

# HowTo: Build and use chromosomal information

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## 1 Overview

The `annotate` package provides a class that can be used to model chromosomal information about a species, using one of the metadata packages provided by Bioconductor. This class contains information about the organism and its chromosomes and provides a standardized interface to the information in the metadata packages for other software to quickly extract necessary chromosomal information. An example of using *chromLocation* objects in other software can be found with the `alongChrom` function of the *geneplotter* package in Bioconductor.

## 2 The `chromLocation` class

The *chromLocation* class is used to provide a structure for chromosomal data of a particular organism. In this section, we will discuss the various slots of the class and the methods for interacting with them. Before this though, we will create an object of class *chromLocation* for demonstration purposes later. The helper function `buildChromLocation` is used, and it takes as an argument the name of a Bioconductor metadata package, which is itself used to extract the data. For this vignette, we will be using the *hgu95av2.db* package.

```
> library("annotate")
> z <- buildChromLocation("hgu95av2")
> z
```

Instance of a `chromLocation` class with the following fields:

```
Organism: Homo sapiens
Data source: hgu95av2
Number of chromosomes for this organism: 455
Chromosomes of this organism and their lengths in base pairs:
  1 : 248956422
  2 : 242193529
  3 : 198295559
  4 : 190214555
```

5 : 181538259  
6 : 170805979  
7 : 159345973  
X : 156040895  
8 : 145138636  
9 : 138394717  
11 : 135086622  
10 : 133797422  
12 : 133275309  
13 : 114364328  
14 : 107043718  
15 : 101991189  
16 : 90338345  
17 : 83257441  
18 : 80373285  
20 : 64444167  
19 : 58617616  
Y : 57227415  
22 : 50818468  
21 : 46709983  
15\_KI270905v1\_alt : 5161414  
6\_GL000256v2\_alt : 4929269  
6\_GL000254v2\_alt : 4827813  
6\_GL000251v2\_alt : 4795265  
6\_GL000253v2\_alt : 4677643  
6\_GL000250v2\_alt : 4672374  
6\_GL000255v2\_alt : 4606388  
6\_GL000252v2\_alt : 4604811  
17\_KI270857v1\_alt : 2877074  
16\_KI270853v1\_alt : 2659700  
16\_KI270728v1\_random : 1872759  
17\_GL000258v2\_alt : 1821992  
5\_GL339449v2\_alt : 1612928  
14\_KI270847v1\_alt : 1511111  
17\_KI270908v1\_alt : 1423190  
14\_KI270846v1\_alt : 1351393  
5\_KI270897v1\_alt : 1144418  
7\_KI270803v1\_alt : 1111570  
19\_GL949749v2\_alt : 1091841  
19\_KI270938v1\_alt : 1066800  
19\_GL949750v2\_alt : 1066390  
19\_GL949748v2\_alt : 1064304  
19\_GL949751v2\_alt : 1002683  
19\_GL949746v1\_alt : 987716  
19\_GL949752v1\_alt : 987100  
8\_KI270821v1\_alt : 985506

1\_KI270763v1\_alt : 911658  
6\_KI270801v1\_alt : 870480  
19\_GL949753v2\_alt : 796479  
19\_GL949747v2\_alt : 729520  
8\_KI270822v1\_alt : 624492  
4\_GL000257v2\_alt : 586476  
12\_KI270904v1\_alt : 572349  
4\_KI270925v1\_alt : 555799  
15\_KI270852v1\_alt : 478999  
15\_KI270727v1\_random : 448248  
9\_KI270823v1\_alt : 439082  
15\_KI270850v1\_alt : 430880  
1\_KI270759v1\_alt : 425601  
12\_GL877876v1\_alt : 408271  
Un\_KI270442v1 : 392061  
17\_KI270862v1\_alt : 391357  
15\_GL383555v2\_alt : 388773  
19\_GL383573v1\_alt : 385657  
4\_KI270896v1\_alt : 378547  
4\_GL383528v1\_alt : 376187  
17\_GL383563v3\_alt : 375691  
8\_KI270810v1\_alt : 374415  
1\_GL383520v2\_alt : 366580  
1\_KI270762v1\_alt : 354444  
15\_KI270848v1\_alt : 327382  
17\_KI270909v1\_alt : 325800  
14\_KI270844v1\_alt : 322166  
8\_KI270900v1\_alt : 318687  
10\_GL383546v1\_alt : 309802  
13\_KI270838v1\_alt : 306913  
8\_KI270816v1\_alt : 305841  
22\_KI270879v1\_alt : 304135  
8\_KI270813v1\_alt : 300230  
11\_KI270831v1\_alt : 296895  
15\_GL383554v1\_alt : 296527  
8\_KI270811v1\_alt : 292436  
18\_GL383567v1\_alt : 289831  
X\_KI270880v1\_alt : 284869  
8\_KI270812v1\_alt : 282736  
19\_KI270921v1\_alt : 282224  
17\_KI270729v1\_random : 280839  
17\_JH159146v1\_alt : 278131  
X\_KI270913v1\_alt : 274009  
6\_KI270798v1\_alt : 271782  
7\_KI270808v1\_alt : 271455  
22\_KI270876v1\_alt : 263666

15\_KI270851v1\_alt : 263054  
22\_KI270875v1\_alt : 259914  
1\_KI270766v1\_alt : 256271  
19\_KI270882v1\_alt : 248807  
3\_KI270778v1\_alt : 248252  
15\_KI270849v1\_alt : 244917  
4\_KI270786v1\_alt : 244096  
12\_KI270835v1\_alt : 238139  
17\_KI270858v1\_alt : 235827  
19\_KI270867v1\_alt : 233762  
16\_KI270855v1\_alt : 232857  
8\_KI270926v1\_alt : 229282  
5\_GL949742v1\_alt : 226852  
3\_KI270780v1\_alt : 224108  
17\_GL383565v1\_alt : 223995  
2\_KI270774v1\_alt : 223625  
4\_KI270790v1\_alt : 220246  
11\_KI270927v1\_alt : 218612  
19\_KI270932v1\_alt : 215732  
11\_KI270903v1\_alt : 214625  
2\_KI270894v1\_alt : 214158  
14\_GL000225v1\_random : 211173  
Un\_KI270743v1 : 210658  
11\_KI270832v1\_alt : 210133  
7\_KI270805v1\_alt : 209988  
4\_GL000008v2\_random : 209709  
7\_KI270809v1\_alt : 209586  
19\_KI270887v1\_alt : 209512  
4\_KI270789v1\_alt : 205944  
3\_KI270779v1\_alt : 205312  
19\_KI270914v1\_alt : 205194  
19\_KI270886v1\_alt : 204239  
11\_KI270829v1\_alt : 204059  
14\_GL000009v2\_random : 201709  
21\_GL383579v2\_alt : 201197  
11\_JH159136v1\_alt : 200998  
19\_KI270930v1\_alt : 200773  
Un\_KI270747v1 : 198735  
18\_GL383571v1\_alt : 198278  
19\_KI270920v1\_alt : 198005  
6\_KI270797v1\_alt : 197536  
3\_KI270935v1\_alt : 197351  
17\_KI270861v1\_alt : 196688  
15\_KI270906v1\_alt : 196384  
5\_KI270791v1\_alt : 195710  
14\_KI270722v1\_random : 194050

