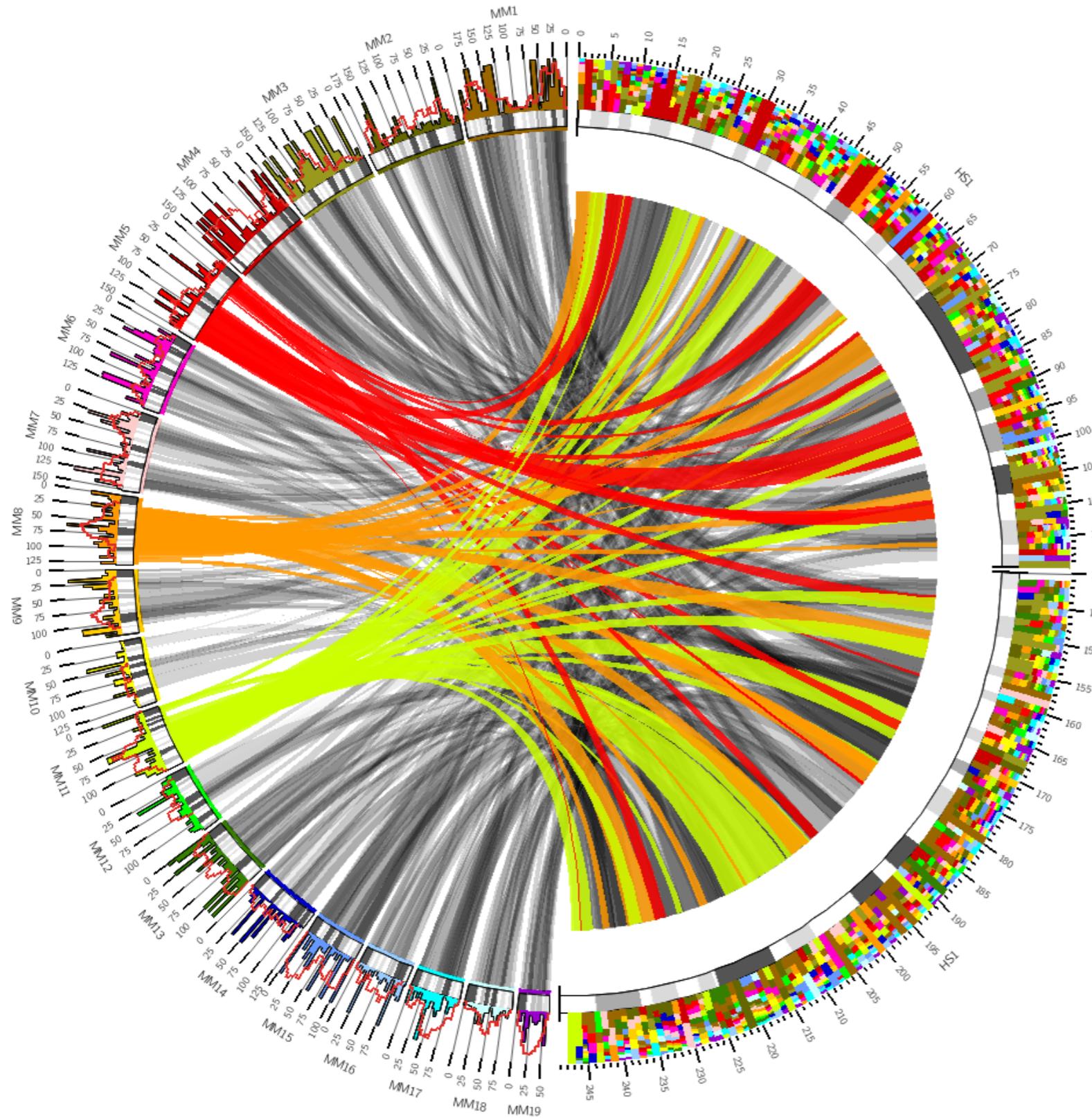
SORTING STACKED HISTOGRAM BINS



3/5/etc/circos.conf

```
<plot>
type      = histogram
min       = 0
max       = 1
r0        = 1r
r1        = 1r+43p
file      = ../data/
           histogram.hs.stacked.norm.txt
thickness = 0
fill_color = chrs
sort_bin_values = yes
</plot>
```

SETTING FILL COLOR WITH RULES



```
# 3/5/etc/circos.conf
```

```
<plot>
type      = histogram
min       = 0
max       = 50e3
r0        = 1r
r1        = 1r+43p
file      = ../../data/histogram.mm.txt
fill_color = black
```

