fission examples

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Example hpgltool usage with a real data set (fission)

This document aims to provide further examples in how to use the hpgltools.

Note to self, the header has rmarkdown::pdf_document instead of html_document or html_vignette because it gets some bullcrap error 'margins too large'...

Setting up

Here are the commands I invoke to get ready to play with new data, including everything required to install hpgltools, the software it uses, and the fission data.

```
## These first 4 lines are not needed once hpgltools is installed.
source("http://bioconductor.org/biocLite.R")
biocLite("devtools")
library(devtools)
install_github("elsayed-lab/hpgltools")
library(hpgltools)
autoloads_all()
opts_knit$set(progress=TRUE, verbose=TRUE, error=TRUE,  fig.width=7, fig.height=7)
```

Import fission

```
library(hpgltools)
autoloads_all()
require.auto("fission")
data(fission)
opts_knit$set(progress=TRUE, verbose=TRUE, error=TRUE,  fig.width=7, fig.height=7)
```

Data import

All the work I do in Dr. El-Sayed's lab makes some pretty hard assumptions about how data is stored. As a result, to use the fission data set I will do a little bit of shenanigans to match it to the expected format. Now that I have played a little with fission, I think its format is quite nice and am likely to have my experiment class instead be a SummarizedExperiment.

```
## Extract the meta data from the fission dataset
meta = as.data.frame(fission@colData)
## Make conditions and batches
meta$condition = paste(meta$strain, meta$minute, sep=".")
meta$batch = meta$replicate
meta$sample.id = rownames(meta)
```

```
## Write it out in the format expected by my toys
write.csv(meta, file="fission.csv")
## Grab the count data
fission_data = fission@assays$data$counts
## This will make an experiment superclass called 'expt' and it contains
## an ExpressionSet along with any arbitrary additional information one might want to include.
## Along the way it writes a Rdata file which is by default called 'expt.Rdata'
fission_expt = create_expt("fission.csv", count_dataframe=fission_data)
```

```
## [1] "This function needs the conditions and batches to be an explicit column in the sample sheet."
## [1] "Please note that thus function assumes a specific set of columns in the sample sheet:"
## [1] "The most important ones are: Sample.ID, Stage, Type."
## [1] "Other columns it will attempt to create by itself, but if"
## [1] "batch and condition are provided, that is a nice help."
```

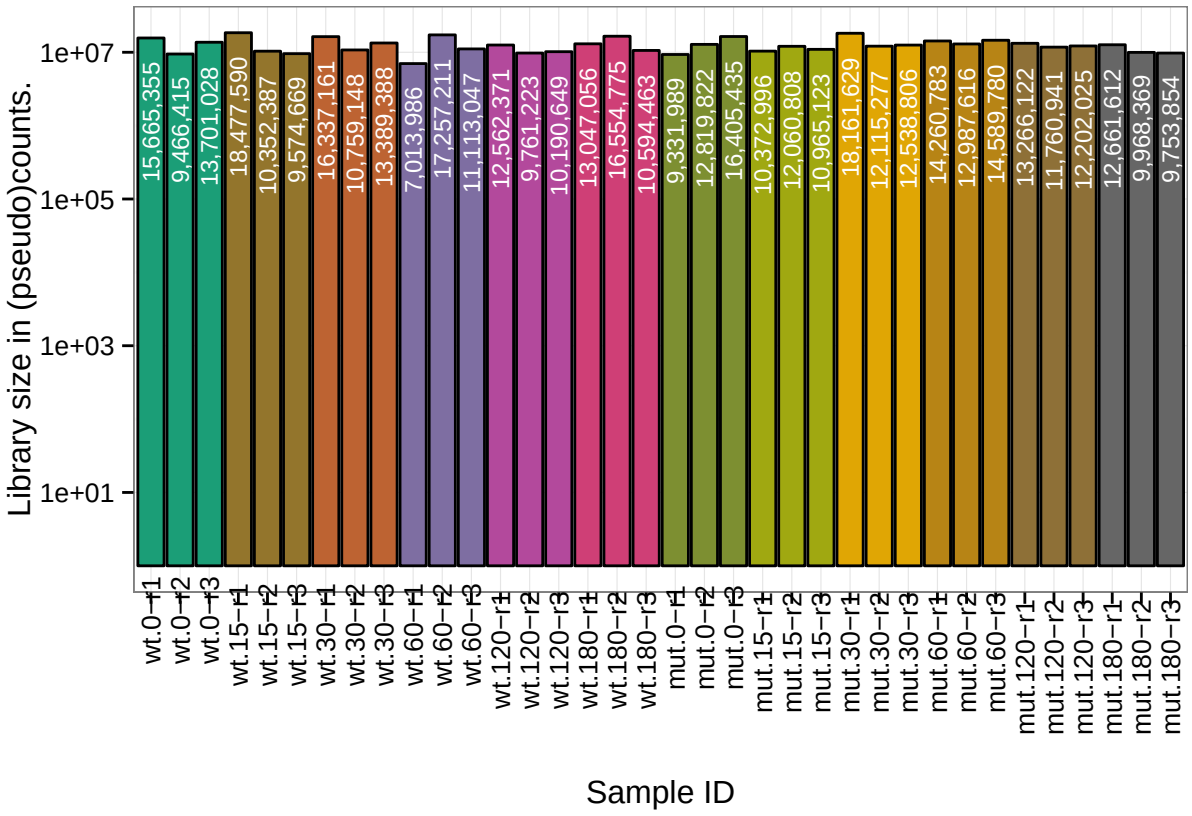
Normalizing and exploring data

There are lots of toys we have learned to use to play with with raw data and explore stuff like batch effects or non-canonical distributions or skewed counts. hpgltools provides some functionality to make this process easier. The graphs shown below and many more are generated with the wrapper 'graph_metrics()' but that takes away the chance to explain the graphs as I generate them.

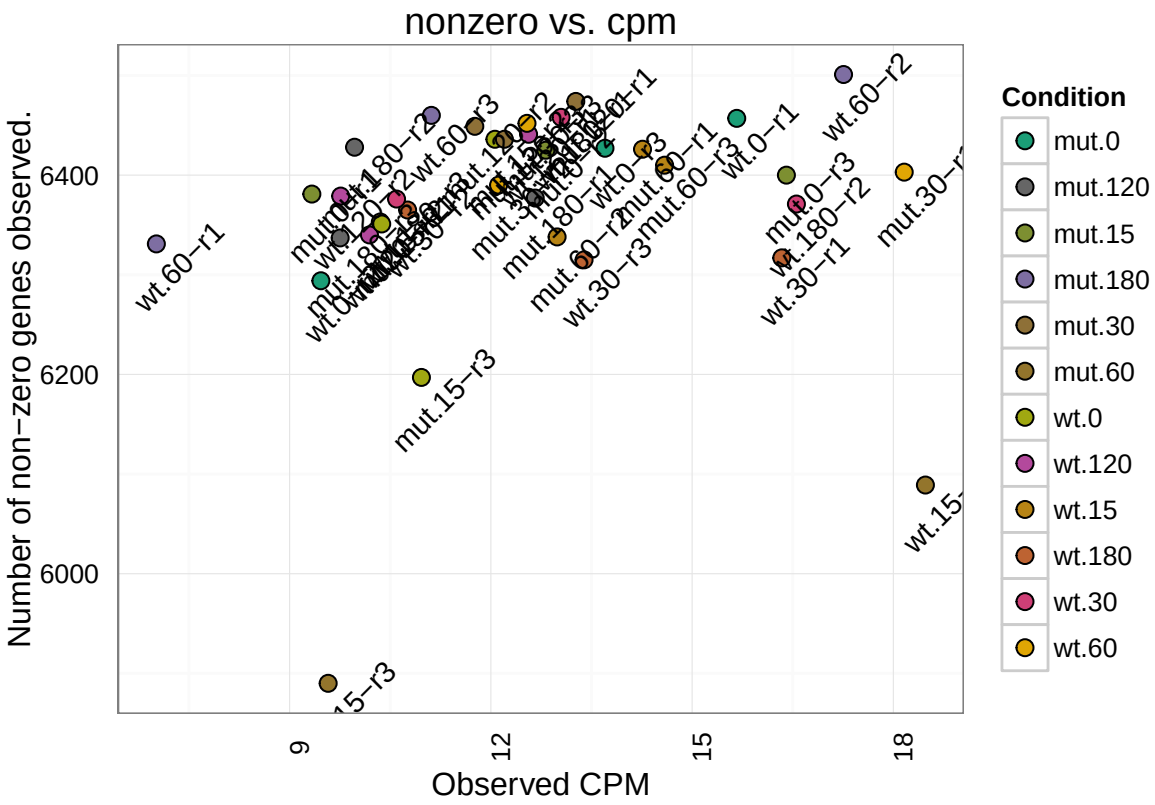
```
full_design = fission_expt$definitions
## First make a bar plot of the library sizes in the experiment.
## Notice that the colors were auto-chosen by create_expt() and they should
## be maintained throughout this process
fis_libsize = hpgl_libsize(fission_expt)
```

```
## Adding log10
```

```
fis_libsize
```



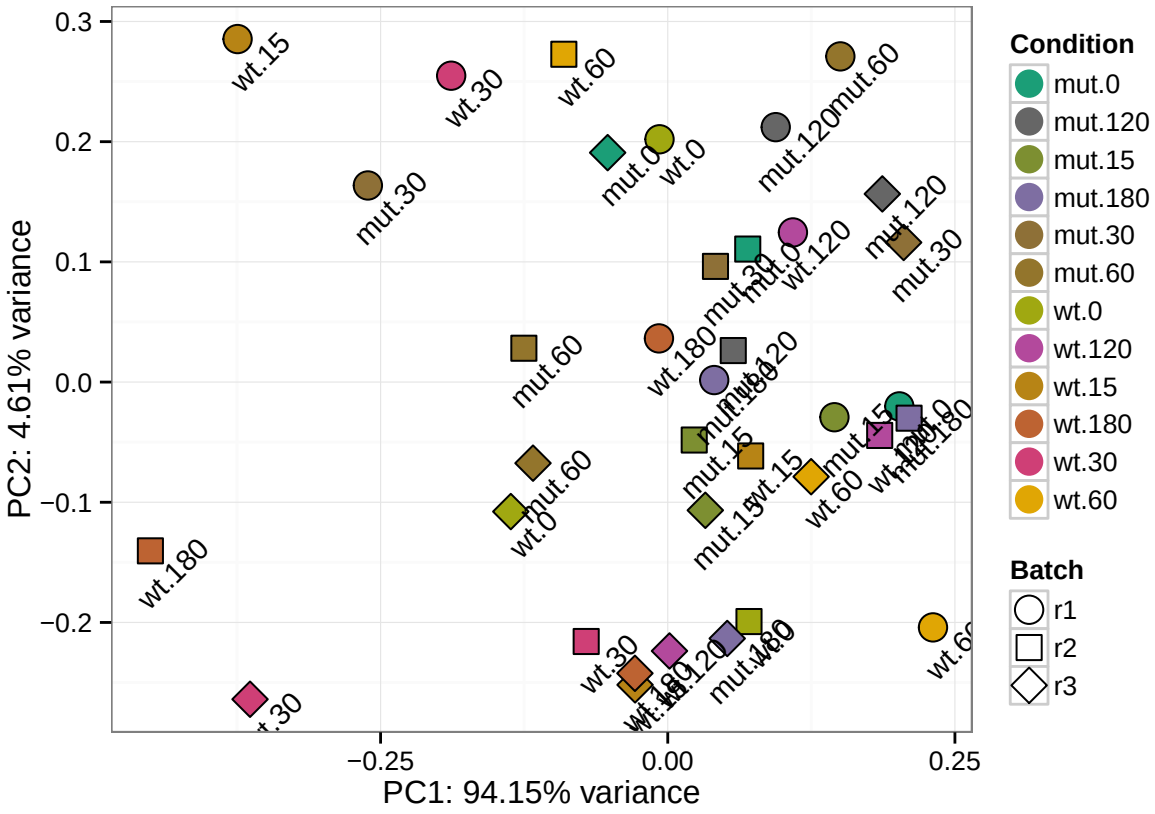

```
## Here we see that the wild type replicate 3 sample for 15 minutes has fewer non-zero genes than all i
fis_nonzero = hpgl_nonzero(fission_expt, labels="boring", title="nonzero vs. cpm")
fis_nonzero
```



An initial pca plot

In most cases, raw data does not cluster very well, lets see if that is also true for the fission experiment. Assuming it doesn't, lets normalize the data using the defaults (cpm, quantile, log2) and try again.

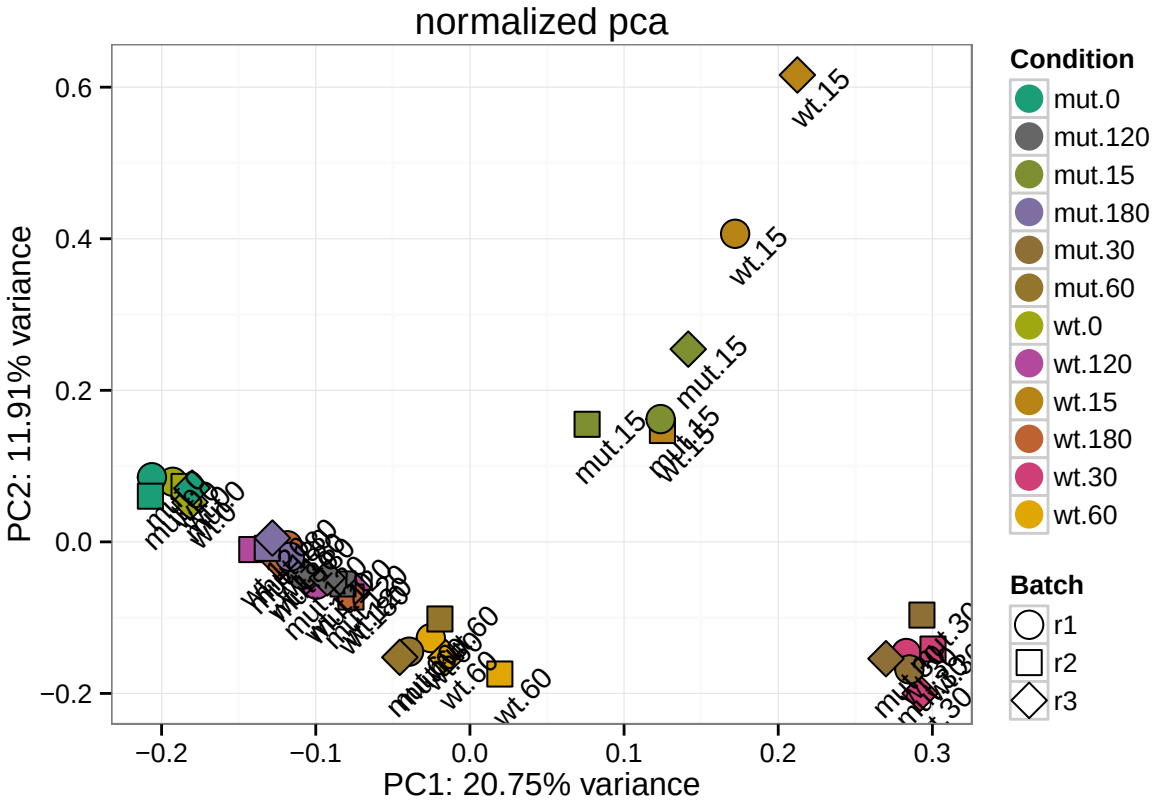
```
## Unsurprisingly, the raw data doesn't cluster well at all...
fis_rawpca = hpgl_pca(fission_expt, labels=fission_expt$condition)
fis_rawpca$plot
```




```
## So, normalize the data
norm_expt = normalize_expt(fission_expt, transform="log2", norm="quant", convert="cpm")
```

```
## [1] "This function will replace the expt$expressionset slot with the log2(quant(cpm))'d data."
## [1] "It saves the current data into a slot named: expt$backup_expressionset"
## [1] "It will also save copies of each step along the way in expt$normalized with the corresponding li
## [1] "Keep the libsizes in mind when invoking limma.  The appropriate libsize is the non-log(cpm(norma
## [1] "This is most likely kept in the slot called: 'new_expt$normalized$normalized_counts$libsize' whi
## [1] "Filter low is false, this should likely be set to something, good choices include cbcb, kofa, pc
## [1] "Not correcting the count-data for batch effects.  If batch is included in EdgerR/limma's model,
```