16\_GL383556v1\_alt : 192462  
13\_KI270840v1\_alt : 191684  
14\_GL000194v1\_random : 191469  
11\_JH159137v1\_alt : 191409  
19\_KI270917v1\_alt : 190932  
7\_KI270899v1\_alt : 190869  
19\_KI270923v1\_alt : 189352  
10\_KI270825v1\_alt : 188315  
19\_GL383576v1\_alt : 188024  
19\_KI270922v1\_alt : 187935  
Un\_KI270742v1 : 186739  
22\_KI270878v1\_alt : 186262  
19\_KI270929v1\_alt : 186203  
11\_KI270826v1\_alt : 186169  
6\_KB021644v2\_alt : 185823  
17\_GL000205v2\_random : 185591  
1\_KI270765v1\_alt : 185285  
19\_KI270916v1\_alt : 184516  
19\_KI270890v1\_alt : 184499  
3\_KI270784v1\_alt : 184404  
12\_GL383551v1\_alt : 184319  
20\_KI270870v1\_alt : 183433  
Un\_GL000195v1 : 182896  
1\_GL383518v1\_alt : 182439  
22\_KI270736v1\_random : 181920  
10\_KI270824v1\_alt : 181496  
14\_KI270845v1\_alt : 180703  
3\_GL383526v1\_alt : 180671  
13\_KI270839v1\_alt : 180306  
22\_KI270733v1\_random : 179772  
Un\_GL000224v1 : 179693  
10\_GL383545v1\_alt : 179254  
Un\_GL000219v1 : 179198  
5\_KI270792v1\_alt : 179043  
17\_KI270860v1\_alt : 178921  
19\_GL000209v2\_alt : 177381  
11\_KI270830v1\_alt : 177092  
9\_KI270719v1\_random : 176845  
Un\_GL000216v2 : 176608  
22\_KI270928v1\_alt : 176103  
1\_KI270712v1\_random : 176043  
6\_KI270800v1\_alt : 175808  
1\_KI270706v1\_random : 175055  
2\_KI270776v1\_alt : 174166  
18\_KI270912v1\_alt : 174061  
3\_KI270777v1\_alt : 173649

5\_GL383531v1\_alt : 173459  
3\_JH636055v2\_alt : 173151  
14\_KI270725v1\_random : 172810  
5\_KI270796v1\_alt : 172708  
9\_GL383541v1\_alt : 171286  
19\_KI270885v1\_alt : 171027  
19\_KI270919v1\_alt : 170701  
19\_KI270889v1\_alt : 170698  
19\_KI270891v1\_alt : 170680  
19\_KI270915v1\_alt : 170665  
19\_KI270933v1\_alt : 170537  
19\_KI270883v1\_alt : 170399  
19\_GL383575v2\_alt : 170222  
19\_KI270931v1\_alt : 170148  
12\_GL383550v2\_alt : 169178  
13\_KI270841v1\_alt : 169134  
Un\_KI270744v1 : 168472  
18\_KI270863v1\_alt : 167999  
18\_GL383569v1\_alt : 167950  
12\_GL877875v1\_alt : 167313  
21\_KI270874v1\_alt : 166743  
3\_KI270924v1\_alt : 166540  
1\_KI270761v1\_alt : 165834  
3\_KI270937v1\_alt : 165607  
22\_KI270734v1\_random : 165050  
18\_GL383570v1\_alt : 164789  
5\_KI270794v1\_alt : 164558  
4\_GL383527v1\_alt : 164536  
Un\_GL000213v1 : 164239  
3\_KI270936v1\_alt : 164170  
3\_KI270934v1\_alt : 163458  
9\_GL383539v1\_alt : 162988  
3\_KI270895v1\_alt : 162896  
22\_GL383582v2\_alt : 162811  
3\_KI270782v1\_alt : 162429  
1\_KI270892v1\_alt : 162212  
Un\_GL000220v1 : 161802  
2\_KI270767v1\_alt : 161578  
2\_KI270715v1\_random : 161471  
2\_KI270893v1\_alt : 161218  
Un\_GL000218v1 : 161147  
18\_GL383572v1\_alt : 159547  
8\_KI270817v1\_alt : 158983  
4\_KI270788v1\_alt : 158965  
Un\_KI270749v1 : 158759  
7\_KI270806v1\_alt : 158166

7\_KI270804v1\_alt : 157952  
18\_KI270911v1\_alt : 157710  
Un\_KI270741v1 : 157432  
17\_KI270910v1\_alt : 157099  
19\_KI270884v1\_alt : 157053  
19\_GL383574v1\_alt : 155864  
19\_KI270888v1\_alt : 155532  
3\_GL000221v1\_random : 155397  
11\_GL383547v1\_alt : 154407  
2\_KI270716v1\_random : 153799  
12\_GL383553v2\_alt : 152874  
6\_KI270799v1\_alt : 152148  
22\_KI270731v1\_random : 150754  
Un\_KI270751v1 : 150742  
Un\_KI270750v1 : 148850  
8\_KI270818v1\_alt : 145606  
X\_KI270881v1\_alt : 144206  
21\_KI270873v1\_alt : 143900  
2\_GL383521v1\_alt : 143390  
8\_KI270814v1\_alt : 141812  
12\_GL383552v1\_alt : 138655  
Un\_KI270519v1 : 138126  
2\_KI270775v1\_alt : 138019  
17\_KI270907v1\_alt : 137721  
Un\_GL000214v1 : 137718  
8\_KI270901v1\_alt : 136959  
2\_KI270770v1\_alt : 136240  
16\_KI270854v1\_alt : 134193  
8\_KI270819v1\_alt : 133535  
17\_GL383564v2\_alt : 133151  
2\_KI270772v1\_alt : 133041  
8\_KI270815v1\_alt : 132244  
5\_KI270795v1\_alt : 131892  
5\_KI270898v1\_alt : 130957  
20\_GL383577v2\_alt : 128386  
1\_KI270708v1\_random : 127682  
7\_KI270807v1\_alt : 126434  
5\_KI270793v1\_alt : 126136  
6\_GL383533v1\_alt : 124736  
2\_GL383522v1\_alt : 123821  
19\_KI270918v1\_alt : 123111  
12\_GL383549v1\_alt : 120804  
2\_KI270769v1\_alt : 120616  
4\_KI270785v1\_alt : 119912  
12\_KI270834v1\_alt : 119498  
7\_GL383534v2\_alt : 119183