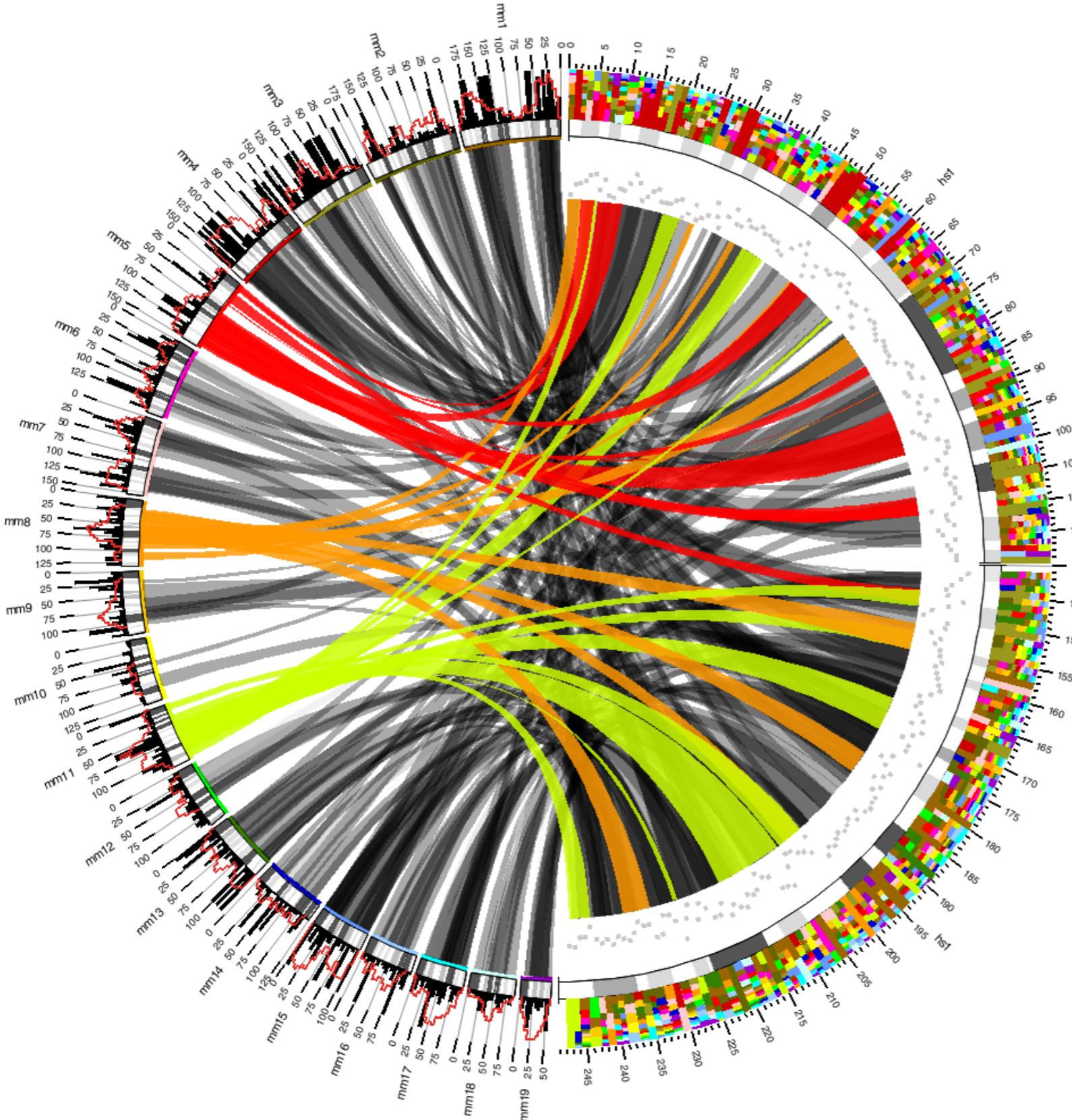
```
<rules>
<rule>
condition = 1
fill_color = eval(
    sprintf("chr%s",substr(var(CHR),2))
)
color      = black
thickness  = 1
</rule>
</rules>

</plot>
```

scatter plot

LESSON 6

SHORT-CIRCUITING RULES



3/6/etc/circos.conf

<plot>

show = yes
type = scatter
file = ../data/scatter.cons.txt
min = 0.39
max = 0.55
r0 = 0.855r
r1 = 0.995r
glyph = square
glyph_size = 3
fill_color = grey