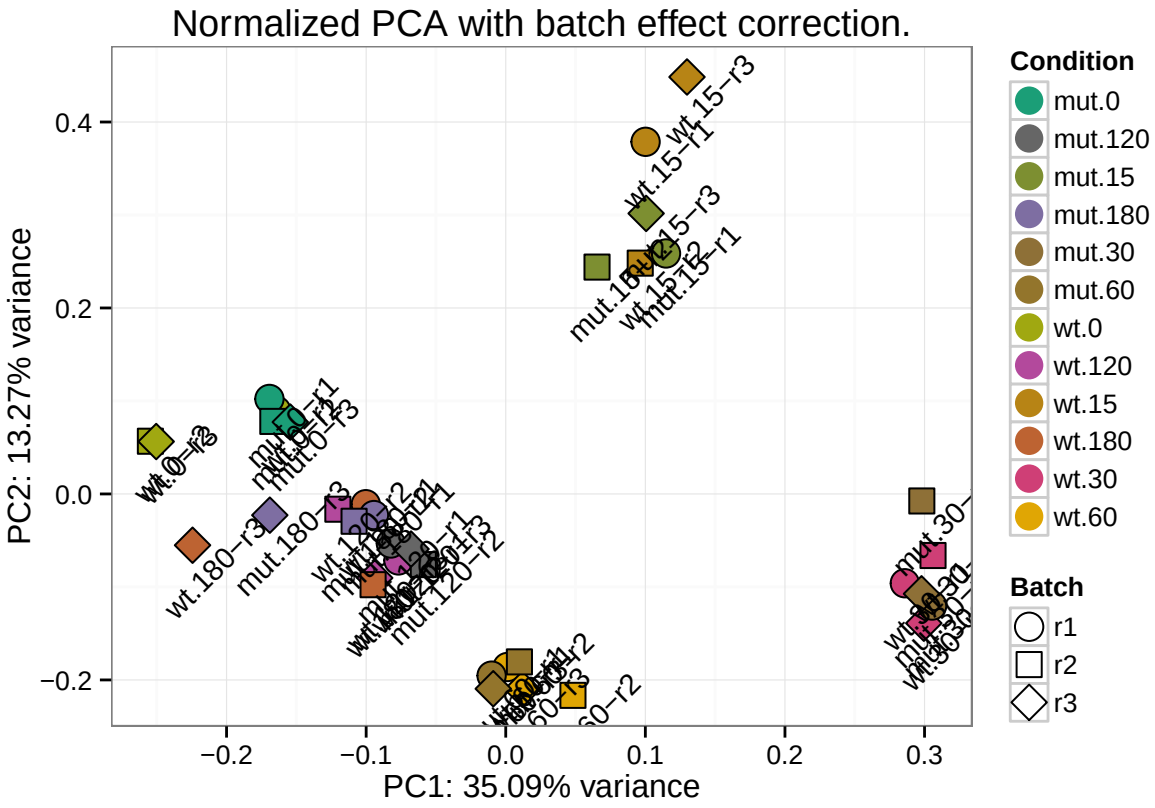
```
## And try the pca again
fis_normpca = hpgl_pca(norm_expt, labels=norm_expt$condition, title="normalized pca")
fis_normpca$plot
```




```
normbatch_expt = normalize_expt(fission_expt, transform="log2", norm="quant", convert="cpm", batch="sva
```

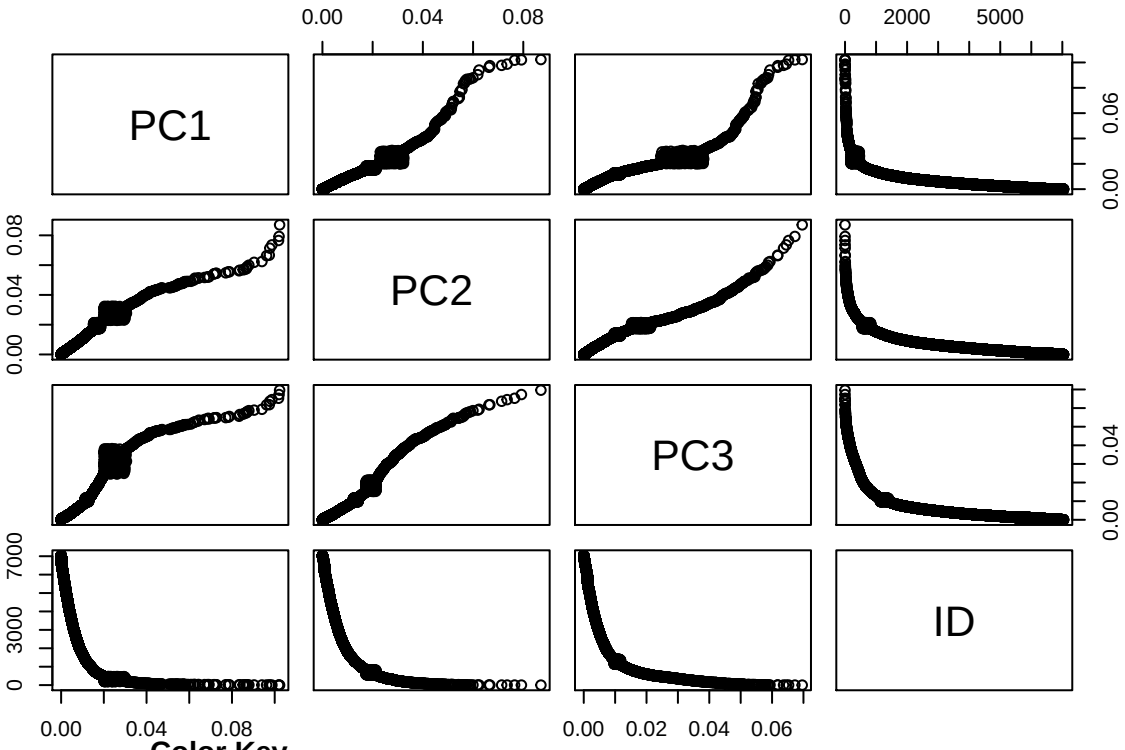
```
## [1] "This function will replace the expt$expressionset slot with the log2(quant(cpm))'d data."
## [1] "It saves the current data into a slot named: expt$backup_expressionset"
## [1] "It will also save copies of each step along the way in expt$normalized with the corresponding li
## [1] "Keep the libsizes in mind when invoking limma.  The appropriate libsize is the non-log(cpm(norma
## [1] "This is most likely kept in the slot called: 'new_expt$normalized$normalized_counts$libsize' whi
## [1] "Filter low is false, this should likely be set to something, good choices include cbcb, kofa, pe
## [1] "Before batch correction, 47195 entries 0<x<1."
## Number of significant surrogate variables is:  1
## Iteration (out of 5 ):1  2  3  4  5  [1] "The number of elements which are < 0 after batch correctio
## [1] "Found 1383 values equal to 0, adding 0.5 to the matrix."
```

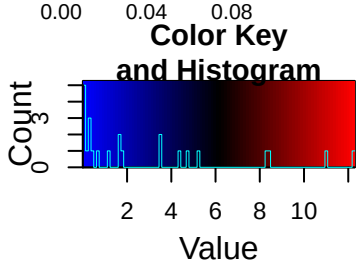
```
fis_normbatchpca = hpgl_pca(normbatch_expt, title="Normalized PCA with batch effect correction.")
fis_normbatchpca$plot
```



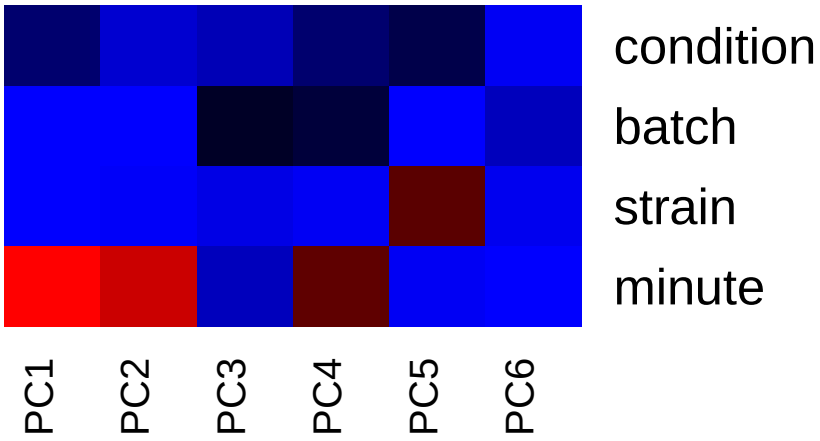

```
## ok, that caused the 0, 60, 15, and 30 minute samples to cluster nicely
## the 120 and 180 minute samples are still a bit tight

## pca_information provides some more information about the call to
## fast.svd that went into making the pca plot
fis_info = pca_information(exprs(norm_expt$expressionset), design=full_design, factors=c("condition","ba
```

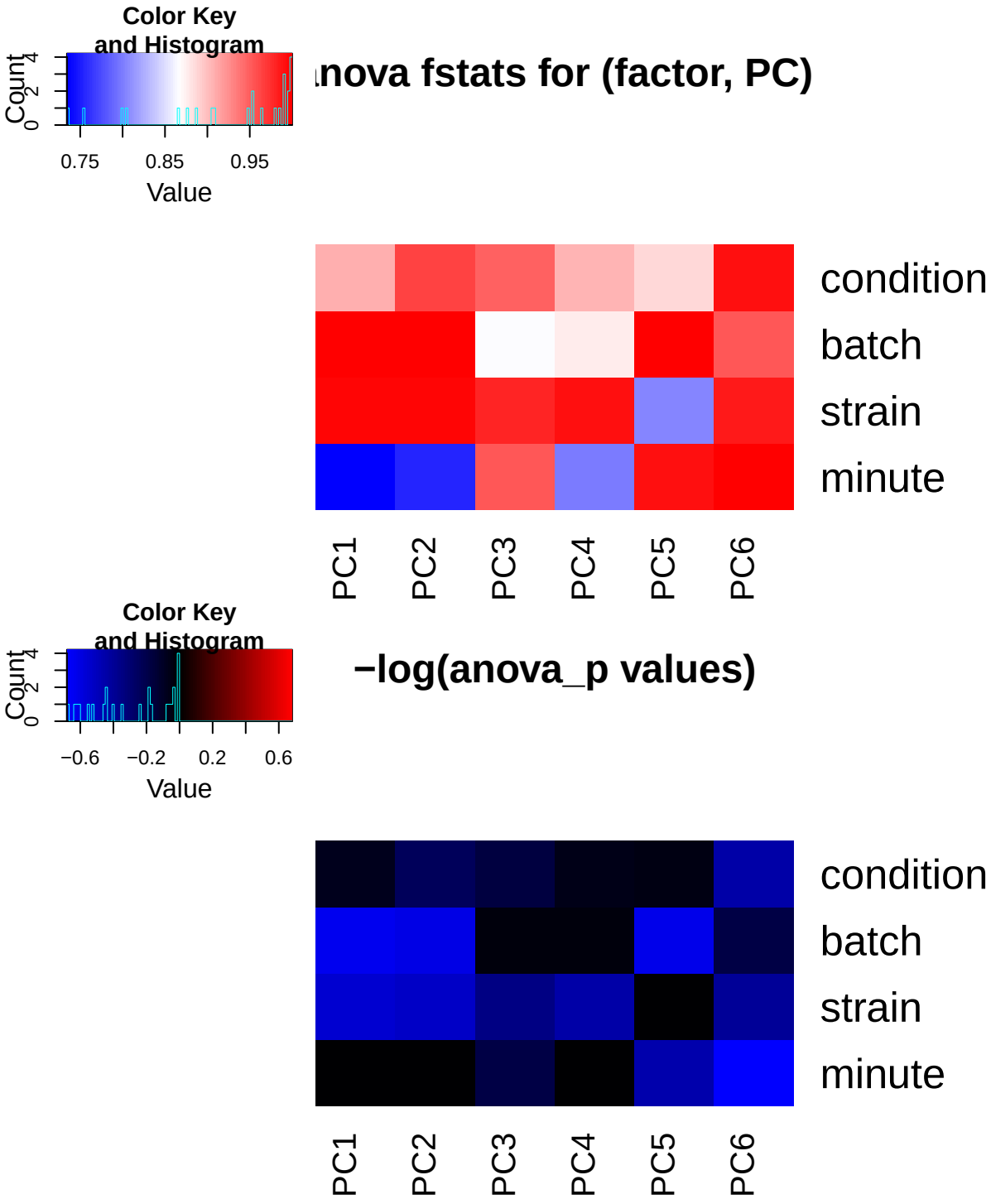
```
## The more shallow the curves in these plots, the more genes responsible for this principle component.
```





nova fstats for (factor, PC)






```
## The r^2 table shows that quite a lot of the variance in the data is explained by condition
head(fis_info$rsquared_table)
```

```
##   prop_var cumulative_prop_var condition  batch strain minute
## 1   20.752              20.752    98.743  0.069  0.315 98.053
## 2   11.911              32.663    87.067  0.772  0.443 80.859
## 3    7.702              40.365    15.586 13.626  1.889 11.256
```

```
## 4    6.138              46.503    76.204 12.331  0.997 65.848
## 5    4.863              51.366    70.220  0.917 19.633 37.284
## 6    3.891              55.257    74.218  4.921  1.369 67.245
```

```
## We can look at the correlation between the principle components and the factors in the experiment
## in this case looking at condition/batch vs the first 4 components.
fis_info$pca_cor
```

```
##                  PC1         PC2        PC3         PC4         PC5
## condition 0.30380317 -0.18690226 -0.2253680  0.30765103  0.33650975
## batch     0.02397345  0.03691367 -0.3645445 -0.35037843 -0.03137802
## strain    0.05616874  0.06653382 -0.1374555  0.09987154  0.44308965
## minute    0.51541477 -0.49466299 -0.2140827  0.44642328 -0.09814799
##                   PC6
## condition  0.099040592
## batch      0.215088641
## strain     0.117025631
## minute    -0.005377346
```

```
## And p-values to lend some credence(or not to those assertions)
fis_info$anova_p
```

```
##                   PC1         PC2        PC3         PC4         PC5
## condition 0.071650310 0.275057211 0.18631370 0.067953327 0.044775771
## batch     0.889620757 0.830751187 0.02882176 0.036170535 0.855842993
## strain    0.744896750 0.699835860 0.42403995 0.562229292 0.006801267
## minute    0.001295445 0.002163481 0.20992903 0.006348466 0.569028441
##                 PC6
## condition 0.5655026
## batch     0.2077438
## strain    0.4966850
## minute    0.9751694
```

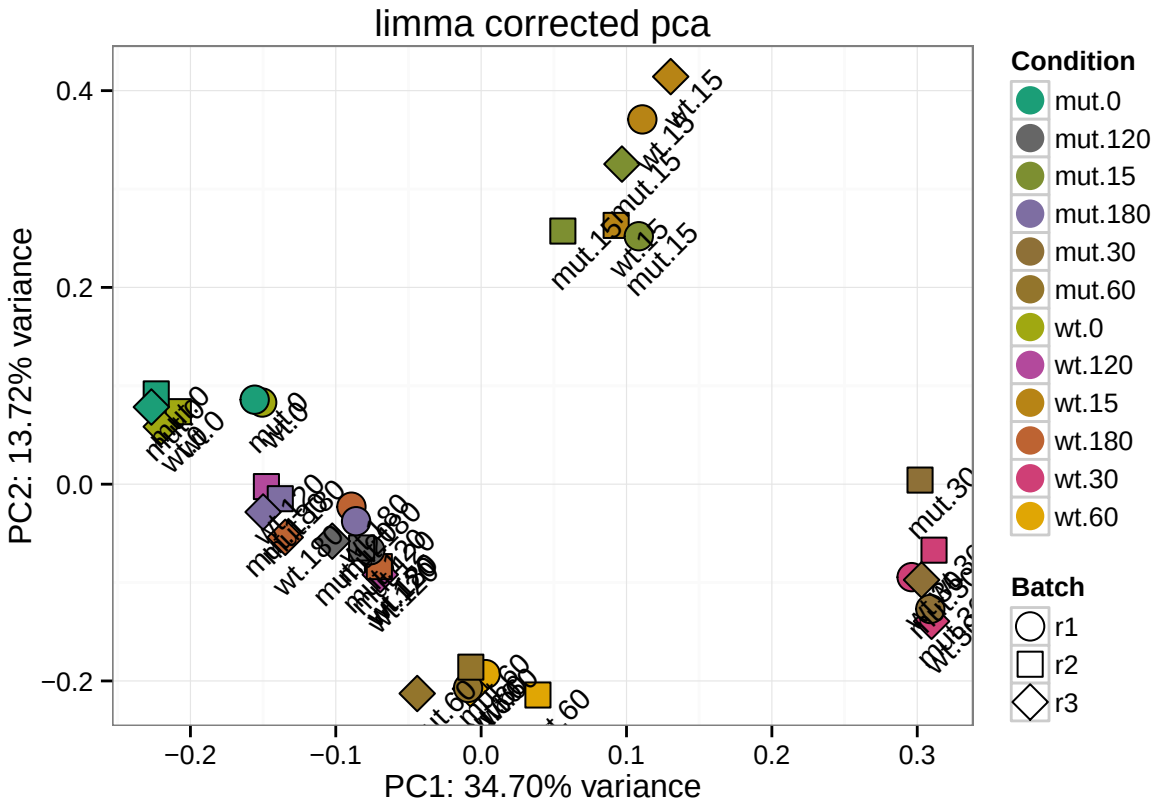
```
## Try again with batch removed data
batchnorm_expt = normalize_expt(fission_expt, batch="limma", norm="quant", transform="log2", convert="cp
```

```
## [1] "This function will replace the expt$expressionset slot with the log2(quant(cpm))'d data."
## [1] "It saves the current data into a slot named: expt$backup_expressionset"
## [1] "It will also save copies of each step along the way in expt$normalized with the corresponding li
## [1] "Keep the libsizes in mind when invoking limma.  The appropriate libsize is the non-log(cpm(norma
## [1] "This is most likely kept in the slot called: 'new_expt$normalized$normalized_counts$libsize' whi
## [1] "Filter low is false, this should likely be set to something, good choices include cbcb, kofa, pe
## [1] "Before batch correction, 47195 entries 0<x<1."
```

```
## Using limma's removeBatchEffect to remove batch effect.
```