20\_KI270869v1\_alt : 118774  
21\_GL383581v2\_alt : 116689  
3\_KI270781v1\_alt : 113034  
17\_KI270730v1\_random : 112551  
Un\_KI270438v1 : 112505  
4\_KI270787v1\_alt : 111943  
18\_KI270864v1\_alt : 111737  
2\_KI270771v1\_alt : 110395  
1\_GL383519v1\_alt : 110268  
2\_KI270768v1\_alt : 110099  
1\_KI270760v1\_alt : 109528  
3\_KI270783v1\_alt : 109187  
17\_KI270859v1\_alt : 108763  
11\_KI270902v1\_alt : 106711  
18\_GL383568v1\_alt : 104552  
22\_KI270737v1\_random : 103838  
13\_KI270843v1\_alt : 103832  
22\_KI270877v1\_alt : 101331  
5\_GL383530v1\_alt : 101241  
11\_KI270721v1\_random : 100316  
22\_KI270738v1\_random : 99375  
22\_GL383583v2\_alt : 96924  
2\_GL582966v2\_alt : 96131  
Un\_KI270748v1 : 93321  
Un\_KI270435v1 : 92983  
5\_GL000208v1\_random : 92689  
Un\_KI270538v1 : 91309  
17\_GL383566v1\_alt : 90219  
16\_GL383557v1\_alt : 89672  
17\_JH159148v1\_alt : 88070  
5\_GL383532v1\_alt : 82728  
21\_KI270872v1\_alt : 82692  
Un\_KI270756v1 : 79590  
6\_KI270758v1\_alt : 76752  
12\_KI270833v1\_alt : 76061  
6\_KI270802v1\_alt : 75005  
21\_GL383580v2\_alt : 74653  
22\_KB663609v1\_alt : 74013  
22\_KI270739v1\_random : 73985  
9\_GL383540v1\_alt : 71551  
Un\_KI270757v1 : 71251  
2\_KI270773v1\_alt : 70887  
17\_JH159147v1\_alt : 70345  
11\_KI270827v1\_alt : 67707  
1\_KI270709v1\_random : 66860  
Un\_KI270746v1 : 66486



16\_KI270856v1\_alt : 63982  
 21\_GL383578v2\_alt : 63917  
 Un\_KI270753v1 : 62944  
 19\_KI270868v1\_alt : 61734  
 9\_GL383542v1\_alt : 60032  
 20\_KI270871v1\_alt : 58661  
 12\_KI270836v1\_alt : 56134  
 19\_KI270865v1\_alt : 52969  
 1\_KI270764v1\_alt : 50258  
 Un\_KI270589v1 : 44474  
 14\_KI270726v1\_random : 43739  
 19\_KI270866v1\_alt : 43156  
 22\_KI270735v1\_random : 42811  
 1\_KI270711v1\_random : 42210  
 Un\_KI270745v1 : 41891  
 1\_KI270714v1\_random : 41717  
 22\_KI270732v1\_random : 41543  
 1\_KI270713v1\_random : 40745  
 Un\_KI270754v1 : 40191  
 1\_KI270710v1\_random : 40176  
 12\_KI270837v1\_alt : 40090  
 9\_KI270717v1\_random : 40062  
 14\_KI270724v1\_random : 39555  
 9\_KI270720v1\_random : 39050  
 14\_KI270723v1\_random : 38115  
 9\_KI270718v1\_random : 38054  
 Un\_KI270317v1 : 37690  
 13\_KI270842v1\_alt : 37287  
 Y\_KI270740v1\_random : 37240  
 Un\_KI270755v1 : 36723  
 8\_KI270820v1\_alt : 36640  
 1\_KI270707v1\_random : 32032  
 Un\_KI270579v1 : 31033  
 Un\_KI270752v1 : 27745  
 Un\_KI270512v1 : 22689  
 Un\_KI270322v1 : 21476  
 M : 16569  
 Un\_GL000226v1 : 15008  
 Un\_KI270311v1 : 12399  
 Un\_KI270366v1 : 8320  
 Un\_KI270511v1 : 8127  
 Un\_KI270448v1 : 7992  
 Un\_KI270521v1 : 7642  
 Un\_KI270581v1 : 7046  
 Un\_KI270582v1 : 6504  
 Un\_KI270515v1 : 6361

Un\_KI270588v1 : 6158  
Un\_KI270591v1 : 5796  
Un\_KI270522v1 : 5674  
Un\_KI270507v1 : 5353  
Un\_KI270590v1 : 4685  
Un\_KI270584v1 : 4513  
Un\_KI270320v1 : 4416  
Un\_KI270382v1 : 4215  
Un\_KI270468v1 : 4055  
Un\_KI270467v1 : 3920  
Un\_KI270362v1 : 3530  
Un\_KI270517v1 : 3253  
Un\_KI270593v1 : 3041  
Un\_KI270528v1 : 2983  
Un\_KI270587v1 : 2969  
Un\_KI270364v1 : 2855  
Un\_KI270371v1 : 2805  
Un\_KI270333v1 : 2699  
Un\_KI270374v1 : 2656  
Un\_KI270411v1 : 2646  
Un\_KI270414v1 : 2489  
Un\_KI270510v1 : 2415  
Un\_KI270390v1 : 2387  
Un\_KI270375v1 : 2378  
Un\_KI270420v1 : 2321  
Un\_KI270509v1 : 2318  
Un\_KI270315v1 : 2276  
Un\_KI270302v1 : 2274  
Un\_KI270518v1 : 2186  
Un\_KI270530v1 : 2168  
Un\_KI270304v1 : 2165  
Un\_KI270418v1 : 2145  
Un\_KI270424v1 : 2140  
Un\_KI270417v1 : 2043  
Un\_KI270508v1 : 1951  
Un\_KI270303v1 : 1942  
Un\_KI270381v1 : 1930  
Un\_KI270529v1 : 1899  
Un\_KI270425v1 : 1884  
Un\_KI270396v1 : 1880  
Un\_KI270363v1 : 1803  
Un\_KI270386v1 : 1788  
Un\_KI270465v1 : 1774  
Un\_KI270383v1 : 1750  
Un\_KI270384v1 : 1658  
Un\_KI270330v1 : 1652

```

Un_KI270372v1 : 1650
Un_KI270548v1 : 1599
Un_KI270580v1 : 1553
Un_KI270387v1 : 1537
Un_KI270391v1 : 1484
Un_KI270305v1 : 1472
Un_KI270373v1 : 1451
Un_KI270422v1 : 1445
Un_KI270316v1 : 1444
Un_KI270338v1 : 1428
Un_KI270340v1 : 1428
Un_KI270583v1 : 1400
Un_KI270334v1 : 1368
Un_KI270429v1 : 1361
Un_KI270393v1 : 1308
Un_KI270516v1 : 1300
Un_KI270389v1 : 1298
Un_KI270466v1 : 1233
Un_KI270388v1 : 1216
Un_KI270544v1 : 1202
Un_KI270310v1 : 1201
Un_KI270412v1 : 1179
Un_KI270395v1 : 1143
Un_KI270376v1 : 1136
Un_KI270337v1 : 1121
Un_KI270335v1 : 1048
Un_KI270378v1 : 1048
Un_KI270379v1 : 1045
Un_KI270329v1 : 1040
Un_KI270419v1 : 1029
Un_KI270336v1 : 1026
Un_KI270312v1 : 998
Un_KI270539v1 : 993
Un_KI270385v1 : 990
Un_KI270423v1 : 981
Un_KI270392v1 : 971
Un_KI270394v1 : 970