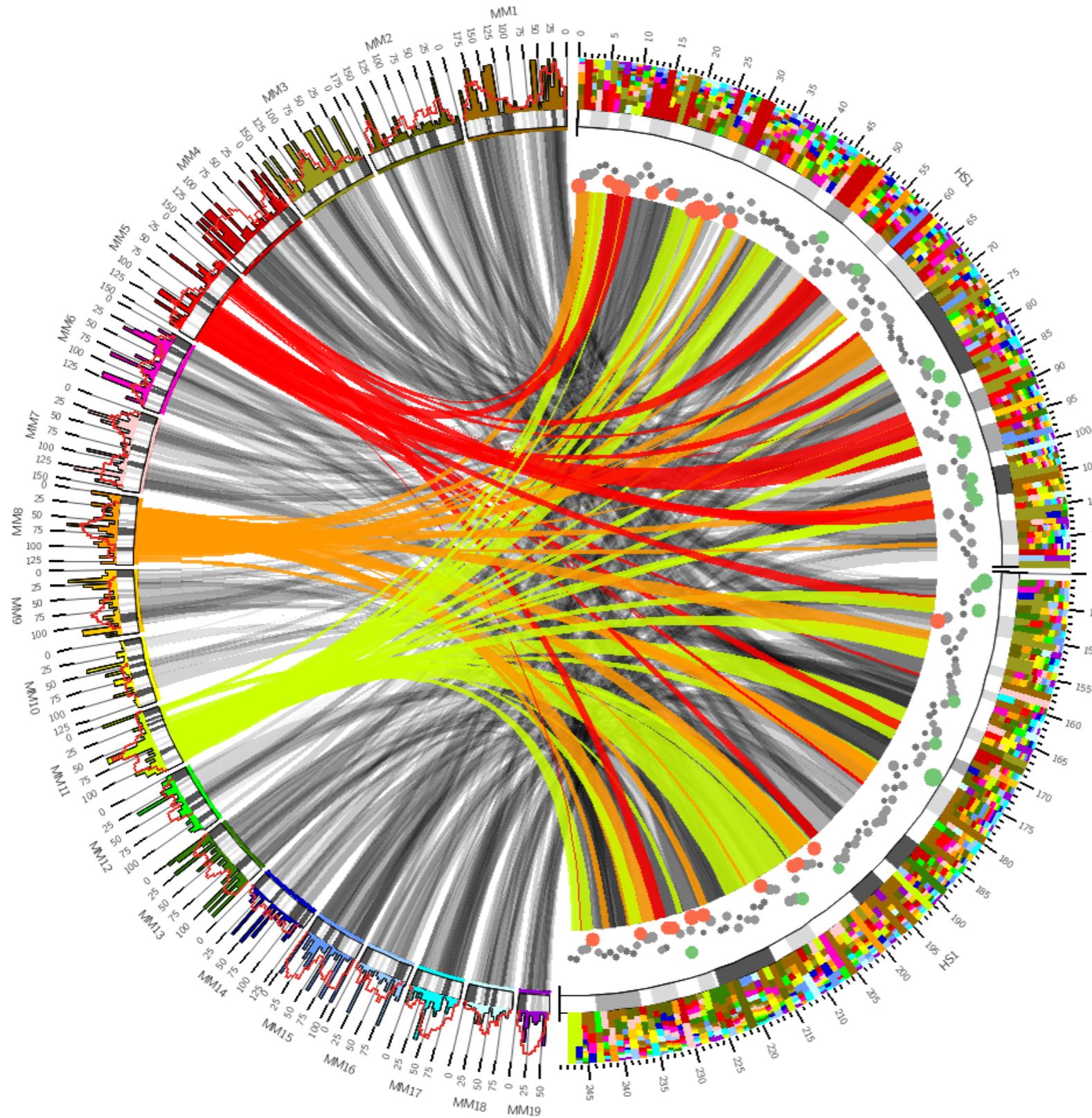
<rules>

<rule>

flow = stop
</rule>

</rules>

COLORING AND RESIZING GLYPHS



```
# 3/6/etc/circos.conf
```

```
<rule>
```

```
# 90% percentile
```

```
condition = var(value) >= 0.489
```

```
fill_color = green
```

```
flow = goto resize if true
```

```
</rule>
```

```
<rule>
```

```
# 10% percentile
```

```
condition = var(value) <= 0.416
```

```
fill_color = red
```

```
flow = goto resize if true
```

```
</rule>
```

```
<rule>
```

```
# within 1 std of mean
```

```
condition = abs(var(value) - 0.455) < 0.01
```

```
fill_color = dgrey
```

```
flow = goto resize if true
```

```
</rule>
```

```
<rule>
```

```
tag = resize
```

```
condition = 1
```

```
glyph_size = eval(
```

```
    remap_round(
```

```
        abs(var(value) - 0.455), 0, 0.1, 5, 20
```

```
    ))
```

```
z = eval(
```

```
    remap_round(
```

```
        abs(var(value) - 0.455), 0, 0.1, 1, 100
```