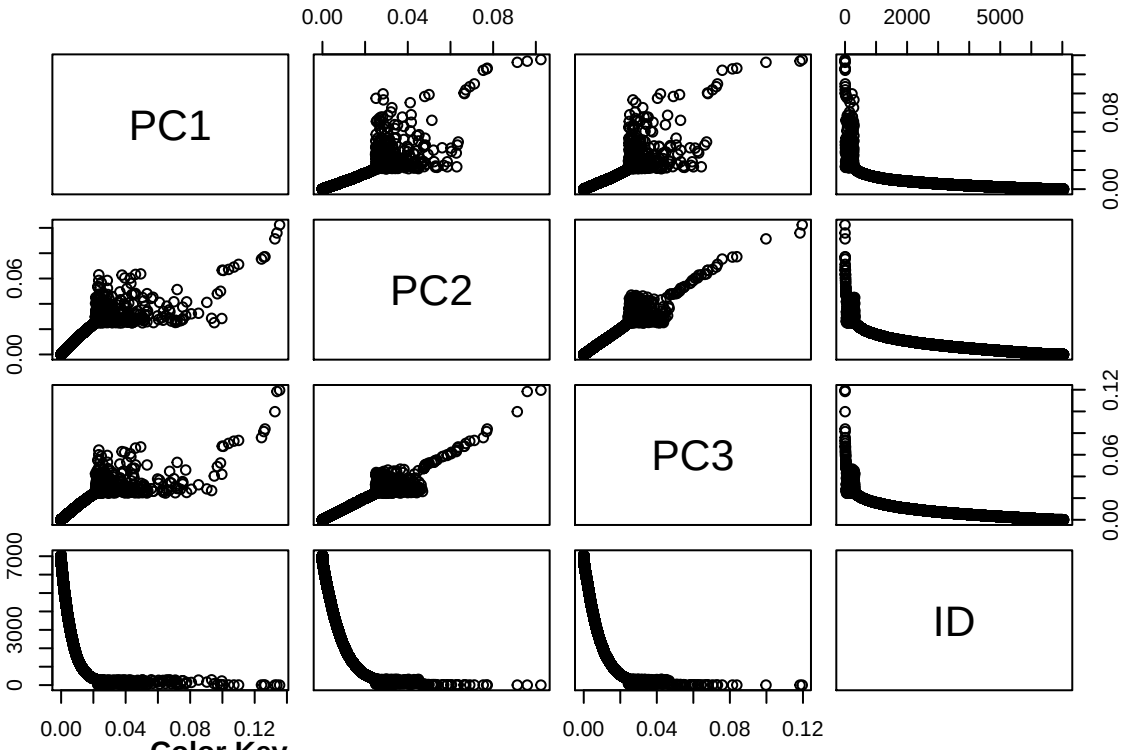
```
## [1] "The number of elements which are < 0 after batch correction is: 1689"
## [1] "Found 1689 values equal to 0, adding 0.5 to the matrix."
```

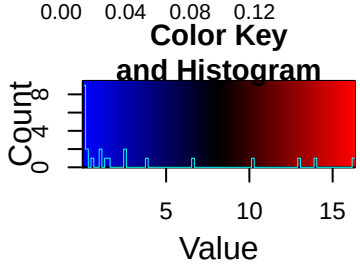
```
fis_batchnormpca = hpgl_pca(batchnorm_expt, labels=norm_expt$condition, title="limma corrected pca")
fis_batchnormpca$plot
```



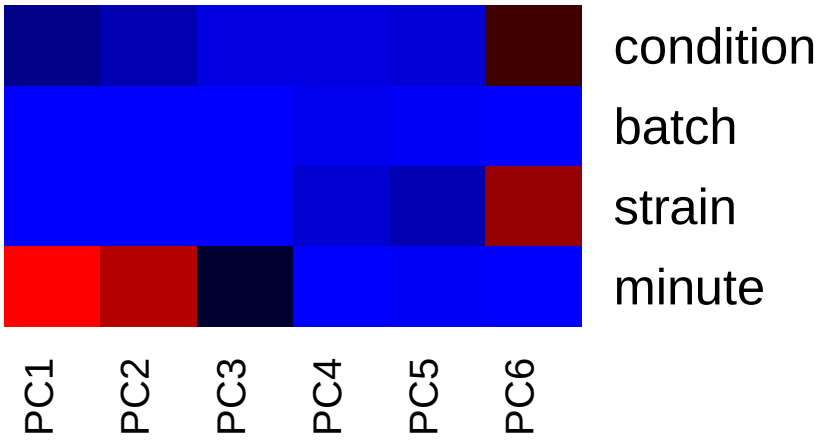

```
test_pca = pca_information(exprs(batchnorm_expt$expressionset), design=full_design, factors=c("condition
```

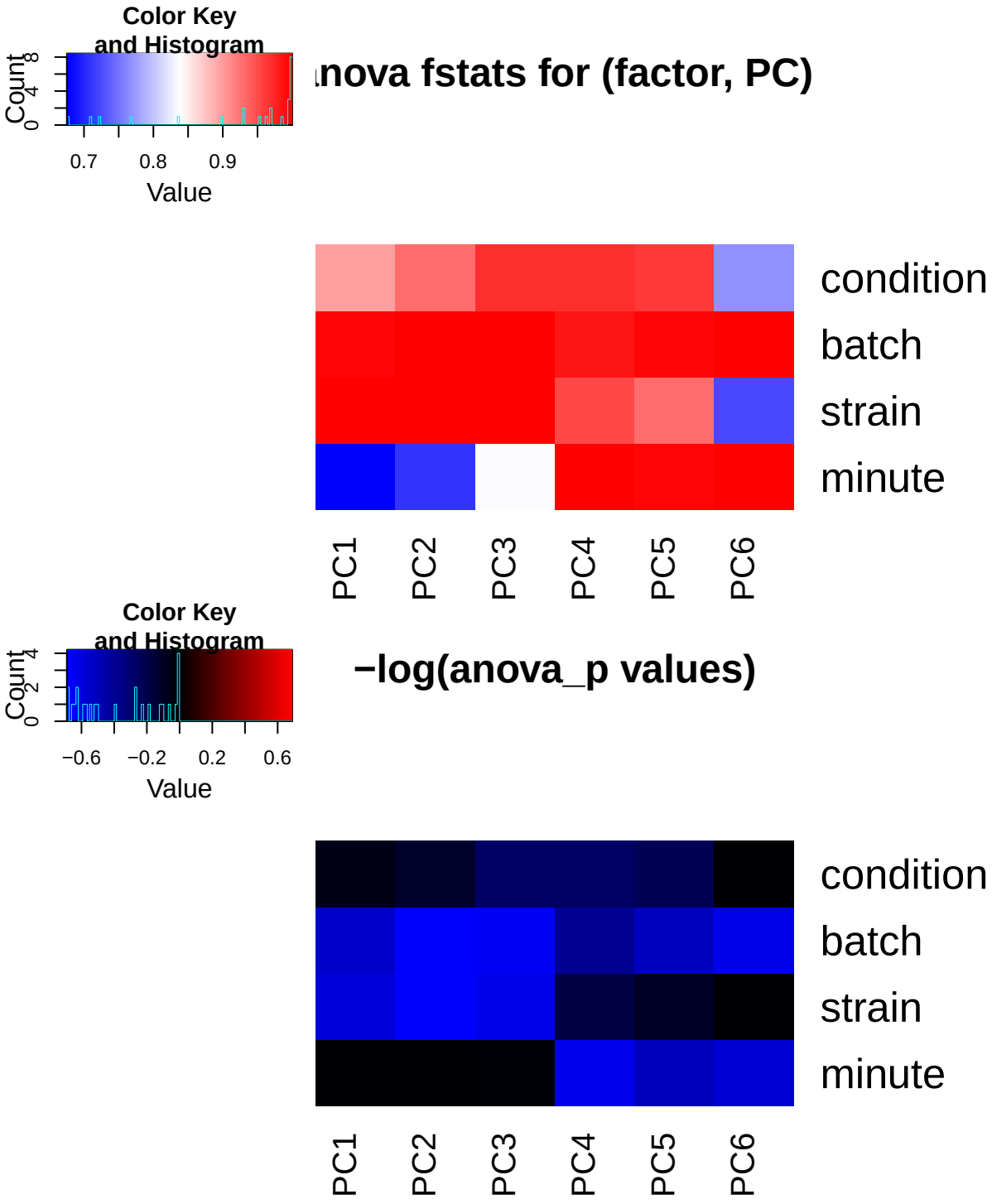
```
## The more shallow the curves in these plots, the more genes responsible for this principle component.
```





ıova fstats for (factor, PC)





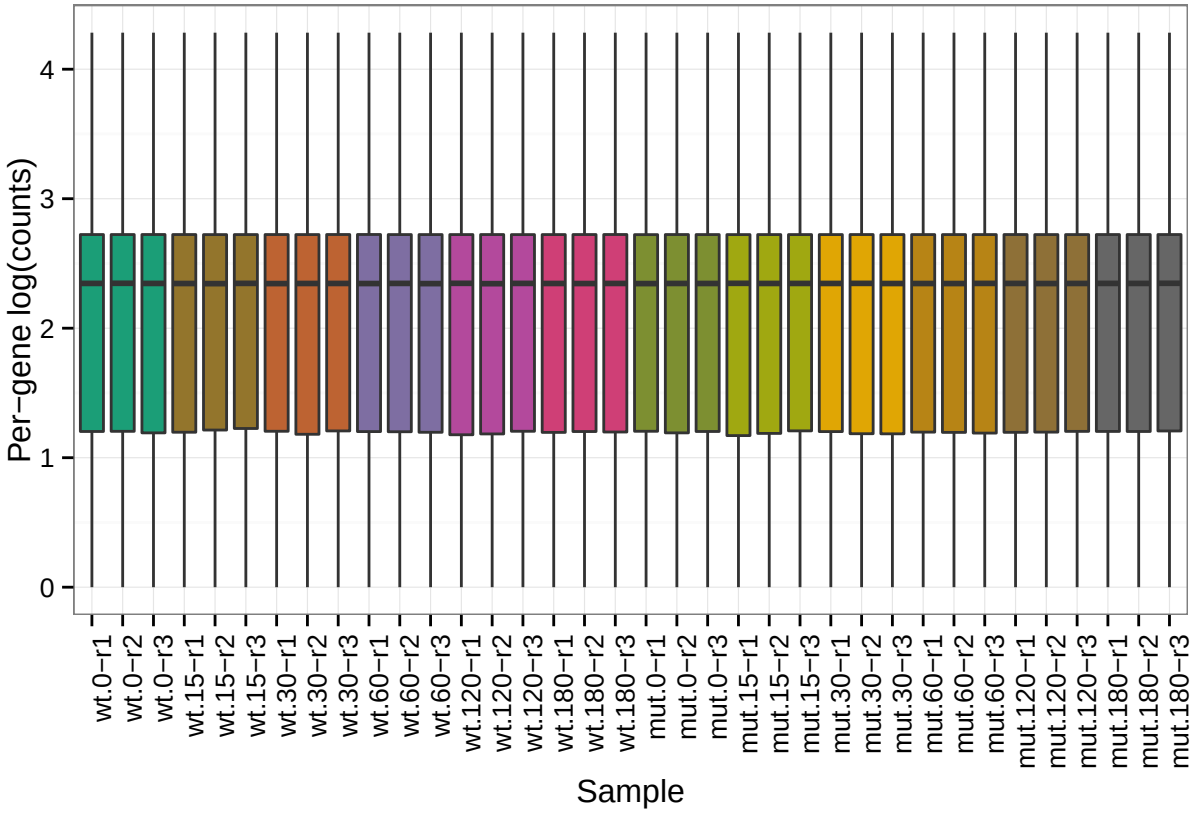

```
##combatnorm_expt = normalize_expt(fission_expt, batch="sva")
##fis_combatnormpca = hpgl_pca(expt=combatnorm_expt, labels=norm_expt$condition, title="sva corrected p
##fis_combatnormpca
##test_pca = pca_information(df=exprs(combatnorm_expt$expressionset), design=full_design, factors=c("co
```

Interesting, the batch normalized pca plot looks much the same as the normalized. The variances are in fact pretty much the exact same...

Look at the data distributions

We have some tools which provide visualizations of the distribution of the data:

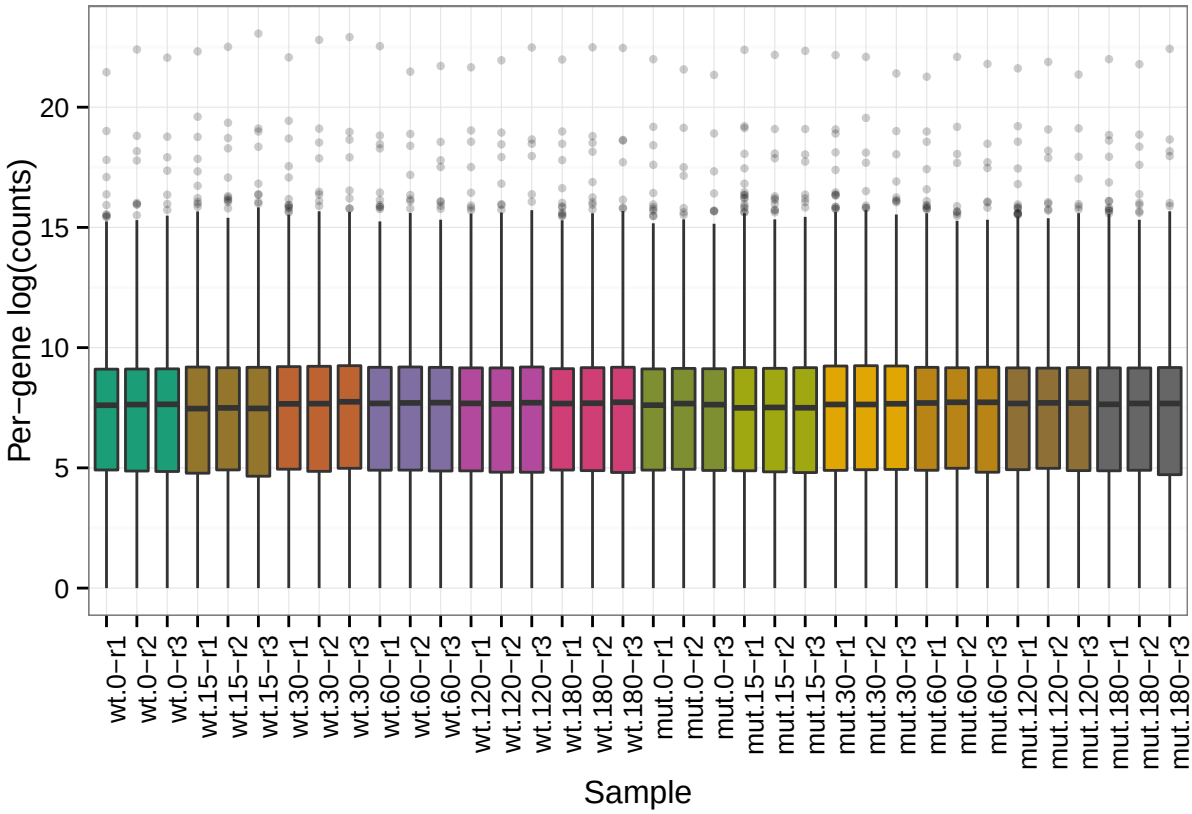
```
hpgl_boxplot(norm_expt, scale="log2")
```




```
sf_expt = normalize_expt(fission_expt, norm="sf")
```

```
## [1] "This function will replace the expt$expressionset slot with the raw(sf(raw))'d data."
## [1] "It saves the current data into a slot named: expt$backup_expressionset"
## [1] "It will also save copies of each step along the way in expt$normalized with the corresponding li
## [1] "Keep the libsizes in mind when invoking limma.  The appropriate libsize is the non-log(cpm(norma
## [1] "This is most likely kept in the slot called: 'new_expt$normalized$normalized_counts$libsize' whi
## [1] "Filter low is false, this should likely be set to something, good choices include cbcb, kofa, pe
## [1] "Leaving the data in its current base format, keep in mind that some metrics are easier to see wh
## [1] "Leaving the data unconverted.  It is often advisable to cpm/rpkm the data to normalize for sampl
## [1] "Not correcting the count-data for batch effects.  If batch is included in EdgerR/limma's model,
```