```

Once we have an object of the *chromLocation* class, we can now access its various slots to get the information contained within it. There are six slots in this class:

```

organism:      This lists the organism that this object is describing.
dataSource:    Where this data was acquired from.
chromLocs:     A list with an element for every unique chromosome
               name, where each element contains a named vector where
               the names are probe IDs and the values describe the

```

location of that probe on the chromosome. Negative values indicate that the location is on the antisense strand.

**probesToChrom:** A hash table which will translate a probe ID to the chromosome it belongs to.

**chromInfo:** A numerical vector representing each chromosome, where the names are the names of the chromosomes and the values are the lengths of those chromosomes.

**geneSymbols:** An environment that maps a probe ID to the appropriate gene symbol.

There is a basic 'get' type method for each of these slots, all with the same name as the respective slot. In the following example, we will demonstrate these basic methods. For the **probesToChrom** and **geneSymbols** methods, the return value is an environment which maps a probe ID to other values, we will be using the probe ID '32972\_at', which was selected at random for these examples. We are showing only part of the **chromLocs** method's output as it is quite long in its entirety.

```
> organism(z)

[1] "Homo sapiens"

> dataSource(z)

[1] "hgu95av2"

> ## The chromLocs list is extremely large. Let's only
> ## look at one of the elements.
> names(chromLocs(z))

[1] "1"           "10"          "11"
[4] "12"          "13"          "14"
[7] "15"          "16"          "17"
[10] "18"          "19"          "2"
[13] "20"          "21"          "22"
[16] "22_KI270879v1_alt" "3"           "4"
[19] "5"           "6"           "7"
[22] "8"           "9"           "X"
[25] "Y"           "17_KI270862v1_alt" "17_KI270857v1_alt"
[28] "20_KI270869v1_alt" "11_KI270832v1_alt" "19_KI270867v1_alt"
[31] "11_KI270831v1_alt" "16_KI270853v1_alt" "5_GL339449v2_alt"
[34] "15_KI270849v1_alt" "10_GL383546v1_alt" "2_GL383522v1_alt"
[37] "13_KI270842v1_alt" "17_GL383564v2_alt" "6_GL000251v2_alt"
[40] "6_GL000254v2_alt" "6_GL000256v2_alt" "20_KI270870v1_alt"
[43] "19_KI270866v1_alt" "8_KI270822v1_alt" "8_KI270819v1_alt"
[46] "17_GL383563v3_alt" "12_KI270904v1_alt" "7_KI270803v1_alt"
[49] "1_GL383519v1_alt" "4_GL000257v2_alt" "2_KI270776v1_alt"
```

|       |                        |                     |                        |
|-------|------------------------|---------------------|------------------------|
| [52]  | "14_KI270846v1_alt"    | "22_KI270875v1_alt" | "19_KI270868v1_alt"    |
| [55]  | "8_KI270821v1_alt"     | "15_KI270905v1_alt" | "11_KI270721v1_random" |
| [58]  | "17_JH159146v1_alt"    | "8_KI270816v1_alt"  | "14_KI270847v1_alt"    |
| [61]  | "17_KI270861v1_alt"    | "5_KI270791v1_alt"  | "8_KI270814v1_alt"     |
| [64]  | "16_KI270855v1_alt"    | "9_GL383540v1_alt"  | "4_GL383527v1_alt"     |
| [67]  | "7_KI270808v1_alt"     | "8_KI270817v1_alt"  | "19_GL383574v1_alt"    |
| [70]  | "22_KI270877v1_alt"    | "2_KI270769v1_alt"  | "17_KI270860v1_alt"    |
| [73]  | "1_KI270762v1_alt"     | "10_KI270825v1_alt" | "1_GL383518v1_alt"     |
| [76]  | "11_KI270927v1_alt"    | "17_GL000258v2_alt" | "17_KI270908v1_alt"    |
| [79]  | "17_KI270909v1_alt"    | "11_KI270902v1_alt" | "21_KI270873v1_alt"    |
| [82]  | "5_KI270898v1_alt"     | "5_KI270795v1_alt"  | "19_GL383575v2_alt"    |
| [85]  | "7_KI270806v1_alt"     | "6_GL000255v2_alt"  | "12_GL877876v1_alt"    |
| [88]  | "20_KI270871v1_alt"    | "9_KI270823v1_alt"  | "12_KI270837v1_alt"    |
| [91]  | "7_KI270809v1_alt"     | "15_KI270851v1_alt" | "21_GL383581v2_alt"    |
| [94]  | "6_KI270801v1_alt"     | "19_GL949746v1_alt" | "19_GL949752v1_alt"    |
| [97]  | "19_KI270938v1_alt"    | "19_GL949747v2_alt" | "19_GL949753v2_alt"    |
| [100] | "22_KI270734v1_random" | "12_GL877875v1_alt" | "15_KI270850v1_alt"    |
| [103] | "2_GL582966v2_alt"     | "12_KI270833v1_alt" | "2_KI270774v1_alt"     |
| [106] | "6_GL000252v2_alt"     | "19_GL383573v1_alt" | "19_KI270865v1_alt"    |
| [109] | "3_KI270782v1_alt"     | "2_KI270768v1_alt"  | "13_KI270838v1_alt"    |
| [112] | "7_GL383534v2_alt"     | "22_KI270928v1_alt" | "22_KB663609v1_alt"    |
| [115] | "22_GL383582v2_alt"    | "21_KI270872v1_alt" | "16_KI270854v1_alt"    |
| [118] | "6_GL000250v2_alt"     | "18_KI270863v1_alt" | "5_KI270897v1_alt"     |
| [121] | "6_GL000253v2_alt"     | "8_KI270812v1_alt"  | "8_KI270818v1_alt"     |
| [124] | "8_KI270900v1_alt"     | "8_KI270926v1_alt"  | "1_GL383520v2_alt"     |
| [127] | "1_KI270763v1_alt"     | "6_KI270758v1_alt"  | "15_KI270848v1_alt"    |
| [130] | "19_GL949749v2_alt"    | "19_GL949750v2_alt" | "19_GL949751v2_alt"    |
| [133] | "19_GL949748v2_alt"    | "19_KI270917v1_alt" | "19_KI270920v1_alt"    |
| [136] | "19_KI270921v1_alt"    | "19_KI270922v1_alt" | "19_KI270923v1_alt"    |
| [139] | "19_KI270929v1_alt"    | "22_KI270876v1_alt" | "3_KI270895v1_alt"     |
| [142] | "3_KI270934v1_alt"     | "3_KI270935v1_alt"  | "3_KI270936v1_alt"     |
| [145] | "3_KI270937v1_alt"     | "3_KI270779v1_alt"  | "3_KI270924v1_alt"     |
| [148] | "17_KI270910v1_alt"    | "19_GL000209v2_alt" | "19_KI270882v1_alt"    |
| [151] | "19_KI270883v1_alt"    | "19_KI270884v1_alt" | "19_KI270885v1_alt"    |
| [154] | "19_KI270886v1_alt"    | "19_KI270887v1_alt" | "19_KI270888v1_alt"    |
| [157] | "19_KI270889v1_alt"    | "19_KI270890v1_alt" | "19_KI270891v1_alt"    |
| [160] | "19_KI270914v1_alt"    | "19_KI270915v1_alt" | "19_KI270916v1_alt"    |
| [163] | "19_KI270918v1_alt"    | "19_KI270919v1_alt" | "19_KI270930v1_alt"    |
| [166] | "19_KI270931v1_alt"    | "19_KI270932v1_alt" | "19_KI270933v1_alt"    |