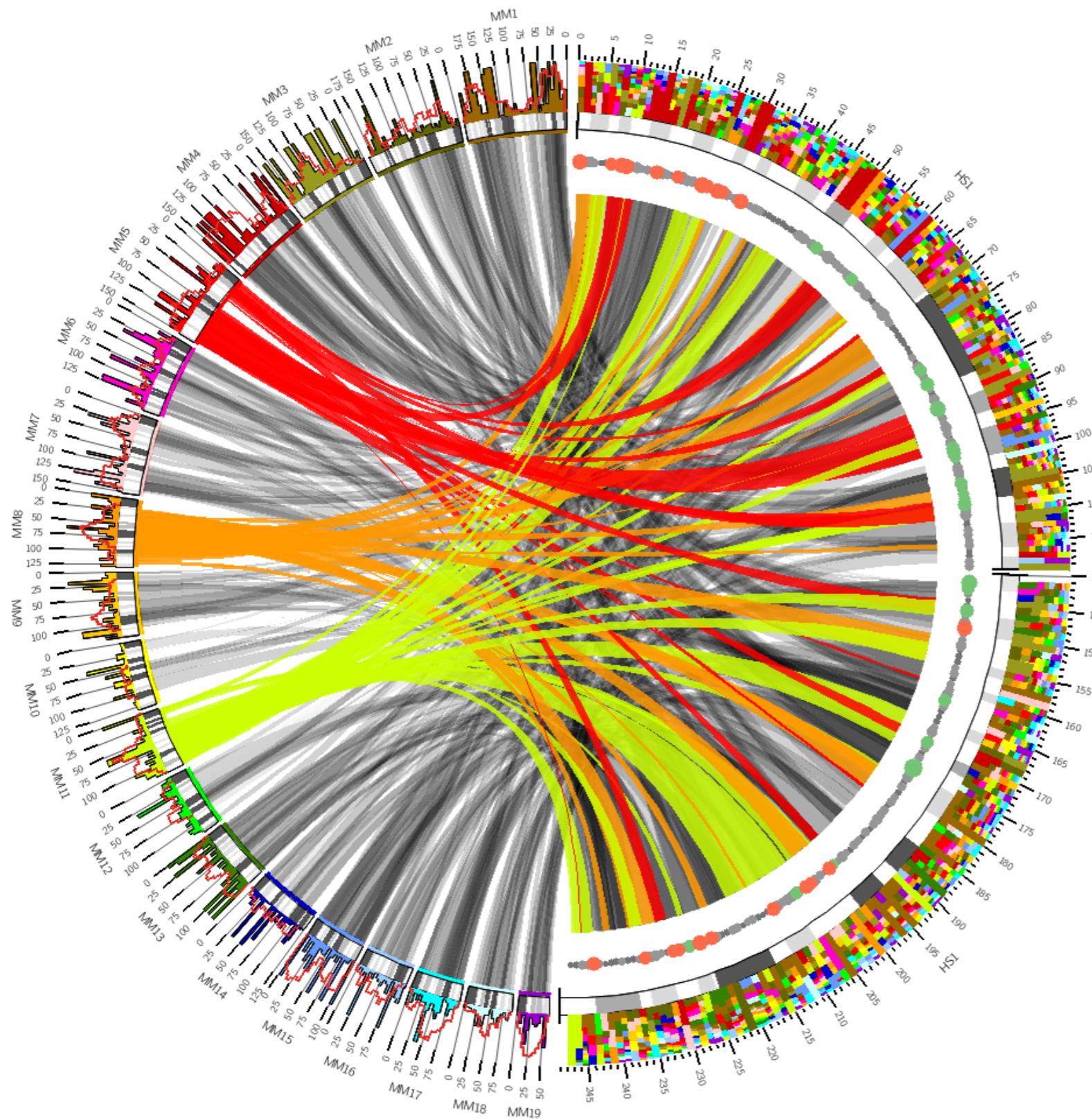
```
    ))
```

```
glyph = circle
```

```
#flow = continue
```

```
</rule>
```