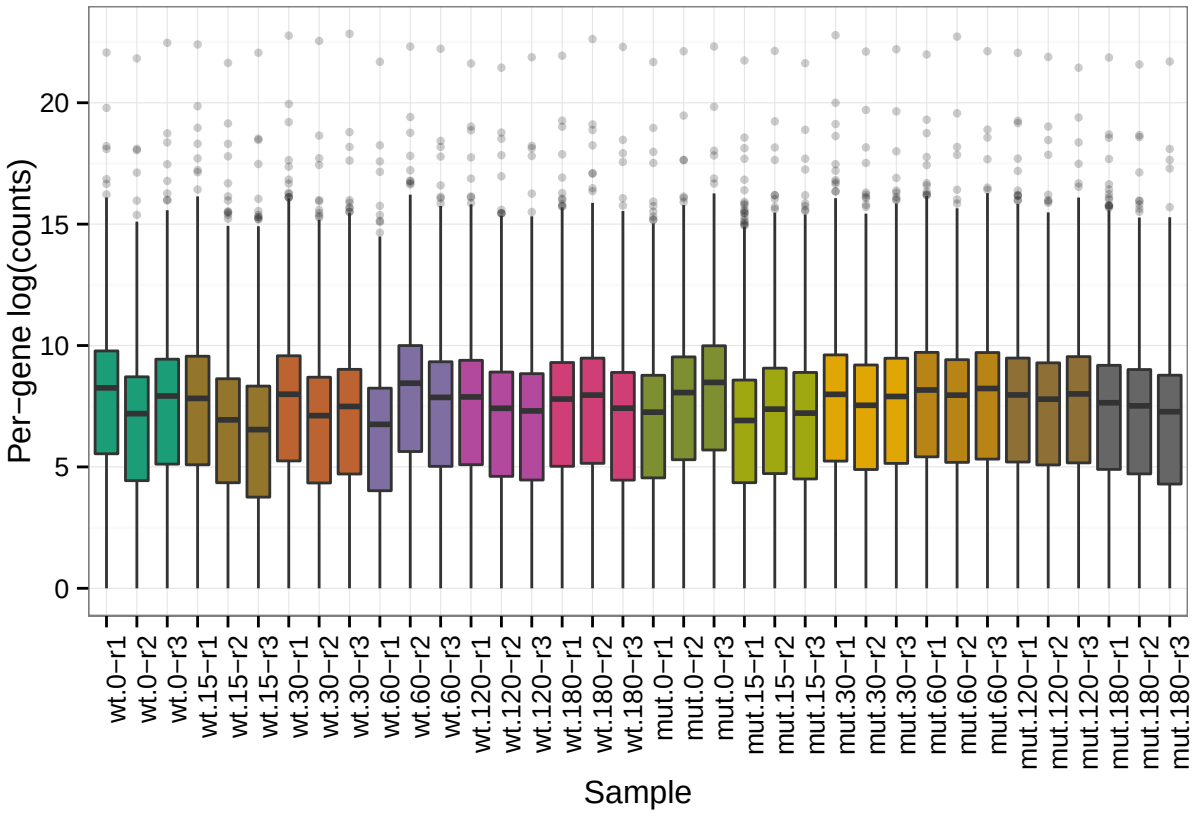
```
hpgl_boxplot(sf_expt, scale="log2")
```




```
tm_expt = normalize_expt(fission_expt, norm="tmm")
```

```
## [1] "This function will replace the expt$expressionset slot with the raw(tmm(raw))'d data."
## [1] "It saves the current data into a slot named: expt$backup_expressionset"
## [1] "It will also save copies of each step along the way in expt$normalized with the corresponding li
## [1] "Keep the libsizes in mind when invoking limma.  The appropriate libsize is the non-log(cpm(norma
## [1] "This is most likely kept in the slot called: 'new_expt$normalized$normalized_counts$libsize' whi
## [1] "Filter low is false, this should likely be set to something, good choices include cbcb, kofa, po
## [1] "Leaving the data in its current base format, keep in mind that some metrics are easier to see wh
## [1] "Leaving the data unconverted.  It is often advisable to cpm/rpkm the data to normalize for sampl
## [1] "Not correcting the count-data for batch effects.  If batch is included in EdgerR/limma's model,
```

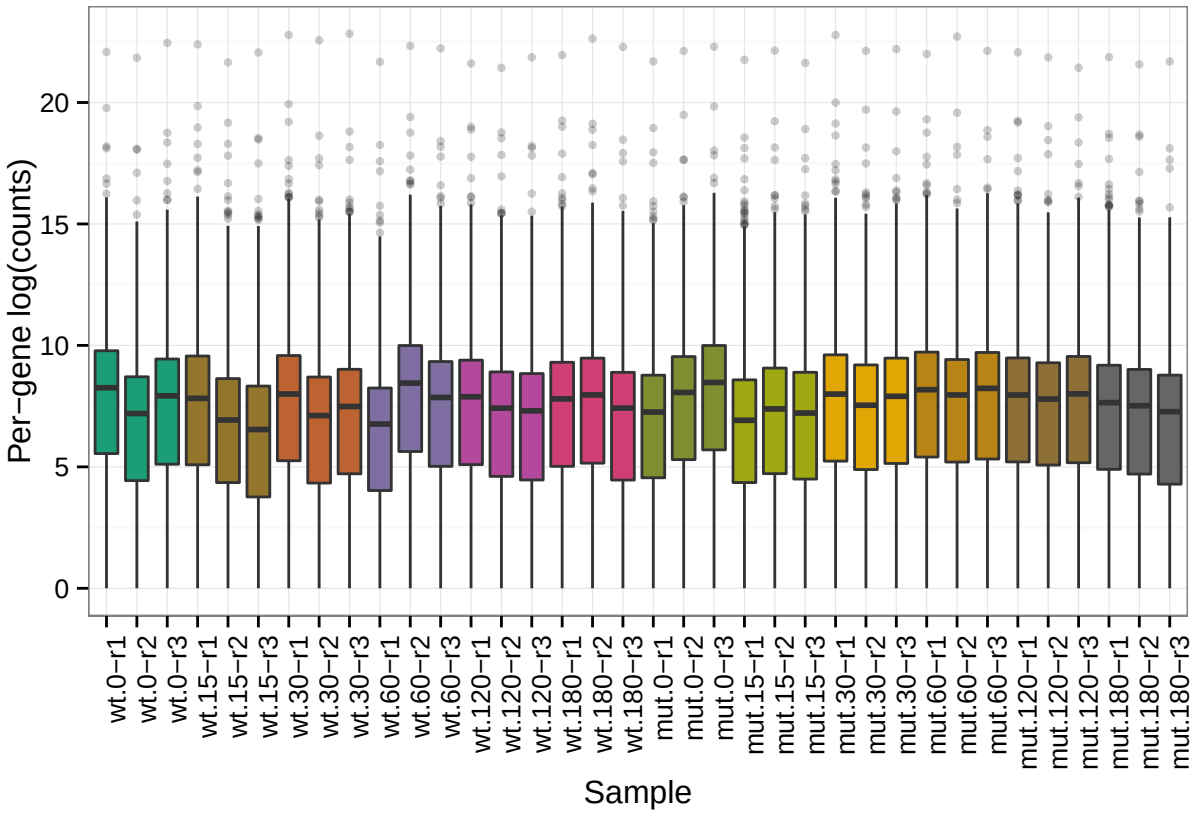
```
hpgl_boxplot(tm_expt, scale="log2")
```




```
rle_expt = normalize_expt(fission_expt, norm="rle")
```

```
## [1] "This function will replace the expt$expressionset slot with the raw(rle(raw))'d data."
## [1] "It saves the current data into a slot named: expt$backup_expressionset"
## [1] "It will also save copies of each step along the way in expt$normalized with the corresponding li
## [1] "Keep the libsizes in mind when invoking limma.  The appropriate libsize is the non-log(cpm(norma
## [1] "This is most likely kept in the slot called: 'new_expt$normalized$normalized_counts$libsize' whi
## [1] "Filter low is false, this should likely be set to something, good choices include cbcb, kofa, pe
## [1] "Leaving the data in its current base format, keep in mind that some metrics are easier to see wh
## [1] "Leaving the data unconverted.  It is often advisable to cpm/rpkm the data to normalize for sampl
## [1] "Not correcting the count-data for batch effects.  If batch is included in EdgerR/limma's model,
```

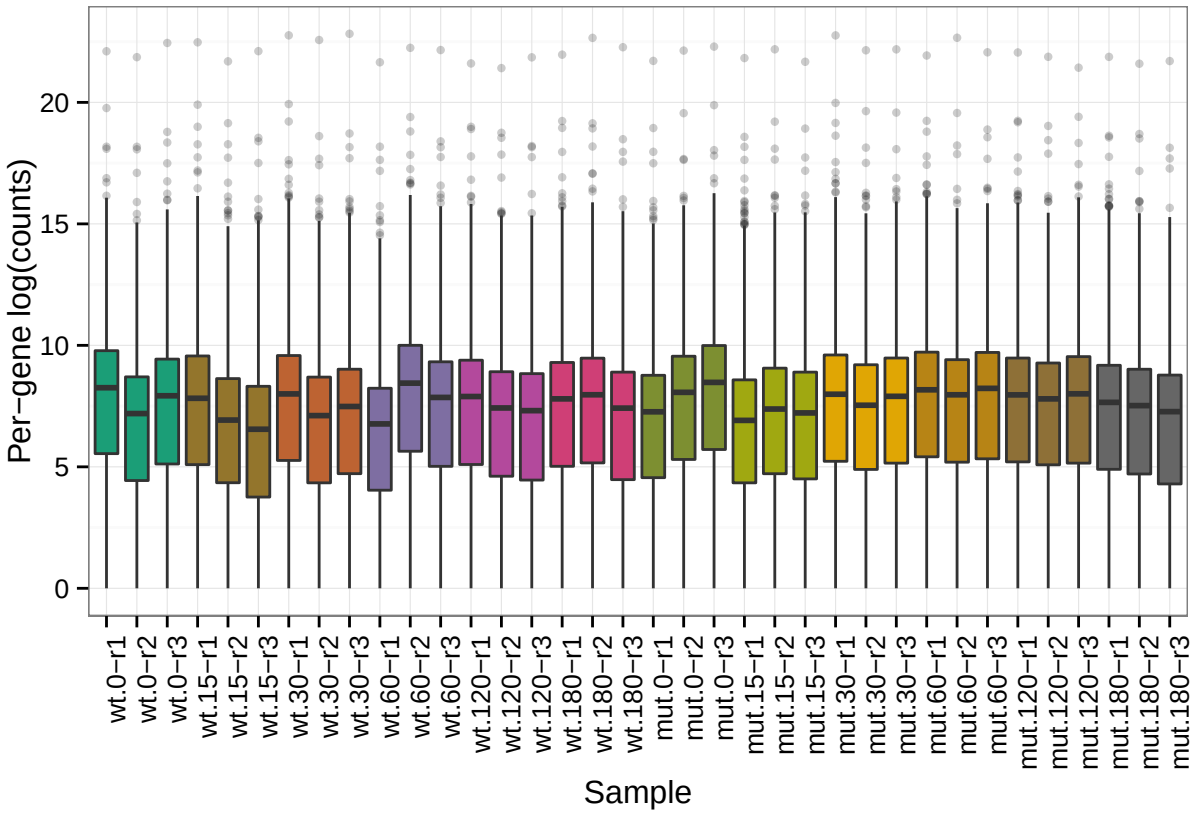
```
hpgl_boxplot(rle_expt, scale="log2")
```




```
up_expt = normalize_expt(fission_expt, norm="upperquartile")
```

```
## [1] "This function will replace the expt$expressionset slot with the raw(upperquartile(raw))'d data.'
## [1] "It saves the current data into a slot named: expt$backup_expressionset"
## [1] "It will also save copies of each step along the way in expt$normalized with the corresponding li
## [1] "Keep the libsizes in mind when invoking limma.  The appropriate libsize is the non-log(cpm(norma
## [1] "This is most likely kept in the slot called: 'new_expt$normalized$normalized_counts$libsize' whi
## [1] "Filter low is false, this should likely be set to something, good choices include cbcb, kofa, pe
## [1] "Leaving the data in its current base format, keep in mind that some metrics are easier to see wh
## [1] "Leaving the data unconverted.  It is often advisable to cpm/rpkm the data to normalize for sampl
## [1] "Not correcting the count-data for batch effects.  If batch is included in EdgerR/limma's model,
```

```
hpgl_boxplot(up_expt, scale="log2")
```