> chromLocs(z)[["Y"]]

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| 40097_at | 41214_at | 1185_at    | 31534_at | 31534_at | 34753_at  | 38182_at |
| 20575710 | 2841581  | 1336615    | 2935476  | 2935070  | 57067799  | 19567357 |

|            |            |            |            |            |            |            |
|------------|------------|------------|------------|------------|------------|------------|
| 38182_at   | 40435_at   | 40436_g_at | 41108_at   | 938_at     | 31411_at   | 31411_at   |
| 19567357   | -1386151   | -1386151   | -304749    | 57184100   | 22984262   | 24618003   |
| 31411_at   | 34477_at   | 34477_at   | 34477_at   | 34172_s_at | 34172_s_at | 34215_at   |
| -25030900  | -13297508  | -13323033  | -13248378  | 1591592    | 1591592    | 1591592    |
| 34215_at   | 35073_at   | 35073_at   | 36553_at   | 36553_at   | 36554_at   | 36554_at   |
| 1591592    | 624343     | 624343     | -1403138   | -1403138   | -1403138   | -1403138   |
| 38355_at   | 38355_at   | 38355_at   | 38355_at   | 39168_at   | 39168_at   | 41138_at   |
| 12905704   | 12904785   | 12904857   | 12903998   | -2486413   | -2486413   | 2691132    |
| 41138_at   | 32930_f_at | 32930_f_at | 32930_f_at | 32930_f_at | 32930_f_at | 33665_s_at |
| 2691132    | 14523504   | 14523745   | 14522607   | 14524573   | 14622020   | 1268799    |
| 33665_s_at | 33665_s_at | 35447_s_at | 35447_s_at | 35447_s_at |            |            |
| 1282677    | 1268799    | 1595454    | 1615132    | 1615047    |            |            |

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[1] "X"
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> chromInfo(z)
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| 4                 | 5                    | 6                 |
| 190214555         | 181538259            | 170805979         |
| 7                 | X                    | 8                 |
| 159345973         | 156040895            | 145138636         |
| 9                 | 11                   | 10                |
| 138394717         | 135086622            | 133797422         |
| 12                | 13                   | 14                |
| 133275309         | 114364328            | 107043718         |
| 15                | 16                   | 17                |
| 101991189         | 90338345             | 83257441          |
| 18                | 20                   | 19                |
| 80373285          | 64444167             | 58617616          |
| Y                 | 22                   | 21                |
| 57227415          | 50818468             | 46709983          |
| 15_KI270905v1_alt | 6_GL000256v2_alt     | 6_GL000254v2_alt  |
| 5161414           | 4929269              | 4827813           |
| 6_GL000251v2_alt  | 6_GL000253v2_alt     | 6_GL000250v2_alt  |
| 4795265           | 4677643              | 4672374           |
| 6_GL000255v2_alt  | 6_GL000252v2_alt     | 17_KI270857v1_alt |
| 4606388           | 4604811              | 2877074           |
| 16_KI270853v1_alt | 16_KI270728v1_random | 17_GL000258v2_alt |
| 2659700           | 1872759              | 1821992           |
| 5_GL339449v2_alt  | 14_KI270847v1_alt    | 17_KI270908v1_alt |
| 1612928           | 1511111              | 1423190           |
| 14_KI270846v1_alt | 5_KI270897v1_alt     | 7_KI270803v1_alt  |
| 1351393           | 1144418              | 1111570           |