CHANGING DATA VALUES WITH RULES



3/6/etc/circos.conf

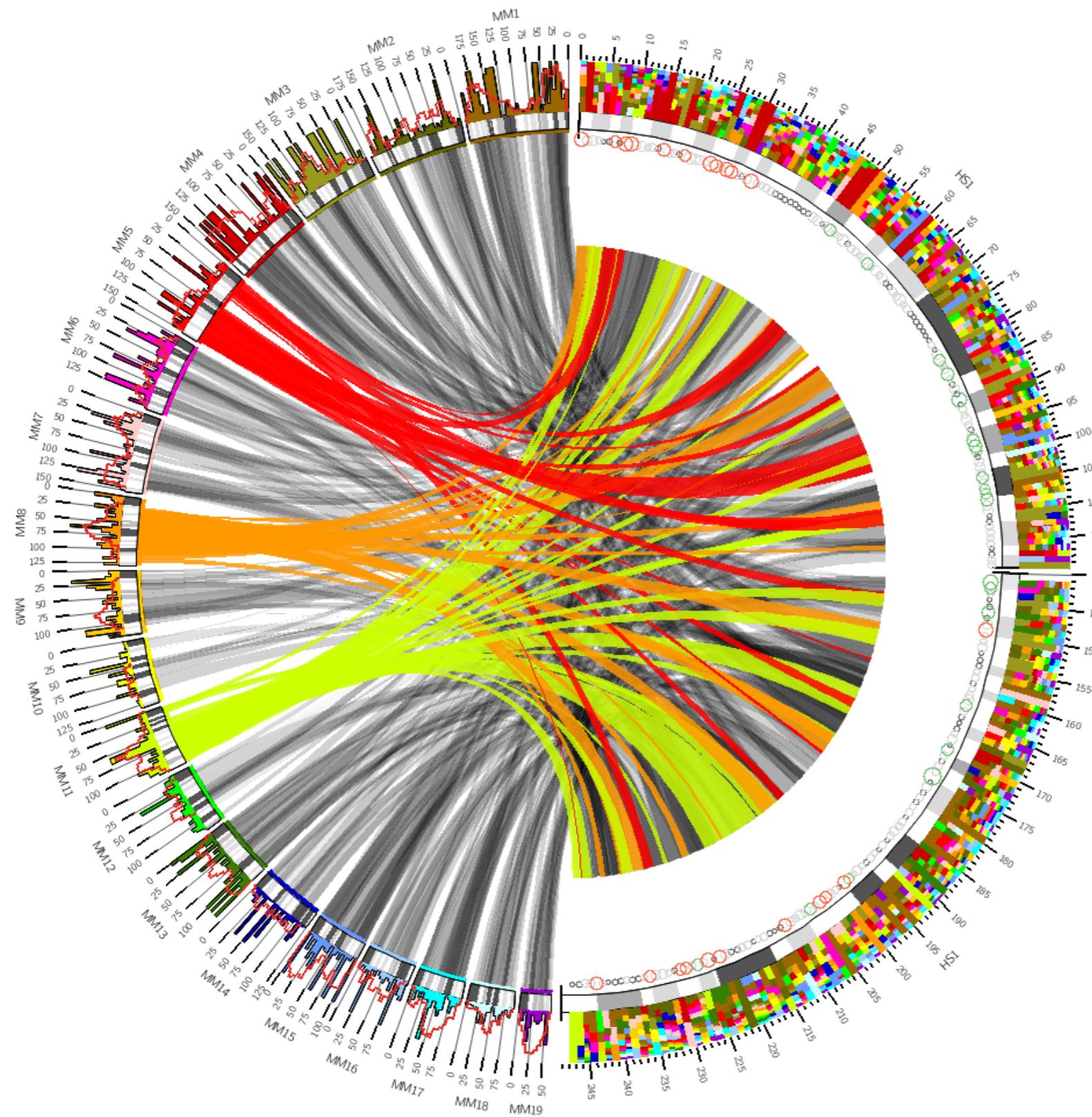
```
<rule>
condition = 1
...
flow      = continue
</rule>
```

```
<rule>
condition = 1
value     = 0.47
</rule>
```

plot counters

LESSON 7

PREPARING FOR AUTOMATION



COUNTERS

```
# 3/7/etc/circos.conf
```

```
ho = 0.75  
hs = 0.07  
hw = 0.06
```