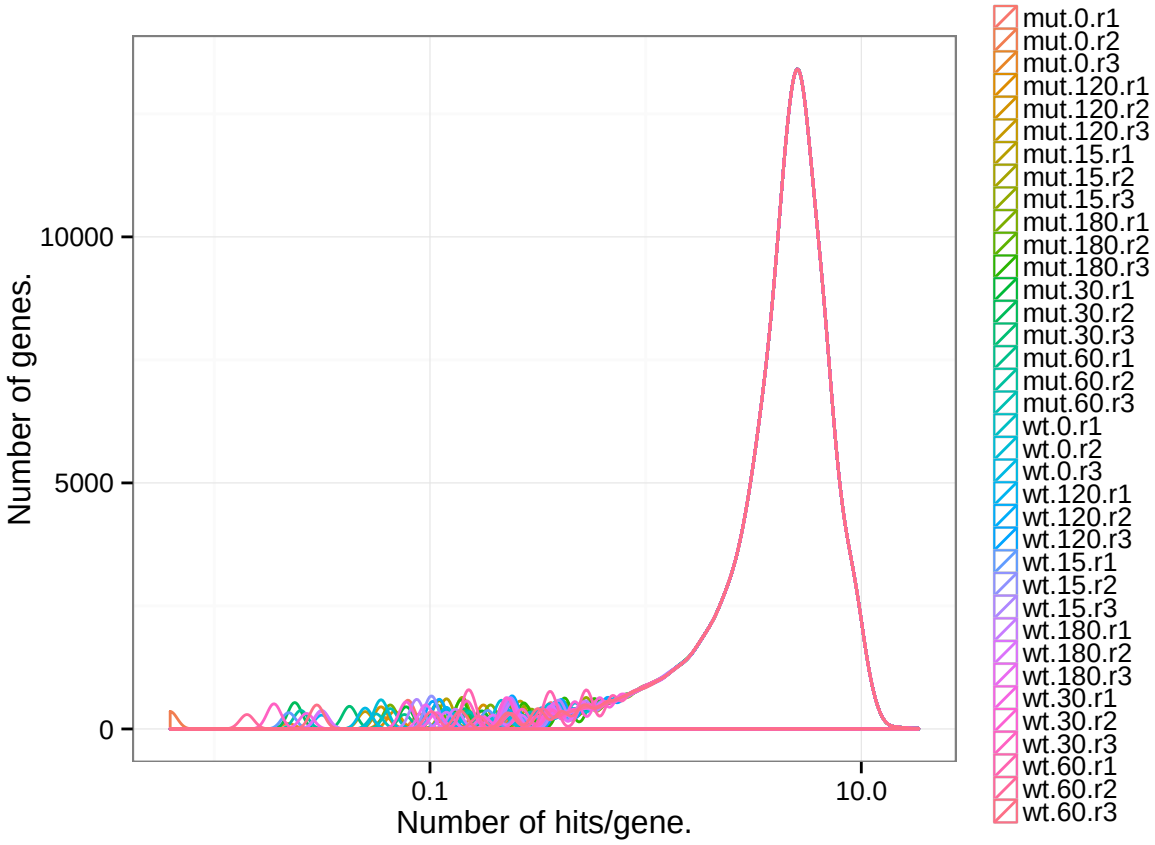



```
hpgl_density(norm_expt, log=TRUE)
```

```
## Warning in scale$trans$trans(x): NaNs produced

## Warning: Removed 1310 rows containing non-finite values (stat_density).

## Warning: Removed 1297 rows containing non-finite values (stat_density).

## Warning: Removed 1311 rows containing non-finite values (stat_density).

## Warning: Removed 1316 rows containing non-finite values (stat_density).

## Warning: Removed 1310 rows containing non-finite values (stat_density).

## Warning: Removed 1310 rows containing non-finite values (stat_density).

## Warning: Removed 1323 rows containing non-finite values (stat_density).

## Warning: Removed 1321 rows containing non-finite values (stat_density).

## Warning: Removed 1330 rows containing non-finite values (stat_density).

## Warning: Removed 1310 rows containing non-finite values (stat_density).

## Warning: Removed 1323 rows containing non-finite values (stat_density).
```

```
## Warning: Removed 1331 rows containing non-finite values (stat_density).

## Warning: Removed 1314 rows containing non-finite values (stat_density).

## Warning: Removed 1294 rows containing non-finite values (stat_density).

## Warning: Removed 1302 rows containing non-finite values (stat_density).

## Warning: Removed 1320 rows containing non-finite values (stat_density).

## Warning: Removed 1301 rows containing non-finite values (stat_density).

## Warning: Removed 1313 rows containing non-finite values (stat_density).

## Warning: Removed 1314 rows containing non-finite values (stat_density).

## Warning: Removed 1304 rows containing non-finite values (stat_density).

## Warning: Removed 1307 rows containing non-finite values (stat_density).

## Warning: Removed 1308 rows containing non-finite values (stat_density).

## Warning: Removed 1320 rows containing non-finite values (stat_density).

## Warning: Removed 1317 rows containing non-finite values (stat_density).

## Warning: Removed 1302 rows containing non-finite values (stat_density).

## Warning: Removed 1312 rows containing non-finite values (stat_density).

## Warning: Removed 1312 rows containing non-finite values (stat_density).

## Warning: Removed 1304 rows containing non-finite values (stat_density).

## Warning: Removed 1305 rows containing non-finite values (stat_density).

## Warning: Removed 1319 rows containing non-finite values (stat_density).

## Warning: Removed 1304 rows containing non-finite values (stat_density).

## Warning: Removed 1311 rows containing non-finite values (stat_density).

## Warning: Removed 1293 rows containing non-finite values (stat_density).

## Warning: Removed 1327 rows containing non-finite values (stat_density).

## Warning: Removed 1301 rows containing non-finite values (stat_density).
```

```
## Warning: Removed 1299 rows containing non-finite values (stat_density).
```



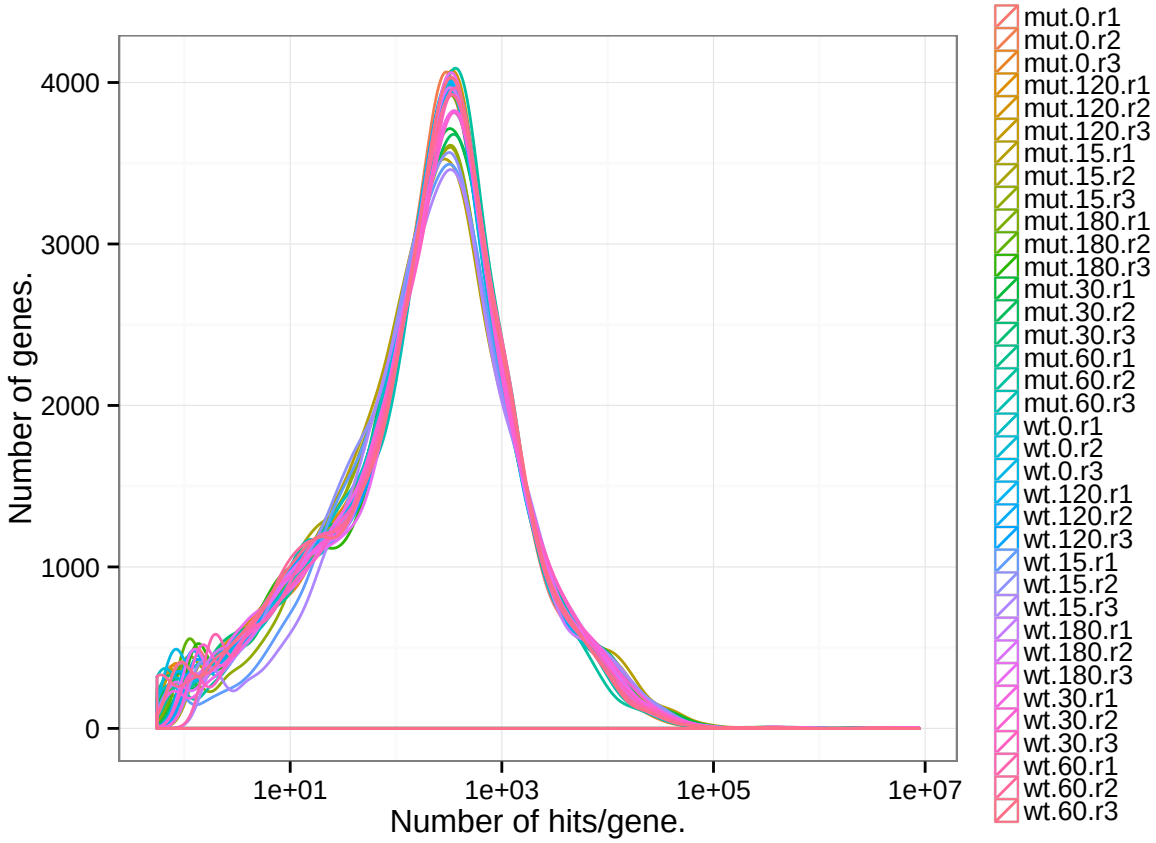

```
hpgl_density(sf_expt, log=TRUE)
```

```
## Warning: Removed 658 rows containing non-finite values (stat_density).

## Warning: Removed 614 rows containing non-finite values (stat_density).

## Warning: Removed 639 rows containing non-finite values (stat_density).

## Warning: Removed 565 rows containing non-finite values (stat_density).

## Warning: Removed 590 rows containing non-finite values (stat_density).

## Warning: Removed 603 rows containing non-finite values (stat_density).

## Warning: Removed 688 rows containing non-finite values (stat_density).

## Warning: Removed 603 rows containing non-finite values (stat_density).

## Warning: Removed 842 rows containing non-finite values (stat_density).

## Warning: Removed 662 rows containing non-finite values (stat_density).
```

```
## Warning: Removed 611 rows containing non-finite values (stat_density).

## Warning: Removed 702 rows containing non-finite values (stat_density).

## Warning: Removed 636 rows containing non-finite values (stat_density).

## Warning: Removed 649 rows containing non-finite values (stat_density).

## Warning: Removed 587 rows containing non-finite values (stat_density).

## Warning: Removed 613 rows containing non-finite values (stat_density).

## Warning: Removed 701 rows containing non-finite values (stat_density).

## Warning: Removed 629 rows containing non-finite values (stat_density).

## Warning: Removed 582 rows containing non-finite values (stat_density).

## Warning: Removed 745 rows containing non-finite values (stat_density).

## Warning: Removed 612 rows containing non-finite values (stat_density).

## Warning: Removed 598 rows containing non-finite values (stat_density).

## Warning: Removed 660 rows containing non-finite values (stat_density).

## Warning: Removed 699 rows containing non-finite values (stat_density).

## Warning: Removed 950 rows containing non-finite values (stat_density).

## Warning: Removed 686 rows containing non-finite values (stat_density).

## Warning: Removed 1149 rows containing non-finite values (stat_density).

## Warning: Removed 581 rows containing non-finite values (stat_density).

## Warning: Removed 668 rows containing non-finite values (stat_density).

## Warning: Removed 663 rows containing non-finite values (stat_density).

## Warning: Removed 722 rows containing non-finite values (stat_density).

## Warning: Removed 674 rows containing non-finite values (stat_density).

## Warning: Removed 724 rows containing non-finite values (stat_density).

## Warning: Removed 708 rows containing non-finite values (stat_density).
```

```
## Warning: Removed 538 rows containing non-finite values (stat_density).
```

```
## Warning: Removed 579 rows containing non-finite values (stat_density).
```




```
hpgl_density(tm_expt, log=TRUE)
```

```
## Warning: Removed 658 rows containing non-finite values (stat_density).
```

```
## Warning: Removed 614 rows containing non-finite values (stat_density).
```

```
## Warning: Removed 639 rows containing non-finite values (stat_density).
```

```
## Warning: Removed 565 rows containing non-finite values (stat_density).
```

```
## Warning: Removed 590 rows containing non-finite values (stat_density).
```

```
## Warning: Removed 603 rows containing non-finite values (stat_density).
```

```
## Warning: Removed 688 rows containing non-finite values (stat_density).
```

```
## Warning: Removed 603 rows containing non-finite values (stat_density).
```

```
## Warning: Removed 842 rows containing non-finite values (stat_density).
```

```
## Warning: Removed 662 rows containing non-finite values (stat_density).

## Warning: Removed 611 rows containing non-finite values (stat_density).

## Warning: Removed 702 rows containing non-finite values (stat_density).

## Warning: Removed 636 rows containing non-finite values (stat_density).

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## Warning: Removed 699 rows containing non-finite values (stat_density).

## Warning: Removed 950 rows containing non-finite values (stat_density).

## Warning: Removed 686 rows containing non-finite values (stat_density).

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## Warning: Removed 581 rows containing non-finite values (stat_density).

## Warning: Removed 668 rows containing non-finite values (stat_density).

## Warning: Removed 663 rows containing non-finite values (stat_density).

## Warning: Removed 722 rows containing non-finite values (stat_density).

## Warning: Removed 674 rows containing non-finite values (stat_density).

## Warning: Removed 724 rows containing non-finite values (stat_density).
```
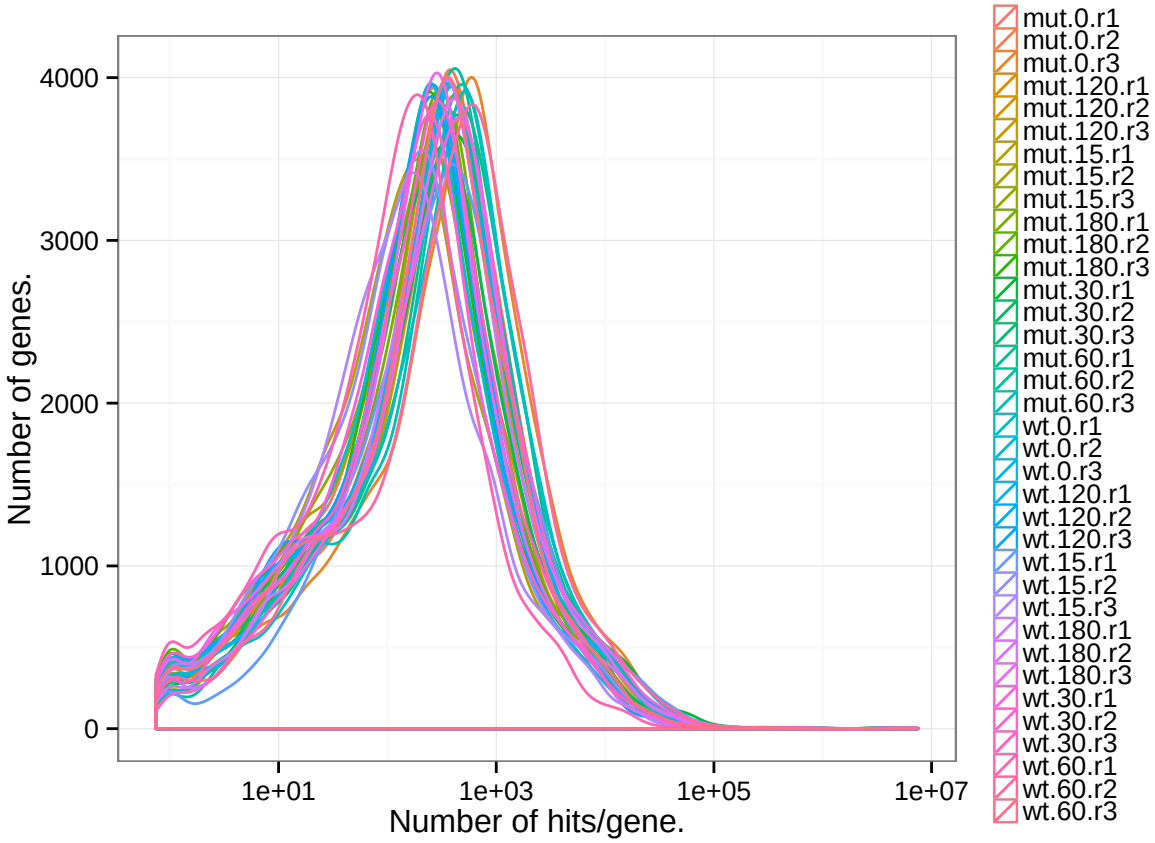

```
## Warning: Removed 708 rows containing non-finite values (stat_density).
```

```
## Warning: Removed 538 rows containing non-finite values (stat_density).
```

```
## Warning: Removed 579 rows containing non-finite values (stat_density).
```

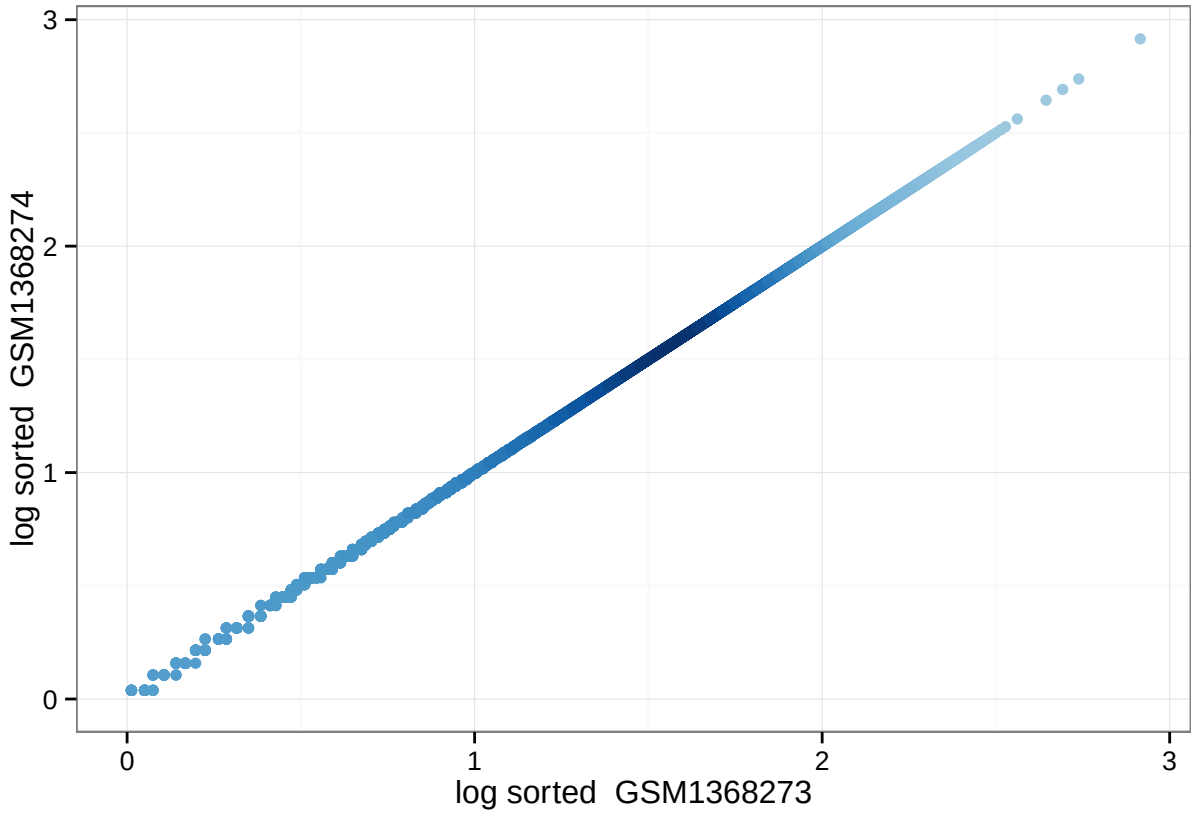



```
compare_12 = hpgl_qq_plot(exprs(norm_expt$expressionset), x=1, y=2)
```

```
## Warning in log(sorted_x): NaNs produced
```

```
## Warning in log(sorted_y): NaNs produced
```