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|----------------------|-------------------|----------------------|
| 19_GL949749v2_alt    | 19_KI270938v1_alt | 19_GL949750v2_alt    |
| 1091841              | 1066800           | 1066390              |
| 19_GL949748v2_alt    | 19_GL949751v2_alt | 19_GL949746v1_alt    |
| 1064304              | 1002683           | 987716               |
| 19_GL949752v1_alt    | 8_KI270821v1_alt  | 1_KI270763v1_alt     |
| 987100               | 985506            | 911658               |
| 6_KI270801v1_alt     | 19_GL949753v2_alt | 19_GL949747v2_alt    |
| 870480               | 796479            | 729520               |
| 8_KI270822v1_alt     | 4_GL000257v2_alt  | 12_KI270904v1_alt    |
| 624492               | 586476            | 572349               |
| 4_KI270925v1_alt     | 15_KI270852v1_alt | 15_KI270727v1_random |
| 555799               | 478999            | 448248               |
| 9_KI270823v1_alt     | 15_KI270850v1_alt | 1_KI270759v1_alt     |
| 439082               | 430880            | 425601               |
| 12_GL877876v1_alt    | Un_KI270442v1     | 17_KI270862v1_alt    |
| 408271               | 392061            | 391357               |
| 15_GL383555v2_alt    | 19_GL383573v1_alt | 4_KI270896v1_alt     |
| 388773               | 385657            | 378547               |
| 4_GL383528v1_alt     | 17_GL383563v3_alt | 8_KI270810v1_alt     |
| 376187               | 375691            | 374415               |
| 1_GL383520v2_alt     | 1_KI270762v1_alt  | 15_KI270848v1_alt    |
| 366580               | 354444            | 327382               |
| 17_KI270909v1_alt    | 14_KI270844v1_alt | 8_KI270900v1_alt     |
| 325800               | 322166            | 318687               |
| 10_GL383546v1_alt    | 13_KI270838v1_alt | 8_KI270816v1_alt     |
| 309802               | 306913            | 305841               |
| 22_KI270879v1_alt    | 8_KI270813v1_alt  | 11_KI270831v1_alt    |
| 304135               | 300230            | 296895               |
| 15_GL383554v1_alt    | 8_KI270811v1_alt  | 18_GL383567v1_alt    |
| 296527               | 292436            | 289831               |
| X_KI270880v1_alt     | 8_KI270812v1_alt  | 19_KI270921v1_alt    |
| 284869               | 282736            | 282224               |
| 17_KI270729v1_random | 17_JH159146v1_alt | X_KI270913v1_alt     |
| 280839               | 278131            | 274009               |
| 6_KI270798v1_alt     | 7_KI270808v1_alt  | 22_KI270876v1_alt    |
| 271782               | 271455            | 263666               |
| 15_KI270851v1_alt    | 22_KI270875v1_alt | 1_KI270766v1_alt     |
| 263054               | 259914            | 256271               |
| 19_KI270882v1_alt    | 3_KI270778v1_alt  | 15_KI270849v1_alt    |
| 248807               | 248252            | 244917               |
| 4_KI270786v1_alt     | 12_KI270835v1_alt | 17_KI270858v1_alt    |
| 244096               | 238139            | 235827               |
| 19_KI270867v1_alt    | 16_KI270855v1_alt | 8_KI270926v1_alt     |
| 233762               | 232857            | 229282               |
| 5_GL949742v1_alt     | 3_KI270780v1_alt  | 17_GL383565v1_alt    |
| 226852               | 224108            | 223995               |

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|----------------------|----------------------|---------------------|
| 2_KI270774v1_alt     | 4_KI270790v1_alt     | 11_KI270927v1_alt   |
| 223625               | 220246               | 218612              |
| 19_KI270932v1_alt    | 11_KI270903v1_alt    | 2_KI270894v1_alt    |
| 215732               | 214625               | 214158              |
| 14_GL000225v1_random | Un_KI270743v1        | 11_KI270832v1_alt   |
| 211173               | 210658               | 210133              |
| 7_KI270805v1_alt     | 4_GL000008v2_random  | 7_KI270809v1_alt    |
| 209988               | 209709               | 209586              |
| 19_KI270887v1_alt    | 4_KI270789v1_alt     | 3_KI270779v1_alt    |
| 209512               | 205944               | 205312              |
| 19_KI270914v1_alt    | 19_KI270886v1_alt    | 11_KI270829v1_alt   |
| 205194               | 204239               | 204059              |
| 14_GL000009v2_random | 21_GL383579v2_alt    | 11_JH159136v1_alt   |
| 201709               | 201197               | 200998              |
| 19_KI270930v1_alt    | Un_KI270747v1        | 18_GL383571v1_alt   |
| 200773               | 198735               | 198278              |
| 19_KI270920v1_alt    | 6_KI270797v1_alt     | 3_KI270935v1_alt    |
| 198005               | 197536               | 197351              |
| 17_KI270861v1_alt    | 15_KI270906v1_alt    | 5_KI270791v1_alt    |
| 196688               | 196384               | 195710              |
| 14_KI270722v1_random | 16_GL383556v1_alt    | 13_KI270840v1_alt   |
| 194050               | 192462               | 191684              |
| 14_GL000194v1_random | 11_JH159137v1_alt    | 19_KI270917v1_alt   |
| 191469               | 191409               | 190932              |
| 7_KI270899v1_alt     | 19_KI270923v1_alt    | 10_KI270825v1_alt   |
| 190869               | 189352               | 188315              |
| 19_GL383576v1_alt    | 19_KI270922v1_alt    | Un_KI270742v1       |
| 188024               | 187935               | 186739              |
| 22_KI270878v1_alt    | 19_KI270929v1_alt    | 11_KI270826v1_alt   |
| 186262               | 186203               | 186169              |
| 6_KB021644v2_alt     | 17_GL000205v2_random | 1_KI270765v1_alt    |
| 185823               | 185591               | 185285              |
| 19_KI270916v1_alt    | 19_KI270890v1_alt    | 3_KI270784v1_alt    |
| 184516               | 184499               | 184404              |
| 12_GL383551v1_alt    | 20_KI270870v1_alt    | Un_GL000195v1       |
| 184319               | 183433               | 182896              |
| 1_GL383518v1_alt     | 22_KI270736v1_random | 10_KI270824v1_alt   |
| 182439               | 181920               | 181496              |
| 14_KI270845v1_alt    | 3_GL383526v1_alt     | 13_KI270839v1_alt   |
| 180703               | 180671               | 180306              |
| 22_KI270733v1_random | Un_GL000224v1        | 10_GL383545v1_alt   |
| 179772               | 179693               | 179254              |
| Un_GL000219v1        | 5_KI270792v1_alt     | 17_KI270860v1_alt   |
| 179198               | 179043               | 178921              |
| 19_GL000209v2_alt    | 11_KI270830v1_alt    | 9_KI270719v1_random |
| 177381               | 177092               | 176845              |