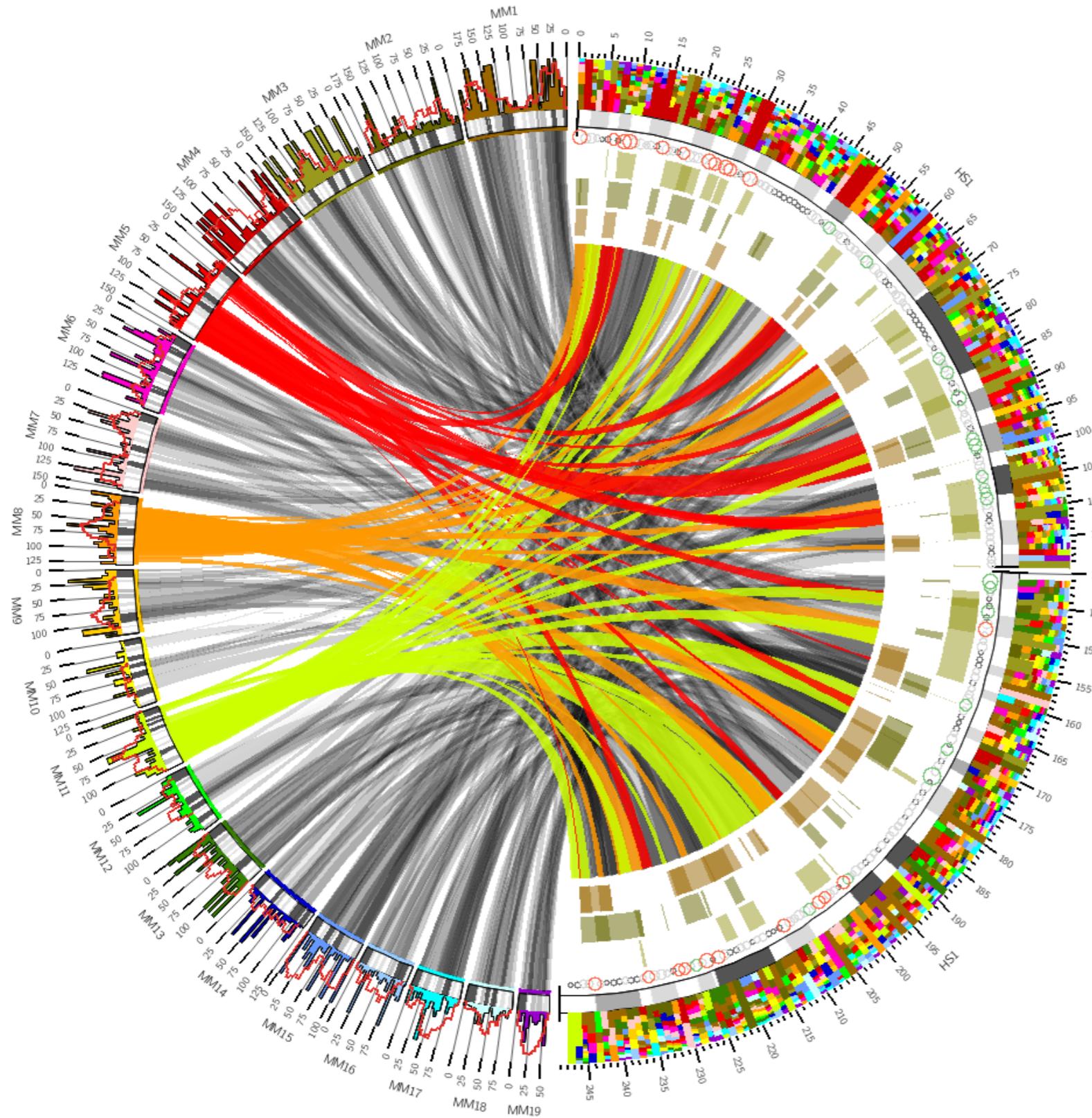
```
<plots>
```

```
<plot>  
init_counter = h:1  
type = heatmap  
file = ../data/heatmap.counter(h).txt  
r0 = eval(sprintf("%fr", conf(ho) + (counter(h)-1) * conf(hs) ))  
r1 = eval(sprintf("%fr", conf(ho) + (counter(h)-1) * conf(hs) + conf(hw) ))  
color = eval(sprintf("chr%s_a3",counter(h)))  
</plot>
```

```
<plot>
```

```
pre_increment_counter = h:1  
type = heatmap  
file = ../data/heatmap.counter(h).txt  
r0 = eval(sprintf("%fr", conf(ho) + (counter(h)-1) * conf(hs) ))  
r1 = eval(sprintf("%fr", conf(ho) + (counter(h)-1) * conf(hs) + conf(hw) ))  
color = eval(sprintf("chr%s_a3",counter(h)))  
</plot>
```