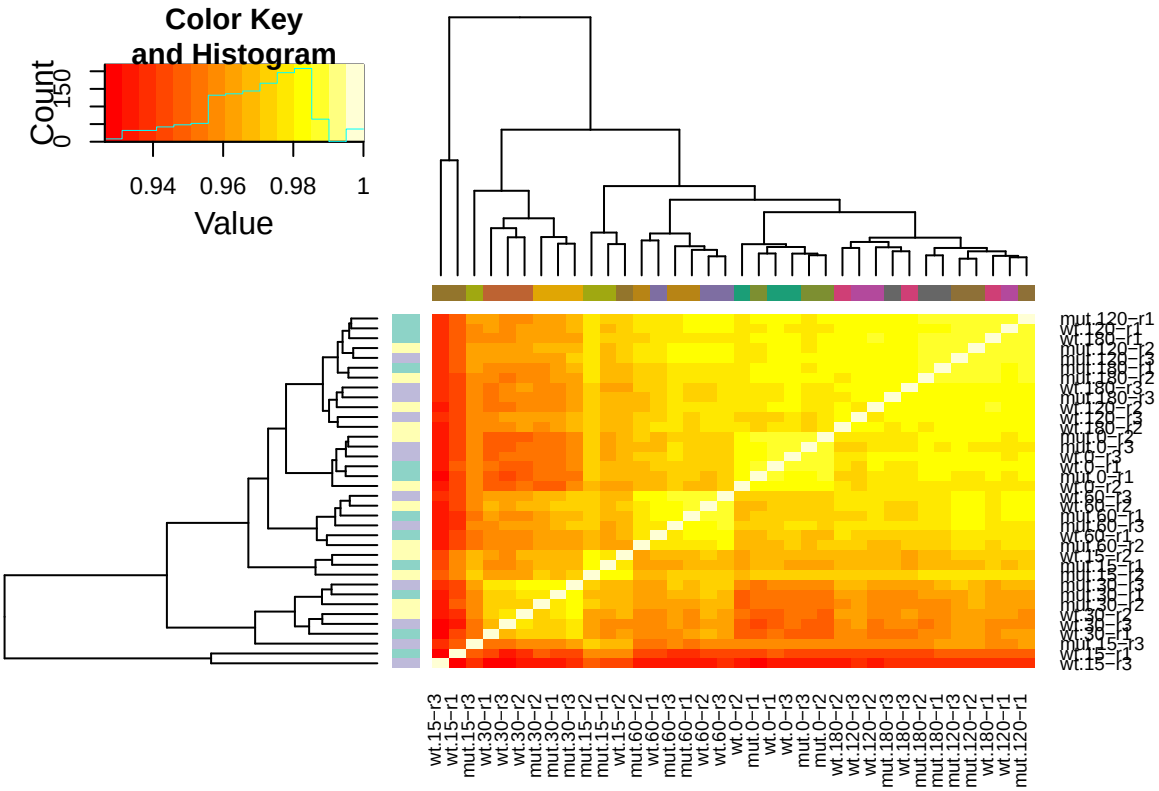
```
compare_12$log
```



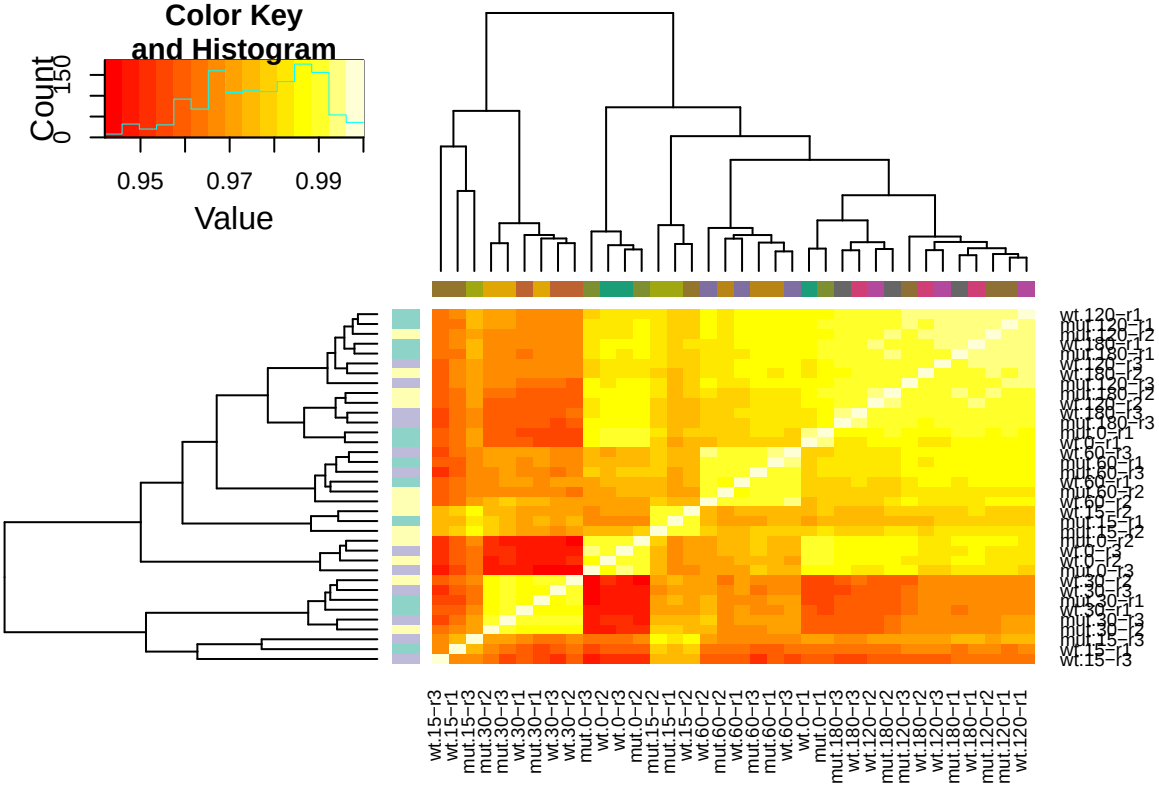
See how they cluster

Ok, so we can further check out how the data cluster with respect to one another...

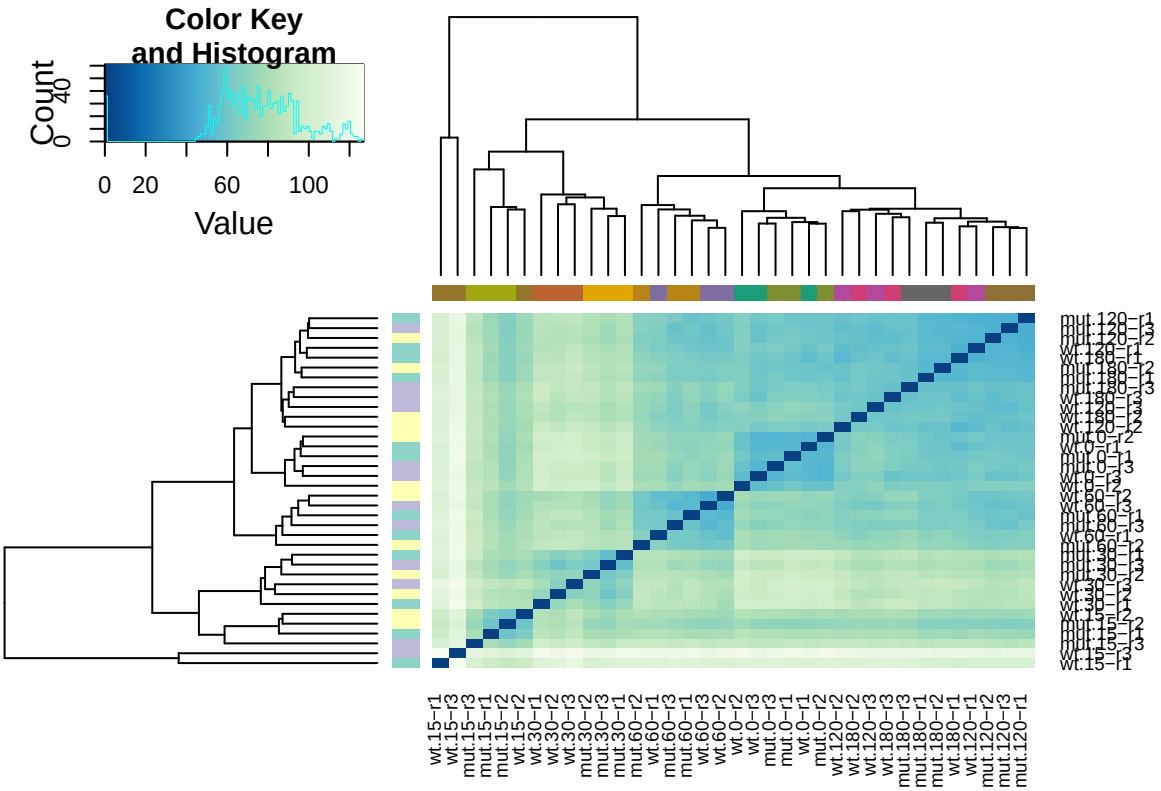
```
hpgl_corheat(norm_expt)
```



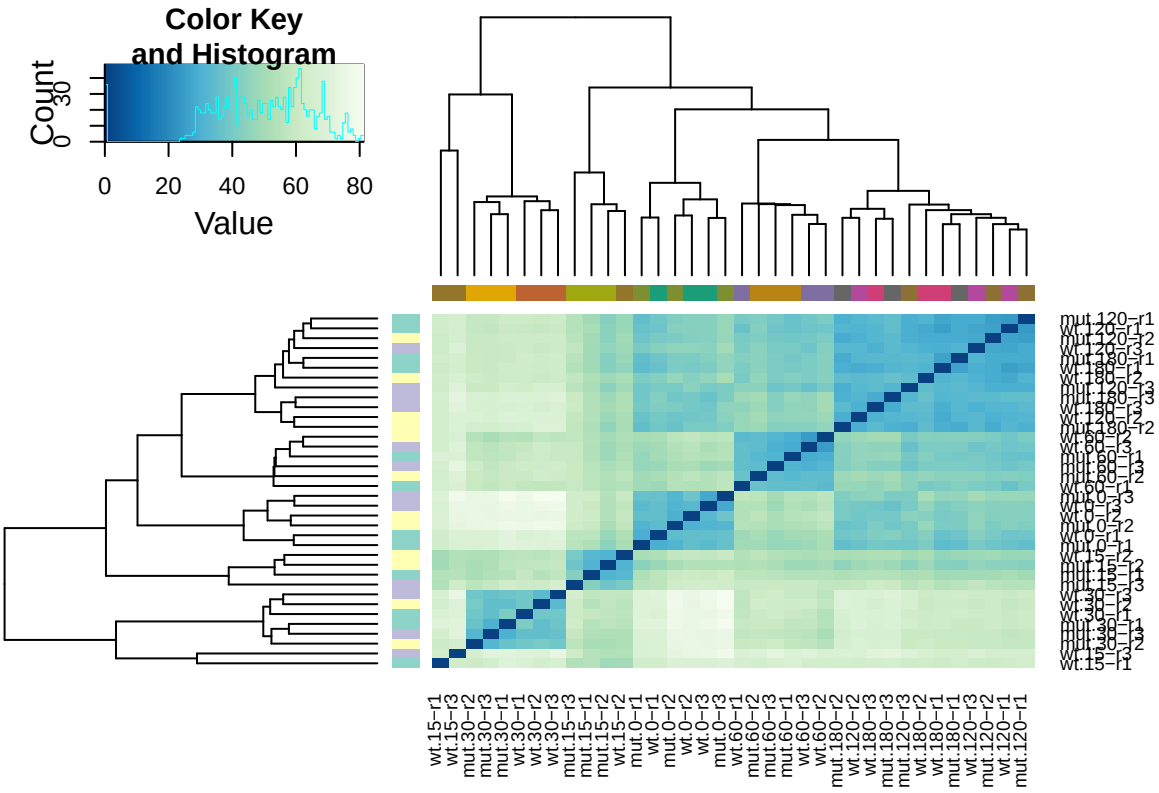

```
hpgl_corheat(batchnorm_expt)
```



```
hpgl_disheat(norm_expt)
```




```
hpgl_disheat(batchnorm_expt)
```