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| Un_GL000216v2        | 22_KI270928v1_alt    | 1_KI270712v1_random  |
| 176608               | 176103               | 176043               |
| 6_KI270800v1_alt     | 1_KI270706v1_random  | 2_KI270776v1_alt     |
| 175808               | 175055               | 174166               |
| 18_KI270912v1_alt    | 3_KI270777v1_alt     | 5_GL383531v1_alt     |
| 174061               | 173649               | 173459               |
| 3_JH636055v2_alt     | 14_KI270725v1_random | 5_KI270796v1_alt     |
| 173151               | 172810               | 172708               |
| 9_GL383541v1_alt     | 19_KI270885v1_alt    | 19_KI270919v1_alt    |
| 171286               | 171027               | 170701               |
| 19_KI270889v1_alt    | 19_KI270891v1_alt    | 19_KI270915v1_alt    |
| 170698               | 170680               | 170665               |
| 19_KI270933v1_alt    | 19_KI270883v1_alt    | 19_GL383575v2_alt    |
| 170537               | 170399               | 170222               |
| 19_KI270931v1_alt    | 12_GL383550v2_alt    | 13_KI270841v1_alt    |
| 170148               | 169178               | 169134               |
| Un_KI270744v1        | 18_KI270863v1_alt    | 18_GL383569v1_alt    |
| 168472               | 167999               | 167950               |
| 12_GL877875v1_alt    | 21_KI270874v1_alt    | 3_KI270924v1_alt     |
| 167313               | 166743               | 166540               |
| 1_KI270761v1_alt     | 3_KI270937v1_alt     | 22_KI270734v1_random |
| 165834               | 165607               | 165050               |
| 18_GL383570v1_alt    | 5_KI270794v1_alt     | 4_GL383527v1_alt     |
| 164789               | 164558               | 164536               |
| Un_GL000213v1        | 3_KI270936v1_alt     | 3_KI270934v1_alt     |
| 164239               | 164170               | 163458               |
| 9_GL383539v1_alt     | 3_KI270895v1_alt     | 22_GL383582v2_alt    |
| 162988               | 162896               | 162811               |
| 3_KI270782v1_alt     | 1_KI270892v1_alt     | Un_GL000220v1        |
| 162429               | 162212               | 161802               |
| 2_KI270767v1_alt     | 2_KI270715v1_random  | 2_KI270893v1_alt     |
| 161578               | 161471               | 161218               |
| Un_GL000218v1        | 18_GL383572v1_alt    | 8_KI270817v1_alt     |
| 161147               | 159547               | 158983               |
| 4_KI270788v1_alt     | Un_KI270749v1        | 7_KI270806v1_alt     |
| 158965               | 158759               | 158166               |
| 7_KI270804v1_alt     | 18_KI270911v1_alt    | Un_KI270741v1        |
| 157952               | 157710               | 157432               |
| 17_KI270910v1_alt    | 19_KI270884v1_alt    | 19_GL383574v1_alt    |
| 157099               | 157053               | 155864               |
| 19_KI270888v1_alt    | 3_GL000221v1_random  | 11_GL383547v1_alt    |
| 155532               | 155397               | 154407               |
| 2_KI270716v1_random  | 12_GL383553v2_alt    | 6_KI270799v1_alt     |
| 153799               | 152874               | 152148               |
| 22_KI270731v1_random | Un_KI270751v1        | Un_KI270750v1        |
| 150754               | 150742               | 148850               |

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| 8_KI270818v1_alt     | X_KI270881v1_alt     | 21_KI270873v1_alt    |
| 145606               | 144206               | 143900               |
| 2_GL383521v1_alt     | 8_KI270814v1_alt     | 12_GL383552v1_alt    |
| 143390               | 141812               | 138655               |
| Un_KI270519v1        | 2_KI270775v1_alt     | 17_KI270907v1_alt    |
| 138126               | 138019               | 137721               |
| Un_GL000214v1        | 8_KI270901v1_alt     | 2_KI270770v1_alt     |
| 137718               | 136959               | 136240               |
| 16_KI270854v1_alt    | 8_KI270819v1_alt     | 17_GL383564v2_alt    |
| 134193               | 133535               | 133151               |
| 2_KI270772v1_alt     | 8_KI270815v1_alt     | 5_KI270795v1_alt     |
| 133041               | 132244               | 131892               |
| 5_KI270898v1_alt     | 20_GL383577v2_alt    | 1_KI270708v1_random  |
| 130957               | 128386               | 127682               |
| 7_KI270807v1_alt     | 5_KI270793v1_alt     | 6_GL383533v1_alt     |
| 126434               | 126136               | 124736               |
| 2_GL383522v1_alt     | 19_KI270918v1_alt    | 12_GL383549v1_alt    |
| 123821               | 123111               | 120804               |
| 2_KI270769v1_alt     | 4_KI270785v1_alt     | 12_KI270834v1_alt    |
| 120616               | 119912               | 119498               |
| 7_GL383534v2_alt     | 20_KI270869v1_alt    | 21_GL383581v2_alt    |
| 119183               | 118774               | 116689               |
| 3_KI270781v1_alt     | 17_KI270730v1_random | Un_KI270438v1        |
| 113034               | 112551               | 112505               |
| 4_KI270787v1_alt     | 18_KI270864v1_alt    | 2_KI270771v1_alt     |
| 111943               | 111737               | 110395               |
| 1_GL383519v1_alt     | 2_KI270768v1_alt     | 1_KI270760v1_alt     |
| 110268               | 110099               | 109528               |
| 3_KI270783v1_alt     | 17_KI270859v1_alt    | 11_KI270902v1_alt    |
| 109187               | 108763               | 106711               |
| 18_GL383568v1_alt    | 22_KI270737v1_random | 13_KI270843v1_alt    |
| 104552               | 103838               | 103832               |
| 22_KI270877v1_alt    | 5_GL383530v1_alt     | 11_KI270721v1_random |
| 101331               | 101241               | 100316               |
| 22_KI270738v1_random | 22_GL383583v2_alt    | 2_GL582966v2_alt     |
| 99375                | 96924                | 96131                |
| Un_KI270748v1        | Un_KI270435v1        | 5_GL000208v1_random  |
| 93321                | 92983                | 92689                |
| Un_KI270538v1        | 17_GL383566v1_alt    | 16_GL383557v1_alt    |
| 91309                | 90219                | 89672                |
| 17_JH159148v1_alt    | 5_GL383532v1_alt     | 21_KI270872v1_alt    |
| 88070                | 82728                | 82692                |
| Un_KI270756v1        | 6_KI270758v1_alt     | 12_KI270833v1_alt    |
| 79590                | 76752                | 76061                |
| 6_KI270802v1_alt     | 21_GL383580v2_alt    | 22_KB663609v1_alt    |
| 75005                | 74653                | 74013                |