THREE AUTOMATED HEATMAPS



fully automated heatmaps

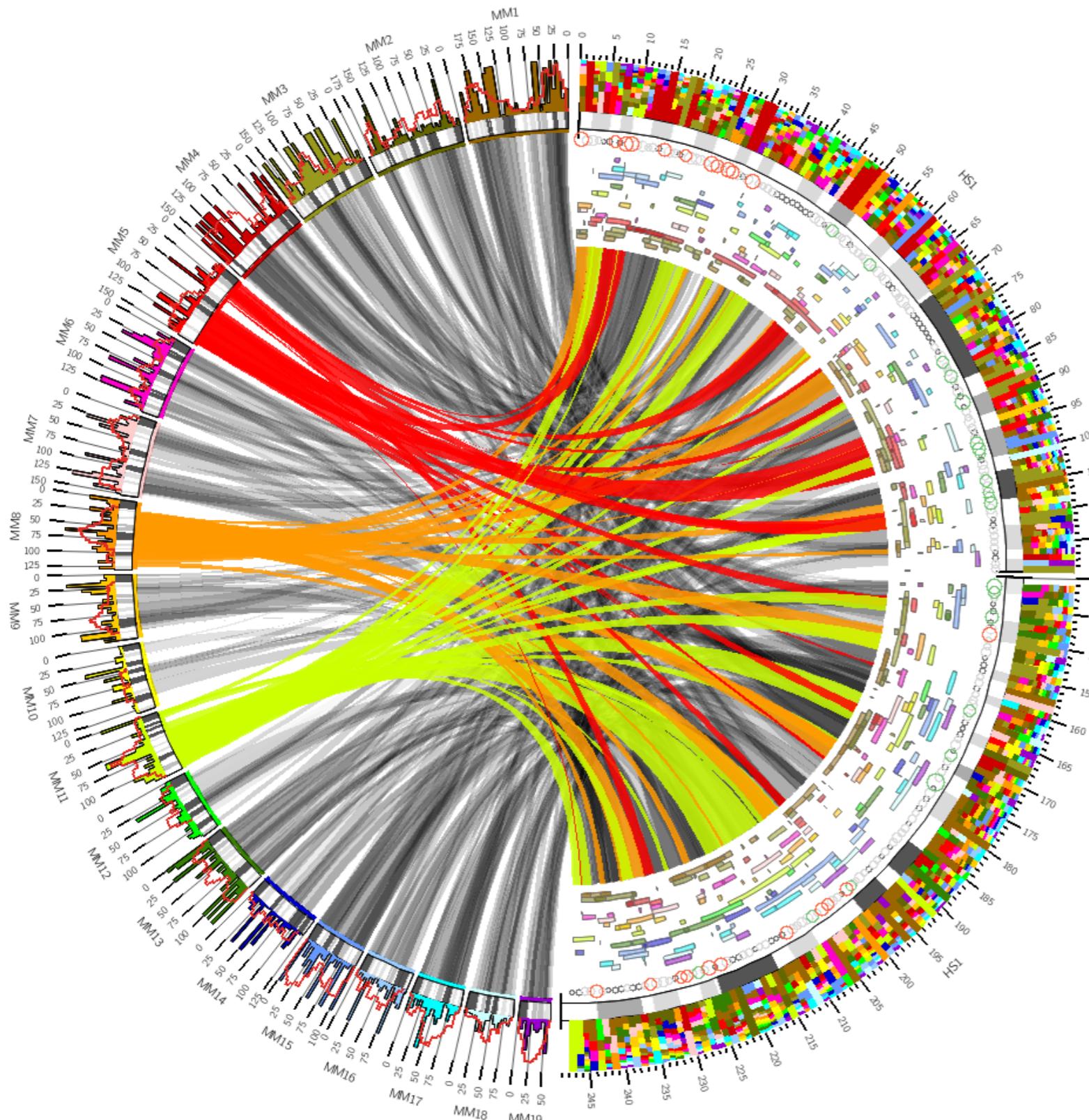
LESSON 8

TEMPLATE BLOCK

```
# 3/8/etc/heatmap.conf
```

```
<plot>
pre_increment_counter = h:1
type    = heatmap
file    = ../../data/heatmap.counter(h).txt
r0      = eval(sprintf("%fr", conf(ho) + (counter(h)-1) * conf(hs) ))
r1      = eval(sprintf("%fr", conf(ho) + (counter(h)-1) * conf(hs) + conf(hw) ))
color   = eval(sprintf("chr%s_a3",counter(h)))
stroke_thickness = 1
stroke_color     = dgrey
</plot>
```

19 AUTOMATED HEATMAPS



```
# 3/8/etc/circos.conf
```

```
# repeated include of template configuration  
#  
# values based on counters  
# are dynamically populated
```