Some simple differential expression analyses

```
all_pairwise = limma_pairwise(normbatch_expt, conditions=norm_expt$conditions, batches=norm_expt$batches
```

```
## libsize was not specified, this parameter has profound effects on limma's result.
## Using the libsize from expt$best_libsize.
```

```
## [1] "As a reference, the identity is: mut.0 = mut.0,"
## [1] "As a reference, the identity is: mut.120 = mut.120,"
## [1] "As a reference, the identity is: mut.15 = mut.15,"
## [1] "As a reference, the identity is: mut.180 = mut.180,"
## [1] "As a reference, the identity is: mut.30 = mut.30,"
## [1] "As a reference, the identity is: mut.60 = mut.60,"
## [1] "As a reference, the identity is: wt.0 = wt.0,"
## [1] "As a reference, the identity is: wt.120 = wt.120,"
## [1] "As a reference, the identity is: wt.15 = wt.15,"
## [1] "As a reference, the identity is: wt.180 = wt.180,"
## [1] "As a reference, the identity is: wt.30 = wt.30,"
## [1] "As a reference, the identity is: wt.60 = wt.60,"
```

```
## 1/78: Printing table: mut.0
## 2/78: Printing table: mut.120
## 3/78: Printing table: mut.15
## 4/78: Printing table: mut.180
## 5/78: Printing table: mut.30
```

```
## 6/78: Printing table: mut.60
## 7/78: Printing table: wt.0
## 8/78: Printing table: wt.120
## 9/78: Printing table: wt.15
## 10/78: Printing table: wt.180
## 11/78: Printing table: wt.30
## 12/78: Printing table: wt.60
## 13/78: Printing table: mut.120_minus_mut.0
## 14/78: Printing table: mut.15_minus_mut.0
## 15/78: Printing table: mut.180_minus_mut.0
## 16/78: Printing table: mut.30_minus_mut.0
## 17/78: Printing table: mut.60_minus_mut.0
## 18/78: Printing table: wt.0_minus_mut.0
## 19/78: Printing table: wt.120_minus_mut.0
## 20/78: Printing table: wt.15_minus_mut.0
## 21/78: Printing table: wt.180_minus_mut.0
## 22/78: Printing table: wt.30_minus_mut.0
## 23/78: Printing table: wt.60_minus_mut.0
## 24/78: Printing table: mut.15_minus_mut.120
## 25/78: Printing table: mut.180_minus_mut.120
## 26/78: Printing table: mut.30_minus_mut.120
## 27/78: Printing table: mut.60_minus_mut.120
## 28/78: Printing table: wt.0_minus_mut.120
## 29/78: Printing table: wt.120_minus_mut.120
## 30/78: Printing table: wt.15_minus_mut.120
## 31/78: Printing table: wt.180_minus_mut.120
## 32/78: Printing table: wt.30_minus_mut.120
## 33/78: Printing table: wt.60_minus_mut.120
## 34/78: Printing table: mut.180_minus_mut.15
## 35/78: Printing table: mut.30_minus_mut.15
## 36/78: Printing table: mut.60_minus_mut.15
## 37/78: Printing table: wt.0_minus_mut.15
## 38/78: Printing table: wt.120_minus_mut.15
## 39/78: Printing table: wt.15_minus_mut.15
## 40/78: Printing table: wt.180_minus_mut.15
## 41/78: Printing table: wt.30_minus_mut.15
## 42/78: Printing table: wt.60_minus_mut.15
## 43/78: Printing table: mut.30_minus_mut.180
## 44/78: Printing table: mut.60_minus_mut.180
## 45/78: Printing table: wt.0_minus_mut.180
## 46/78: Printing table: wt.120_minus_mut.180
## 47/78: Printing table: wt.15_minus_mut.180
## 48/78: Printing table: wt.180_minus_mut.180
## 49/78: Printing table: wt.30_minus_mut.180
## 50/78: Printing table: wt.60_minus_mut.180
## 51/78: Printing table: mut.60_minus_mut.30
## 52/78: Printing table: wt.0_minus_mut.30
## 53/78: Printing table: wt.120_minus_mut.30
## 54/78: Printing table: wt.15_minus_mut.30
## 55/78: Printing table: wt.180_minus_mut.30
## 56/78: Printing table: wt.30_minus_mut.30
## 57/78: Printing table: wt.60_minus_mut.30
## 58/78: Printing table: wt.0_minus_mut.60
## 59/78: Printing table: wt.120_minus_mut.60
```

```
## 60/78: Printing table: wt.15_minus_mut.60
## 61/78: Printing table: wt.180_minus_mut.60
## 62/78: Printing table: wt.30_minus_mut.60
## 63/78: Printing table: wt.60_minus_mut.60
## 64/78: Printing table: wt.120_minus_wt.0
## 65/78: Printing table: wt.15_minus_wt.0
## 66/78: Printing table: wt.180_minus_wt.0
## 67/78: Printing table: wt.30_minus_wt.0
## 68/78: Printing table: wt.60_minus_wt.0
## 69/78: Printing table: wt.15_minus_wt.120
## 70/78: Printing table: wt.180_minus_wt.120
## 71/78: Printing table: wt.30_minus_wt.120
## 72/78: Printing table: wt.60_minus_wt.120
## 73/78: Printing table: wt.180_minus_wt.15
## 74/78: Printing table: wt.30_minus_wt.15
## 75/78: Printing table: wt.60_minus_wt.15
## 76/78: Printing table: wt.30_minus_wt.180
## 77/78: Printing table: wt.60_minus_wt.180
## 78/78: Printing table: wt.60_minus_wt.30
```

```
## I have the following elements in this list:
### conditions_table     :  how many replicates are there of each condition
### batches_table        :  how many replicates are there of each batch
### conditions           :  a factor of all the conditions
### batches              :  a factor of all the batches
### model                :  the model of the data used for voom etc.
### fit                  :  the result of lmfit()
### voom_result          :  the result of voom()
### voom_design          :  the design matrix fed to voom()
### identities           :  the strings fed to makeContrasts() which describe each sample alone
### all_pairwise         :  the strings describing all the subtractions fed to makeContrasts()
### contrast_string      :  the entire string fed to makeContrasts() including the design etc.
### pairwise_fits        :  the result of contrasts.fit()
### pairwise_comparisons :  the result from eBayes()
### limma_result         :  a list of toptable()s corresponding to each pairwise comparison

names(all_pairwise$all_tables)
```

```
##  [1] "mut.0"                 "mut.120"
##  [3] "mut.15"                "mut.180"
##  [5] "mut.30"                "mut.60"
##  [7] "wt.0"                  "wt.120"
##  [9] "wt.15"                 "wt.180"
## [11] "wt.30"                 "wt.60"
## [13] "mut.120_minus_mut.0"   "mut.15_minus_mut.0"
## [15] "mut.180_minus_mut.0"   "mut.30_minus_mut.0"
## [17] "mut.60_minus_mut.0"    "wt.0_minus_mut.0"
## [19] "wt.120_minus_mut.0"    "wt.15_minus_mut.0"
## [21] "wt.180_minus_mut.0"    "wt.30_minus_mut.0"
## [23] "wt.60_minus_mut.0"     "mut.15_minus_mut.120"
## [25] "mut.180_minus_mut.120" "mut.30_minus_mut.120"
## [27] "mut.60_minus_mut.120"  "wt.0_minus_mut.120"
## [29] "wt.120_minus_mut.120"  "wt.15_minus_mut.120"
## [31] "wt.180_minus_mut.120"  "wt.30_minus_mut.120"
```

```
## [33] "wt.60_minus_mut.120"   "mut.180_minus_mut.15"
## [35] "mut.30_minus_mut.15"   "mut.60_minus_mut.15"
## [37] "wt.0_minus_mut.15"     "wt.120_minus_mut.15"
## [39] "wt.15_minus_mut.15"    "wt.180_minus_mut.15"
## [41] "wt.30_minus_mut.15"    "wt.60_minus_mut.15"
## [43] "mut.30_minus_mut.180"  "mut.60_minus_mut.180"
## [45] "wt.0_minus_mut.180"    "wt.120_minus_mut.180"
## [47] "wt.15_minus_mut.180"   "wt.180_minus_mut.180"
## [49] "wt.30_minus_mut.180"   "wt.60_minus_mut.180"
## [51] "mut.60_minus_mut.30"   "wt.0_minus_mut.30"
## [53] "wt.120_minus_mut.30"   "wt.15_minus_mut.30"
## [55] "wt.180_minus_mut.30"   "wt.30_minus_mut.30"
## [57] "wt.60_minus_mut.30"    "wt.0_minus_mut.60"
## [59] "wt.120_minus_mut.60"   "wt.15_minus_mut.60"
## [61] "wt.180_minus_mut.60"   "wt.30_minus_mut.60"
## [63] "wt.60_minus_mut.60"    "wt.120_minus_wt.0"
## [65] "wt.15_minus_wt.0"      "wt.180_minus_wt.0"
## [67] "wt.30_minus_wt.0"      "wt.60_minus_wt.0"
## [69] "wt.15_minus_wt.120"    "wt.180_minus_wt.120"
## [71] "wt.30_minus_wt.120"    "wt.60_minus_wt.120"
## [73] "wt.180_minus_wt.15"    "wt.30_minus_wt.15"
## [75] "wt.60_minus_wt.15"     "wt.30_minus_wt.180"
## [77] "wt.60_minus_wt.180"    "wt.60_minus_wt.30"
```

```
summary(all_pairwise$all_tables$wt.120_minus_mut.120)
```

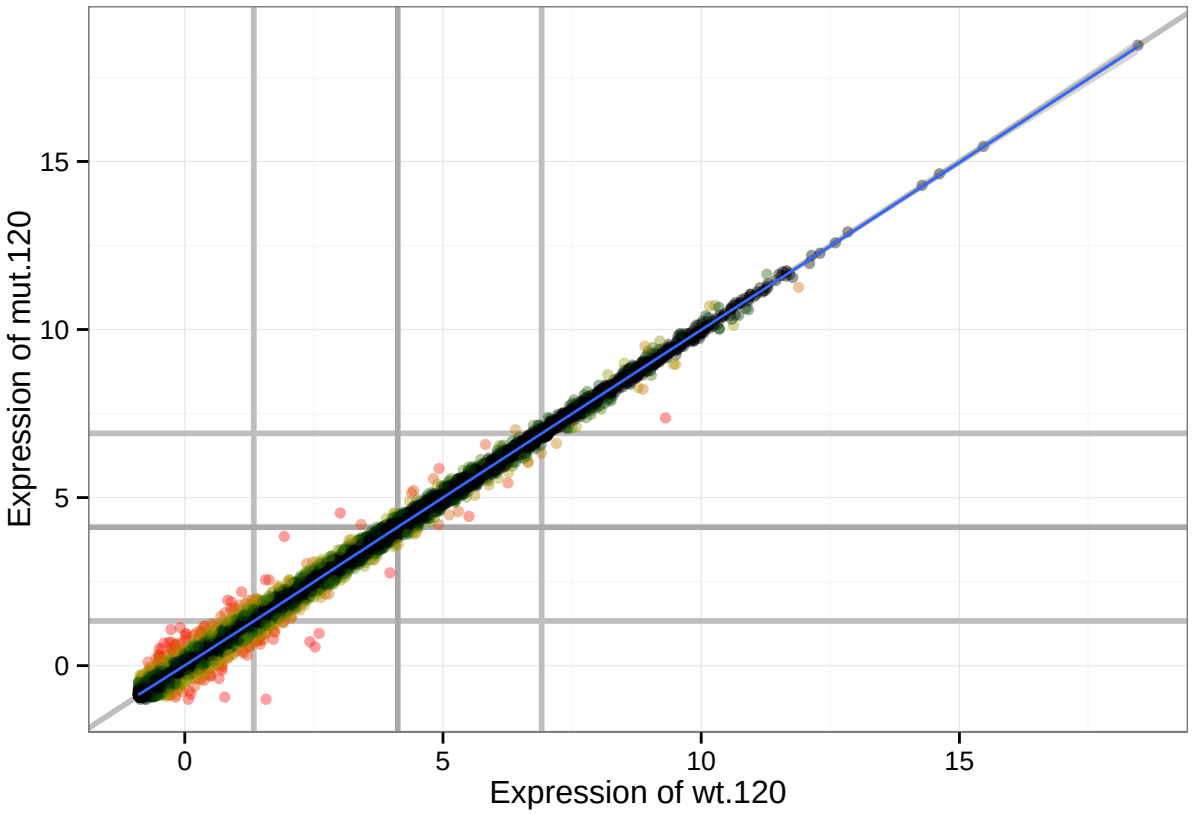
```
##      logFC              AveExpr              t
##  Min.   :-1.9159878   Min.   :-0.8891   Min.   :-5.19733
##  1st Qu.:-0.0934409   1st Qu.: 1.5572   1st Qu.:-0.57454
##  Median :-0.0004676   Median : 4.1264   Median :-0.01783
##  Mean   :-0.0006453   Mean   : 3.7550   Mean   :-0.03102
##  3rd Qu.: 0.0880072   3rd Qu.: 5.5871   3rd Qu.: 0.53622
##  Max.   : 2.5735281   Max.   :18.4575   Max.   : 5.75051
##     P.Value            adj.P.Val             B              qvalue
##  Min.   :0.0000054   Min.   :0.03819   Min.   :-5.879   Min.   :0.03819
##  1st Qu.:0.3321500   1st Qu.:0.99940   1st Qu.:-5.499   1st Qu.:0.99940
##  Median :0.5847000   Median :0.99940   Median :-5.102   Median :0.99940
##  Mean   :0.5678418   Mean   :0.99783   Mean   :-5.108   Mean   :0.99783
##  3rd Qu.:0.8280500   3rd Qu.:0.99940   3rd Qu.:-4.927   3rd Qu.:0.99940
##  Max.   :0.9997000   Max.   :0.99970   Max.   : 1.755   Max.   :0.99970
```

```
wt_120 = all_pairwise$all_tables$wt.120
mut_120 = all_pairwise$all_tables$mut.120

scatter_wt_mut = coefficient_scatter(all_pairwise, x="wt.120", y="mut.120", gvis_filename=NULL)
```

```
## [1] "This can do comparisons among the following columns in the limma result:"
##  [1] "mut.0"                 "mut.120"
##  [3] "mut.15"                "mut.180"
##  [5] "mut.30"                "mut.60"
##  [7] "wt.0"                  "wt.120"
##  [9] "wt.15"                 "wt.180"
## [11] "wt.30"                 "wt.60"
```

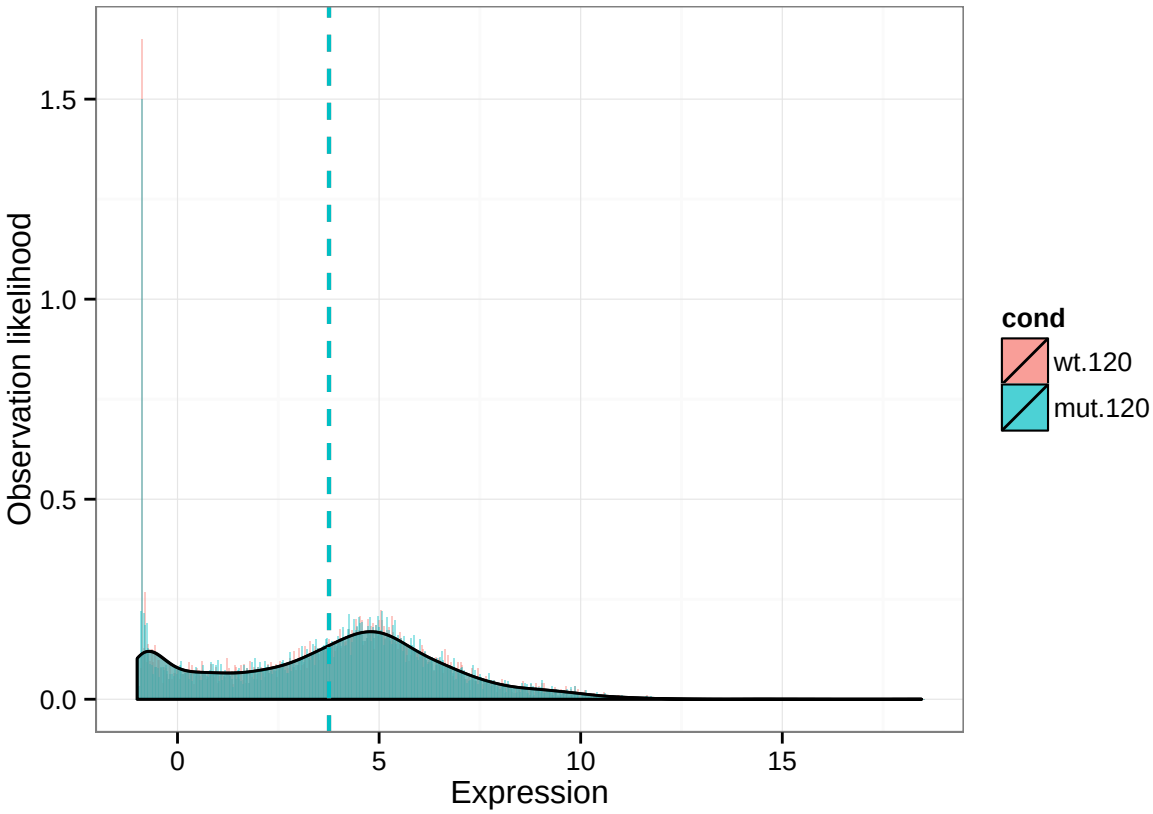
```
## [13] "mut.120_minus_mut.0"   "mut.15_minus_mut.0"
## [15] "mut.180_minus_mut.0"   "mut.30_minus_mut.0"
## [17] "mut.60_minus_mut.0"    "wt.0_minus_mut.0"
## [19] "wt.120_minus_mut.0"    "wt.15_minus_mut.0"
## [21] "wt.180_minus_mut.0"    "wt.30_minus_mut.0"
## [23] "wt.60_minus_mut.0"     "mut.15_minus_mut.120"
## [25] "mut.180_minus_mut.120" "mut.30_minus_mut.120"
## [27] "mut.60_minus_mut.120"  "wt.0_minus_mut.120"
## [29] "wt.120_minus_mut.120"  "wt.15_minus_mut.120"
## [31] "wt.180_minus_mut.120"  "wt.30_minus_mut.120"
## [33] "wt.60_minus_mut.120"   "mut.180_minus_mut.15"
## [35] "mut.30_minus_mut.15"   "mut.60_minus_mut.15"
## [37] "wt.0_minus_mut.15"     "wt.120_minus_mut.15"
## [39] "wt.15_minus_mut.15"    "wt.180_minus_mut.15"
## [41] "wt.30_minus_mut.15"    "wt.60_minus_mut.15"
## [43] "mut.30_minus_mut.180"  "mut.60_minus_mut.180"
## [45] "wt.0_minus_mut.180"    "wt.120_minus_mut.180"
## [47] "wt.15_minus_mut.180"   "wt.180_minus_mut.180"
## [49] "wt.30_minus_mut.180"   "wt.60_minus_mut.180"
## [51] "mut.60_minus_mut.30"   "wt.0_minus_mut.30"
## [53] "wt.120_minus_mut.30"   "wt.15_minus_mut.30"
## [55] "wt.180_minus_mut.30"   "wt.30_minus_mut.30"
## [57] "wt.60_minus_mut.30"    "wt.0_minus_mut.60"
## [59] "wt.120_minus_mut.60"   "wt.15_minus_mut.60"
## [61] "wt.180_minus_mut.60"   "wt.30_minus_mut.60"
## [63] "wt.60_minus_mut.60"    "wt.120_minus_wt.0"
## [65] "wt.15_minus_wt.0"      "wt.180_minus_wt.0"
## [67] "wt.30_minus_wt.0"      "wt.60_minus_wt.0"
## [69] "wt.15_minus_wt.120"    "wt.180_minus_wt.120"
## [71] "wt.30_minus_wt.120"    "wt.60_minus_wt.120"
## [73] "wt.180_minus_wt.15"    "wt.30_minus_wt.15"
## [75] "wt.60_minus_wt.15"     "wt.30_minus_wt.180"
## [77] "wt.60_minus_wt.180"    "wt.60_minus_wt.30"
## [1] "Actually comparing wt.120 and mut.120."

## No binwidth nor bins provided, setting it to 0.0389150079764497 in order to have 500 bins.
```

```
scatter_wt_mut$scatter
```




```
scatter_wt_mut$both_histogram
```

```
## $plot
```




```
##
## $data_summary
##      wt.120           mut.120
##  Min.   :-0.9011   Min.   :-1.000
##  1st Qu.: 1.5503   1st Qu.: 1.552
##  Median : 4.1239   Median : 4.120
##  Mean   : 3.7575   Mean   : 3.758
##  3rd Qu.: 5.6070   3rd Qu.: 5.615
##  Max.   :18.4575   Max.   :18.458
##
## $uncor_t
##
##  Pairwise comparisons using t tests with pooled SD
##
## data:  play_all$expression and play_all$cond
##
##         wt.120
## mut.120 0.99
##
## P value adjustment method: none
##
## $bon_t
##
##  Pairwise comparisons using t tests with pooled SD
##
## data:  play_all$expression and play_all$cond
##
##         wt.120
```

```
## mut.120 0.99
##
## P value adjustment method: bonferroni
```