|                      |                     |                      |
|----------------------|---------------------|----------------------|
| 22_KI270739v1_random | 9_GL383540v1_alt    | Un_KI270757v1        |
| 73985                | 71551               | 71251                |
| 2_KI270773v1_alt     | 17_JH159147v1_alt   | 11_KI270827v1_alt    |
| 70887                | 70345               | 67707                |
| 1_KI270709v1_random  | Un_KI270746v1       | 16_KI270856v1_alt    |
| 66860                | 66486               | 63982                |
| 21_GL383578v2_alt    | Un_KI270753v1       | 19_KI270868v1_alt    |
| 63917                | 62944               | 61734                |
| 9_GL383542v1_alt     | 20_KI270871v1_alt   | 12_KI270836v1_alt    |
| 60032                | 58661               | 56134                |
| 19_KI270865v1_alt    | 1_KI270764v1_alt    | Un_KI270589v1        |
| 52969                | 50258               | 44474                |
| 14_KI270726v1_random | 19_KI270866v1_alt   | 22_KI270735v1_random |
| 43739                | 43156               | 42811                |
| 1_KI270711v1_random  | Un_KI270745v1       | 1_KI270714v1_random  |
| 42210                | 41891               | 41717                |
| 22_KI270732v1_random | 1_KI270713v1_random | Un_KI270754v1        |
| 41543                | 40745               | 40191                |
| 1_KI270710v1_random  | 12_KI270837v1_alt   | 9_KI270717v1_random  |
| 40176                | 40090               | 40062                |
| 14_KI270724v1_random | 9_KI270720v1_random | 14_KI270723v1_random |
| 39555                | 39050               | 38115                |
| 9_KI270718v1_random  | Un_KI270317v1       | 13_KI270842v1_alt    |
| 38054                | 37690               | 37287                |
| Y_KI270740v1_random  | Un_KI270755v1       | 8_KI270820v1_alt     |
| 37240                | 36723               | 36640                |
| 1_KI270707v1_random  | Un_KI270579v1       | Un_KI270752v1        |
| 32032                | 31033               | 27745                |
| Un_KI270512v1        | Un_KI270322v1       | M                    |
| 22689                | 21476               | 16569                |
| Un_GL000226v1        | Un_KI270311v1       | Un_KI270366v1        |
| 15008                | 12399               | 8320                 |
| Un_KI270511v1        | Un_KI270448v1       | Un_KI270521v1        |
| 8127                 | 7992                | 7642                 |
| Un_KI270581v1        | Un_KI270582v1       | Un_KI270515v1        |
| 7046                 | 6504                | 6361                 |
| Un_KI270588v1        | Un_KI270591v1       | Un_KI270522v1        |
| 6158                 | 5796                | 5674                 |
| Un_KI270507v1        | Un_KI270590v1       | Un_KI270584v1        |
| 5353                 | 4685                | 4513                 |
| Un_KI270320v1        | Un_KI270382v1       | Un_KI270468v1        |
| 4416                 | 4215                | 4055                 |
| Un_KI270467v1        | Un_KI270362v1       | Un_KI270517v1        |
| 3920                 | 3530                | 3253                 |
| Un_KI270593v1        | Un_KI270528v1       | Un_KI270587v1        |
| 3041                 | 2983                | 2969                 |

|               |               |               |
|---------------|---------------|---------------|
| Un_KI270364v1 | Un_KI270371v1 | Un_KI270333v1 |
| 2855          | 2805          | 2699          |
| Un_KI270374v1 | Un_KI270411v1 | Un_KI270414v1 |
| 2656          | 2646          | 2489          |
| Un_KI270510v1 | Un_KI270390v1 | Un_KI270375v1 |
| 2415          | 2387          | 2378          |
| Un_KI270420v1 | Un_KI270509v1 | Un_KI270315v1 |
| 2321          | 2318          | 2276          |
| Un_KI270302v1 | Un_KI270518v1 | Un_KI270530v1 |
| 2274          | 2186          | 2168          |
| Un_KI270304v1 | Un_KI270418v1 | Un_KI270424v1 |
| 2165          | 2145          | 2140          |
| Un_KI270417v1 | Un_KI270508v1 | Un_KI270303v1 |
| 2043          | 1951          | 1942          |
| Un_KI270381v1 | Un_KI270529v1 | Un_KI270425v1 |
| 1930          | 1899          | 1884          |
| Un_KI270396v1 | Un_KI270363v1 | Un_KI270386v1 |
| 1880          | 1803          | 1788          |
| Un_KI270465v1 | Un_KI270383v1 | Un_KI270384v1 |
| 1774          | 1750          | 1658          |
| Un_KI270330v1 | Un_KI270372v1 | Un_KI270548v1 |
| 1652          | 1650          | 1599          |
| Un_KI270580v1 | Un_KI270387v1 | Un_KI270391v1 |
| 1553          | 1537          | 1484          |
| Un_KI270305v1 | Un_KI270373v1 | Un_KI270422v1 |
| 1472          | 1451          | 1445          |
| Un_KI270316v1 | Un_KI270338v1 | Un_KI270340v1 |
| 1444          | 1428          | 1428          |
| Un_KI270583v1 | Un_KI270334v1 | Un_KI270429v1 |
| 1400          | 1368          | 1361          |
| Un_KI270393v1 | Un_KI270516v1 | Un_KI270389v1 |
| 1308          | 1300          | 1298          |
| Un_KI270466v1 | Un_KI270388v1 | Un_KI270544v1 |
| 1233          | 1216          | 1202          |
| Un_KI270310v1 | Un_KI270412v1 | Un_KI270395v1 |
| 1201          | 1179          | 1143          |
| Un_KI270376v1 | Un_KI270337v1 | Un_KI270335v1 |
| 1136          | 1121          | 1048          |
| Un_KI270378v1 | Un_KI270379v1 | Un_KI270329v1 |
| 1048          | 1045          | 1040          |
| Un_KI270419v1 | Un_KI270336v1 | Un_KI270312v1 |
| 1029          | 1026          | 998           |
| Un_KI270539v1 | Un_KI270385v1 | Un_KI270423v1 |
| 993           | 990           | 981           |
| Un_KI270392v1 | Un_KI270394v1 |               |
| 971           | 970           |               |

```
> get("32972_at", geneSymbols(z))
```

```
[1] "NOX1"
```

```
>
```

Another method which can be used to access information about the particular *chromLocation* object is the `nChrom` method, which will list how many chromosomes this organism has:

```
> nChrom(z)
```

```
[1] 455
```

### 3 Summary

The *chromLocation* class has a simple design, but can be powerful if one wants to store the chromosomal data contained in a Bioconductor package into a single object. These objects can be created once and then passed around to multiple functions, which can cut down on computation time to access the desired information from the package. These objects allow access to basic but also important information, and provide a standard interface for writers of other software to access this information.