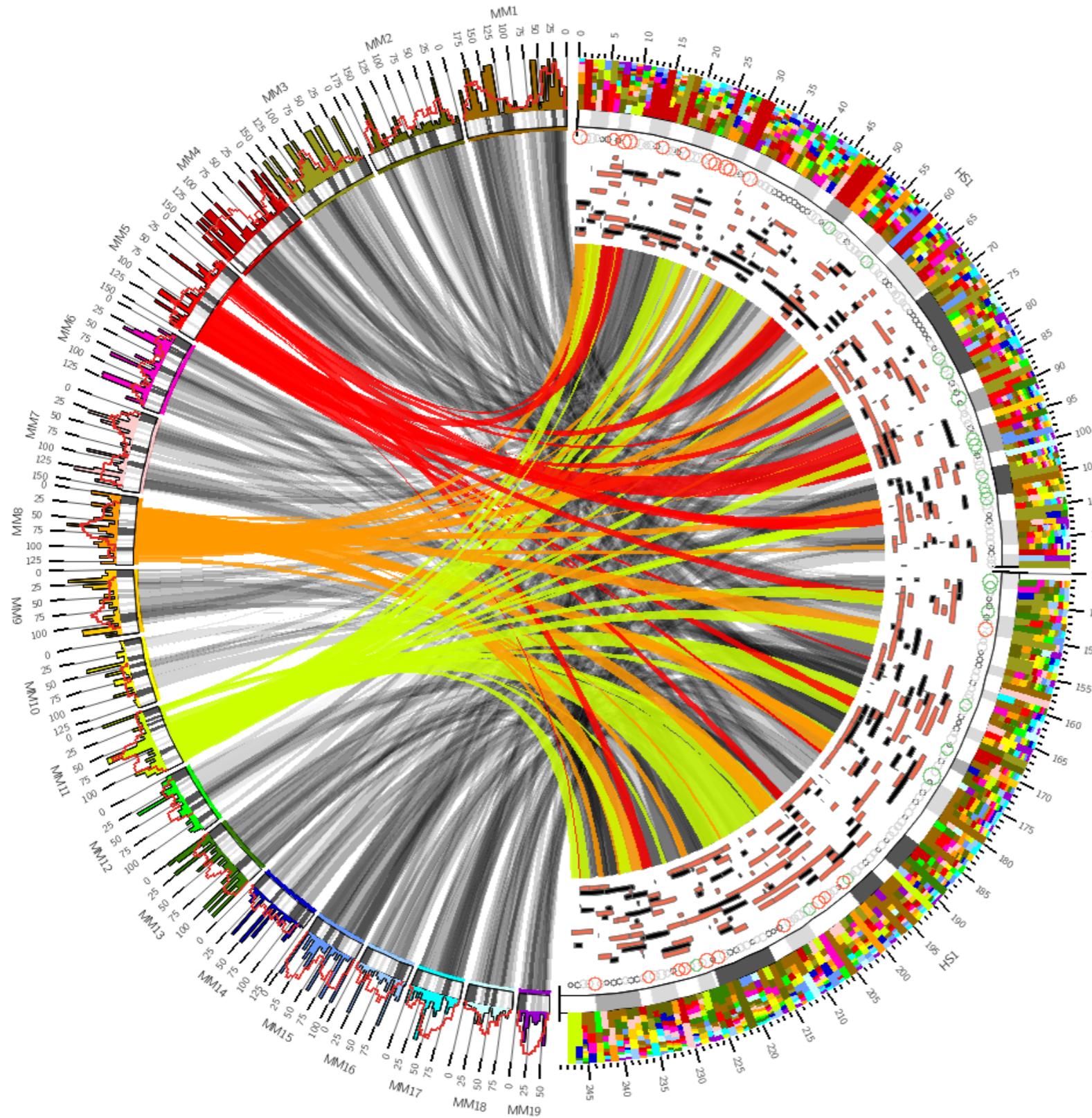
```
<<include ../../etc/heatmap.conf>> # mm1  
<<include ../../etc/heatmap.conf>>  
<<include ../../etc/heatmap.conf>>  
<<include ../../etc/heatmap.conf>>  
<<include ../../etc/heatmap.conf>>
```

```
<<include ../../etc/heatmap.conf>>  
<<include ../../etc/heatmap.conf>>  
<<include ../../etc/heatmap.conf>>  
<<include ../../etc/heatmap.conf>>  
<<include ../../etc/heatmap.conf>>
```

```
<<include ../../etc/heatmap.conf>>  
<<include ../../etc/heatmap.conf>>  
<<include ../../etc/heatmap.conf>>  
<<include ../../etc/heatmap.conf>>  
<<include ../../etc/heatmap.conf>>
```

```
<<include ../../etc/heatmap.conf>>  
<<include ../../etc/heatmap.conf>>  
<<include ../../etc/heatmap.conf>>  
<<include ../../etc/heatmap.conf>> # mm19
```

USING COUNTER VALUES IN RULES



```
# 3/8/etc/heatmap.conf
```

```
color = eval(("black","red")[counter(h)%2])
```

TITLE