Compare limma/DESeq2/EdgeR

```
all_comparison = all_pairwise(normbatch_expt)
```

```
## libsize was not specified, this parameter has profound effects on limma's result.
## Using the libsize from expt$best_libsize.
```

```
## [1] "As a reference, the identity is: mut.0 = mut.0,"
## [1] "As a reference, the identity is: mut.120 = mut.120,"
## [1] "As a reference, the identity is: mut.15 = mut.15,"
## [1] "As a reference, the identity is: mut.180 = mut.180,"
## [1] "As a reference, the identity is: mut.30 = mut.30,"
## [1] "As a reference, the identity is: mut.60 = mut.60,"
## [1] "As a reference, the identity is: wt.0 = wt.0,"
## [1] "As a reference, the identity is: wt.120 = wt.120,"
## [1] "As a reference, the identity is: wt.15 = wt.15,"
## [1] "As a reference, the identity is: wt.180 = wt.180,"
## [1] "As a reference, the identity is: wt.30 = wt.30,"
## [1] "As a reference, the identity is: wt.60 = wt.60,"
```

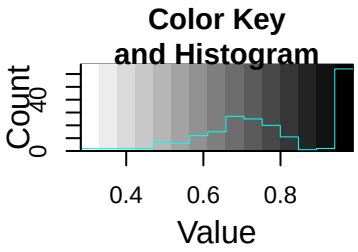
```
## 1/78: Printing table: mut.0
## 2/78: Printing table: mut.120
## 3/78: Printing table: mut.15
## 4/78: Printing table: mut.180
## 5/78: Printing table: mut.30
## 6/78: Printing table: mut.60
## 7/78: Printing table: wt.0
## 8/78: Printing table: wt.120
## 9/78: Printing table: wt.15
## 10/78: Printing table: wt.180
## 11/78: Printing table: wt.30
## 12/78: Printing table: wt.60
## 13/78: Printing table: mut.120_minus_mut.0
## 14/78: Printing table: mut.15_minus_mut.0
## 15/78: Printing table: mut.180_minus_mut.0
## 16/78: Printing table: mut.30_minus_mut.0
## 17/78: Printing table: mut.60_minus_mut.0
## 18/78: Printing table: wt.0_minus_mut.0
## 19/78: Printing table: wt.120_minus_mut.0
## 20/78: Printing table: wt.15_minus_mut.0
## 21/78: Printing table: wt.180_minus_mut.0
## 22/78: Printing table: wt.30_minus_mut.0
## 23/78: Printing table: wt.60_minus_mut.0
## 24/78: Printing table: mut.15_minus_mut.120
## 25/78: Printing table: mut.180_minus_mut.120
## 26/78: Printing table: mut.30_minus_mut.120
## 27/78: Printing table: mut.60_minus_mut.120
```

```
## 28/78: Printing table: wt.0_minus_mut.120
## 29/78: Printing table: wt.120_minus_mut.120
## 30/78: Printing table: wt.15_minus_mut.120
## 31/78: Printing table: wt.180_minus_mut.120
## 32/78: Printing table: wt.30_minus_mut.120
## 33/78: Printing table: wt.60_minus_mut.120
## 34/78: Printing table: mut.180_minus_mut.15
## 35/78: Printing table: mut.30_minus_mut.15
## 36/78: Printing table: mut.60_minus_mut.15
## 37/78: Printing table: wt.0_minus_mut.15
## 38/78: Printing table: wt.120_minus_mut.15
## 39/78: Printing table: wt.15_minus_mut.15
## 40/78: Printing table: wt.180_minus_mut.15
## 41/78: Printing table: wt.30_minus_mut.15
## 42/78: Printing table: wt.60_minus_mut.15
## 43/78: Printing table: mut.30_minus_mut.180
## 44/78: Printing table: mut.60_minus_mut.180
## 45/78: Printing table: wt.0_minus_mut.180
## 46/78: Printing table: wt.120_minus_mut.180
## 47/78: Printing table: wt.15_minus_mut.180
## 48/78: Printing table: wt.180_minus_mut.180
## 49/78: Printing table: wt.30_minus_mut.180
## 50/78: Printing table: wt.60_minus_mut.180
## 51/78: Printing table: mut.60_minus_mut.30
## 52/78: Printing table: wt.0_minus_mut.30
## 53/78: Printing table: wt.120_minus_mut.30
## 54/78: Printing table: wt.15_minus_mut.30
## 55/78: Printing table: wt.180_minus_mut.30
## 56/78: Printing table: wt.30_minus_mut.30
## 57/78: Printing table: wt.60_minus_mut.30
## 58/78: Printing table: wt.0_minus_mut.60
## 59/78: Printing table: wt.120_minus_mut.60
## 60/78: Printing table: wt.15_minus_mut.60
## 61/78: Printing table: wt.180_minus_mut.60
## 62/78: Printing table: wt.30_minus_mut.60
## 63/78: Printing table: wt.60_minus_mut.60
## 64/78: Printing table: wt.120_minus_wt.0
## 65/78: Printing table: wt.15_minus_wt.0
## 66/78: Printing table: wt.180_minus_wt.0
## 67/78: Printing table: wt.30_minus_wt.0
## 68/78: Printing table: wt.60_minus_wt.0
## 69/78: Printing table: wt.15_minus_wt.120
## 70/78: Printing table: wt.180_minus_wt.120
## 71/78: Printing table: wt.30_minus_wt.120
## 72/78: Printing table: wt.60_minus_wt.120
## 73/78: Printing table: wt.180_minus_wt.15
## 74/78: Printing table: wt.30_minus_wt.15
## 75/78: Printing table: wt.60_minus_wt.15
## 76/78: Printing table: wt.30_minus_wt.180
## 77/78: Printing table: wt.60_minus_wt.180
## 78/78: Printing table: wt.60_minus_wt.30

## [1] "DESeq2 demands raw data as input, reverting to the original expressionset."
```

```
## estimating size factors
## estimating dispersions
## gene-wise dispersion estimates
## mean-dispersion relationship
## final dispersion estimates
## fitting model and testing
## At this time, this only does conditional models.
## Using EdgeR to normalize the data.
## Estimating the common dispersion.
## Estimating dispersion across genes.
## Estimating GLM Common dispersion.
## Estimating GLM Trended dispersion.
## Estimating GLM Tagged dispersion.

## [1] "As a reference, the identity is: mut.0 = mut.0,"
## [1] "As a reference, the identity is: mut.120 = mut.120,"
## [1] "As a reference, the identity is: mut.15 = mut.15,"
## [1] "As a reference, the identity is: mut.180 = mut.180,"
## [1] "As a reference, the identity is: mut.30 = mut.30,"
## [1] "As a reference, the identity is: mut.60 = mut.60,"
## [1] "As a reference, the identity is: wt.0 = wt.0,"
## [1] "As a reference, the identity is: wt.120 = wt.120,"
## [1] "As a reference, the identity is: wt.15 = wt.15,"
## [1] "As a reference, the identity is: wt.180 = wt.180,"
## [1] "As a reference, the identity is: wt.30 = wt.30,"
## [1] "As a reference, the identity is: wt.60 = wt.60,"

## 1/66: Performing mut.120_minus_mut.0 contrast.
## 2/66: Performing mut.15_minus_mut.0 contrast.
## 3/66: Performing mut.180_minus_mut.0 contrast.
## 4/66: Performing mut.30_minus_mut.0 contrast.
## 5/66: Performing mut.60_minus_mut.0 contrast.
## 6/66: Performing wt.0_minus_mut.0 contrast.
## 7/66: Performing wt.120_minus_mut.0 contrast.
## 8/66: Performing wt.15_minus_mut.0 contrast.
## 9/66: Performing wt.180_minus_mut.0 contrast.
## 10/66: Performing wt.30_minus_mut.0 contrast.
## 11/66: Performing wt.60_minus_mut.0 contrast.
## 12/66: Performing mut.15_minus_mut.120 contrast.
## 13/66: Performing mut.180_minus_mut.120 contrast.
## 14/66: Performing mut.30_minus_mut.120 contrast.
## 15/66: Performing mut.60_minus_mut.120 contrast.
## 16/66: Performing wt.0_minus_mut.120 contrast.
## 17/66: Performing wt.120_minus_mut.120 contrast.
## 18/66: Performing wt.15_minus_mut.120 contrast.
## 19/66: Performing wt.180_minus_mut.120 contrast.
## 20/66: Performing wt.30_minus_mut.120 contrast.
## 21/66: Performing wt.60_minus_mut.120 contrast.
## 22/66: Performing mut.180_minus_mut.15 contrast.
## 23/66: Performing mut.30_minus_mut.15 contrast.
## 24/66: Performing mut.60_minus_mut.15 contrast.
## 25/66: Performing wt.0_minus_mut.15 contrast.
## 26/66: Performing wt.120_minus_mut.15 contrast.
## 27/66: Performing wt.15_minus_mut.15 contrast.
```

```
## 28/66: Performing wt.180_minus_mut.15 contrast.
## 29/66: Performing wt.30_minus_mut.15 contrast.
## 30/66: Performing wt.60_minus_mut.15 contrast.
## 31/66: Performing mut.30_minus_mut.180 contrast.
## 32/66: Performing mut.60_minus_mut.180 contrast.
## 33/66: Performing wt.0_minus_mut.180 contrast.
## 34/66: Performing wt.120_minus_mut.180 contrast.
## 35/66: Performing wt.15_minus_mut.180 contrast.
## 36/66: Performing wt.180_minus_mut.180 contrast.
## 37/66: Performing wt.30_minus_mut.180 contrast.
## 38/66: Performing wt.60_minus_mut.180 contrast.
## 39/66: Performing mut.60_minus_mut.30 contrast.
## 40/66: Performing wt.0_minus_mut.30 contrast.
## 41/66: Performing wt.120_minus_mut.30 contrast.
## 42/66: Performing wt.15_minus_mut.30 contrast.
## 43/66: Performing wt.180_minus_mut.30 contrast.
## 44/66: Performing wt.30_minus_mut.30 contrast.
## 45/66: Performing wt.60_minus_mut.30 contrast.
## 46/66: Performing wt.0_minus_mut.60 contrast.
## 47/66: Performing wt.120_minus_mut.60 contrast.
## 48/66: Performing wt.15_minus_mut.60 contrast.
## 49/66: Performing wt.180_minus_mut.60 contrast.
## 50/66: Performing wt.30_minus_mut.60 contrast.
## 51/66: Performing wt.60_minus_mut.60 contrast.
## 52/66: Performing wt.120_minus_wt.0 contrast.
## 53/66: Performing wt.15_minus_wt.0 contrast.
## 54/66: Performing wt.180_minus_wt.0 contrast.
## 55/66: Performing wt.30_minus_wt.0 contrast.
## 56/66: Performing wt.60_minus_wt.0 contrast.
## 57/66: Performing wt.15_minus_wt.120 contrast.
## 58/66: Performing wt.180_minus_wt.120 contrast.
## 59/66: Performing wt.30_minus_wt.120 contrast.
## 60/66: Performing wt.60_minus_wt.120 contrast.
## 61/66: Performing wt.180_minus_wt.15 contrast.
## 62/66: Performing wt.30_minus_wt.15 contrast.
## 63/66: Performing wt.60_minus_wt.15 contrast.
## 64/66: Performing wt.30_minus_wt.180 contrast.
## 65/66: Performing wt.60_minus_wt.180 contrast.
## 66/66: Performing wt.60_minus_wt.30 contrast.
## 1/66: Comparing analyses for: mut.120_minus_mut.0
## 2/66: Comparing analyses for: mut.15_minus_mut.0
## 3/66: Comparing analyses for: mut.180_minus_mut.0
## 4/66: Comparing analyses for: mut.30_minus_mut.0
## 5/66: Comparing analyses for: mut.60_minus_mut.0
## 6/66: Comparing analyses for: wt.0_minus_mut.0
## 7/66: Comparing analyses for: wt.120_minus_mut.0
## 8/66: Comparing analyses for: wt.15_minus_mut.0
## 9/66: Comparing analyses for: wt.180_minus_mut.0
## 10/66: Comparing analyses for: wt.30_minus_mut.0
## 11/66: Comparing analyses for: wt.60_minus_mut.0
## 12/66: Comparing analyses for: mut.15_minus_mut.120
## 13/66: Comparing analyses for: mut.180_minus_mut.120
## 14/66: Comparing analyses for: mut.30_minus_mut.120
## 15/66: Comparing analyses for: mut.60_minus_mut.120
```

```
## 16/66: Comparing analyses for: wt.0_minus_mut.120
## 17/66: Comparing analyses for: wt.120_minus_mut.120
## 18/66: Comparing analyses for: wt.15_minus_mut.120
## 19/66: Comparing analyses for: wt.180_minus_mut.120
## 20/66: Comparing analyses for: wt.30_minus_mut.120
## 21/66: Comparing analyses for: wt.60_minus_mut.120
## 22/66: Comparing analyses for: mut.180_minus_mut.15
## 23/66: Comparing analyses for: mut.30_minus_mut.15
## 24/66: Comparing analyses for: mut.60_minus_mut.15
## 25/66: Comparing analyses for: wt.0_minus_mut.15
## 26/66: Comparing analyses for: wt.120_minus_mut.15
## 27/66: Comparing analyses for: wt.15_minus_mut.15
## 28/66: Comparing analyses for: wt.180_minus_mut.15
## 29/66: Comparing analyses for: wt.30_minus_mut.15
## 30/66: Comparing analyses for: wt.60_minus_mut.15
## 31/66: Comparing analyses for: mut.30_minus_mut.180
## 32/66: Comparing analyses for: mut.60_minus_mut.180
## 33/66: Comparing analyses for: wt.0_minus_mut.180
## 34/66: Comparing analyses for: wt.120_minus_mut.180
## 35/66: Comparing analyses for: wt.15_minus_mut.180
## 36/66: Comparing analyses for: wt.180_minus_mut.180
## 37/66: Comparing analyses for: wt.30_minus_mut.180
## 38/66: Comparing analyses for: wt.60_minus_mut.180
## 39/66: Comparing analyses for: mut.60_minus_mut.30
## 40/66: Comparing analyses for: wt.0_minus_mut.30
## 41/66: Comparing analyses for: wt.120_minus_mut.30
## 42/66: Comparing analyses for: wt.15_minus_mut.30
## 43/66: Comparing analyses for: wt.180_minus_mut.30
## 44/66: Comparing analyses for: wt.30_minus_mut.30
## 45/66: Comparing analyses for: wt.60_minus_mut.30
## 46/66: Comparing analyses for: wt.0_minus_mut.60
## 47/66: Comparing analyses for: wt.120_minus_mut.60
## 48/66: Comparing analyses for: wt.15_minus_mut.60
## 49/66: Comparing analyses for: wt.180_minus_mut.60
## 50/66: Comparing analyses for: wt.30_minus_mut.60
## 51/66: Comparing analyses for: wt.60_minus_mut.60
## 52/66: Comparing analyses for: wt.120_minus_wt.0
## 53/66: Comparing analyses for: wt.15_minus_wt.0
## 54/66: Comparing analyses for: wt.180_minus_wt.0
## 55/66: Comparing analyses for: wt.30_minus_wt.0
## 56/66: Comparing analyses for: wt.60_minus_wt.0
## 57/66: Comparing analyses for: wt.15_minus_wt.120
## 58/66: Comparing analyses for: wt.180_minus_wt.120
## 59/66: Comparing analyses for: wt.30_minus_wt.120
## 60/66: Comparing analyses for: wt.60_minus_wt.120
## 61/66: Comparing analyses for: wt.180_minus_wt.15
## 62/66: Comparing analyses for: wt.30_minus_wt.15
## 63/66: Comparing analyses for: wt.60_minus_wt.15
## 64/66: Comparing analyses for: wt.30_minus_wt.180
## 65/66: Comparing analyses for: wt.60_minus_wt.180
## 66/66: Comparing analyses for: wt.60_minus_wt.30
```



Compare DE tools