

# 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"	"2_KI270768v1_alt"
[70]	"19_GL383574v1_alt"	"22_KI270877v1_alt"	"2_KI270769v1_alt"
[73]	"17_KI270860v1_alt"	"1_KI270762v1_alt"	"10_KI270825v1_alt"
[76]	"1_GL383518v1_alt"	"11_KI270927v1_alt"	"17_GL000258v2_alt"
[79]	"17_KI270908v1_alt"	"17_KI270909v1_alt"	"11_KI270902v1_alt"
[82]	"21_KI270873v1_alt"	"5_KI270795v1_alt"	"5_KI270898v1_alt"
[85]	"19_GL383575v2_alt"	"7_KI270806v1_alt"	"6_GL000255v2_alt"
[88]	"12_GL877876v1_alt"	"20_KI270871v1_alt"	"9_KI270823v1_alt"
[91]	"12_KI270837v1_alt"	"7_KI270809v1_alt"	"15_KI270851v1_alt"
[94]	"21_GL383581v2_alt"	"6_KI270801v1_alt"	"19_GL949746v1_alt"
[97]	"19_GL949752v1_alt"	"19_KI270938v1_alt"	"19_GL949747v2_alt"
[100]	"19_GL949753v2_alt"	"22_KI270734v1_random"	"12_GL877875v1_alt"
[103]	"15_KI270850v1_alt"	"2_GL582966v2_alt"	"12_KI270833v1_alt"
[106]	"2_KI270774v1_alt"	"6_GL000252v2_alt"	"19_GL383573v1_alt"
[109]	"19_KI270865v1_alt"	"3_KI270782v1_alt"	"13_KI270838v1_alt"
[112]	"7_GL383534v2_alt"	"22_KB663609v1_alt"	"22_KI270928v1_alt"
[115]	"22_GL383582v2_alt"	"21_KI270872v1_alt"	"22_KI270876v1_alt"
[118]	"16_KI270854v1_alt"	"6_GL000250v2_alt"	"18_KI270863v1_alt"
[121]	"5_KI270897v1_alt"	"6_GL000253v2_alt"	"1_GL383520v2_alt"
[124]	"1_KI270763v1_alt"	"8_KI270818v1_alt"	"8_KI270812v1_alt"
[127]	"8_KI270900v1_alt"	"8_KI270926v1_alt"	"6_KI270758v1_alt"
[130]	"15_KI270848v1_alt"	"19_GL949751v2_alt"	"19_GL949750v2_alt"
[133]	"19_GL949748v2_alt"	"19_GL949749v2_alt"	"19_KI270929v1_alt"
[136]	"19_KI270923v1_alt"	"19_KI270922v1_alt"	"19_KI270921v1_alt"
[139]	"19_KI270920v1_alt"	"19_KI270917v1_alt"	"3_KI270779v1_alt"
[142]	"3_KI270895v1_alt"	"3_KI270924v1_alt"	"3_KI270934v1_alt"
[145]	"3_KI270935v1_alt"	"3_KI270936v1_alt"	"3_KI270937v1_alt"
[148]	"17_KI270910v1_alt"	"19_KI270883v1_alt"	"19_KI270919v1_alt"
[151]	"19_KI270887v1_alt"	"19_KI270888v1_alt"	"19_KI270918v1_alt"
[154]	"19_KI270885v1_alt"	"19_KI270882v1_alt"	"19_KI270933v1_alt"
[157]	"19_KI270930v1_alt"	"19_KI270891v1_alt"	"19_KI270914v1_alt"
[160]	"19_KI270915v1_alt"	"19_KI270916v1_alt"	"19_KI270884v1_alt"
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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	-13248378	-13297508	-13323033	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
12904785	12905704	12903998	12904857	-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	14524573	14523745	14522607	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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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

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

2_KI270774v1_alt	4_KI270790v1_alt	11_KI270927v1_alt
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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
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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

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

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

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2855	2805	2699
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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.